ENSTROM TH-28/480 SERIES MAINTENANCE MANUAL

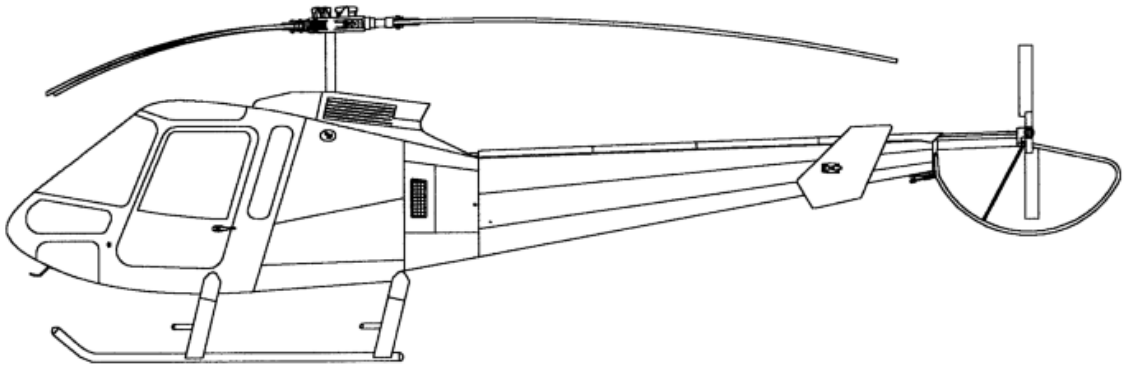
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The Airworthiness Limitations section is FAA approved and specifies inspections and other maintenance required under 14 CFR §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

For EASA approval, this Airworthiness Limitations section is approved and variations must also be approved.

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RECOMMENDED CHANGE REPORT

This maintenance manual is prepared and distributed by The Enstrom Helicopter Corporation and is intended for use by personnel responsible for maintaining Enstrom TH-28, 480, and 480B helicopters. This manual is periodically revised. If, in the opinion of the user, any information has been omitted or requires clarification, please direct your comments to Enstrom via this form (duplicate of this page), or via the Enstrom Helicopter website, or other similar form.

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Manual Identification: Enstrom TH-28/480 Series Maintenance Manual
Manual Date: February 9, 2001
Revision Number and Date: _____
Aircraft Model: _____

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INTRODUCTION

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SECTION 1

INTRODUCTION

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SECTION 1

INTRODUCTION

1-1. Maintenance Manual Arrangement

The maintenance manual sections divide the aircraft into major systems and related subsystems to provide maintenance procedures required for proper system function and optimum component service life. Each section details the following maintenance functions for the associated subsystems and components, if applicable:

General Description
Troubleshooting
Adjustment/Rigging
Removal
Disassembly
Inspections (other than Periodic Inspections)
Repair
Assembly
Installation

1-2. Aircraft Effectivity

The maintenance data presented in this manual is applicable to all TH-28, 480, and 480B model Enstrom helicopters with standard equipment. Optional equipment maintenance procedures are included in the TH-28/480 Series Maintenance Manual for common optional equipment that is installed before aircraft delivery (This does not include avionics installations).

1-3. Maintenance Manual Supplements

Maintenance procedures for optional equipment may be provided in maintenance manual supplements. These supplements are part of the TH-28/480 Series Maintenance Manual when an aircraft is equipped with equipment which requires a maintenance manual supplement. The following equipment supplements are applicable to the TH-28/480 Series Maintenance Manual.

Supplement 1:	Air Conditioning System, P/N 4220176-( ), Revision 8, Dated: May 1/17.
Supplement 2:	Emergency Pop-Out Floats, P/N 4220091-1 and 4220091-3, Revision 3, Dated: Mar 21/16.
Supplement 3:	Gyrocam Dual or Triple Sensor Camera System, Dated: Feb 8/08.
Supplement 4:	Chelton Flightlogic EFIS System, Revision 1, Dated: Nov 9/10.
Supplement 5:	Avionic Systems, Revision 18, Dated: Apr 30/20.
Supplement 6:	Partial Wide Instrument Panel, Dated: Nov 15/10.
Supplement 7:	Bambi Bucket Interface Kit, Dated: Apr 30/13.
Supplement 8:	G1000H Integrated Flight Control System, Revision 2, Dated: Oct 18/19.

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1-4. Maintenance Manual Changes and Revisions

Subsequent to the publication of the initial issue of this manual, changes in equipment, support concepts and procedures, as well as information developed by experience may affect the contents of this manual. To ensure that coverage in the manual continues to reflect such changes, revised information is released by one of the following methods:

1. Revision - A revision alters portions of the manual by replacement, addition, and/or removal of pages.

2. Reissue - A reissue of this manual will occur when the amount of changes warrants complete reissue.

3. Service Directive Bulletins - Used to direct the owner/operator and/or maintenance personnel to make mandatory changes, improvements, or inspections to the aircraft applicable to the entire fleet or a segment of the fleet that are typically safety/airworthiness related. The information provided in the Service Directive Bulletins will be incorporated in the maintenance manual as needed at a later date. At the time of incorporation, the Service Directive Bulletin is superseded by the maintenance manual, and accomplishment or sign-off of the Service Directive Bulletin in the maintenance records book is no longer required. A detailed entry should be made in the maintenance records to indicate that the Service Directive Bulletin is superseded by the maintenance manual.

4. Service Information Letters - Used to transmit information, recommendations, and general service instructions to the aircraft owner/operator and/or maintenance personnel applicable to the entire fleet or a segment of the fleet. The information provided in the Service Information Letters will be incorporated into the maintenance manual as needed at a later date.

5. Service Instructions – Used to provide the owner/operator and/or maintenance personnel with information that is applicable to specific aircraft and does not meet the criteria of a Service Information Letter or Service Directive Bulletin. Service Instructions will not be distributed to the entire fleet.

Enstrom distributes maintenance manual revisions and reissues in electronic form via the Enstrom Helicopter website: www.enstromhelicopter.com (follow the applicable link under the Technical Publications section of the Technical Support page). Revision update notices are sent via email to owners and operators who are registered with Enstrom. Registration to receive publication mailing notifications can be coordinated through the Enstrom Technical Publications Administrator. A complete manual hardcopy may be ordered through Enstrom Customer Service.

Service Information Letters and Service Directive Bulletins incorporated into the maintenance manual are logged in the Service Information Letter Index or the Service Directive Bulletin Index (as appropriate) located on the Enstrom Helicopter website: www.enstromhelicopter.com (follow the applicable link under the Technical Publications section of the Technical Support page). Each index numerically lists all Service Information Letters and Service Directive Bulletins, respectively, and identifies those which have been incorporated into the maintenance manual. All Service Information Letters and Service Directive Bulletins are also located under the Technical Publications section of the website.

Notice of recently released Service Information Letters and Service Directive Bulletins is provided via email notification. Registration to receive publication mailing notifications can be coordinated through the Enstrom Technical Publications Administrator.

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1-5. Application of Warnings, Cautions, and Notes

Warnings, Cautions, and Notes emphasize important and critical instructions and are used for the following conditions.

WARNING

Calls attention to use of materials, processes, methods, or procedures that must be followed to avoid personal injury or loss of life.

CAUTION

Calls attention to methods and procedures which must be followed to avoid damage to the aircraft or equipment.

NOTE

Calls attention to information essential to highlight for clarification of procedures.

1-6. Definitions and Abbreviations

Table 1-1. List of Definitions

Airframe	Means the fuselage, stabilizers, tailcone, cowlings, fairings, rotors, and landing gear of the helicopter and their accessories and controls.
Annually	With respect to an annual inspection, annually means within the preceding 12 calendar months.
Approved	Unless used with reference to another person, means approved by the FAA or any person to whom the FAA has delegated its authority in the matter concerned, or approved under the provisions of a bilateral agreement between the United States and a foreign country or jurisdiction.
Empty Weight	Standard empty weight of a standard helicopter including unusable fuel, full operating fluids, and full engine oil. Basic empty weight is standard empty weight plus weight of installed optional equipment.
FAR	Means the Federal Aviation Regulations (FARs) prescribed by the Federal Aviation Administration (FAA). The FARs comprise Title 14 of the Code of Federal Regulations (14 CFR).
Life-Limited Component	Any part for which a mandatory replacement limit is specified in the type design, the Instructions for Continued Airworthiness, or the maintenance manual. (Refer to Section 3, *Airworthiness Limitations*, Table 3-1.)

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Table 1-2. List of Abbreviations

A/R	As Required
AC	Advisory Circular
AGL	Above Ground Level
ALT	Altitude
APU	Auxiliary Power Unit
ASTM	American Society for Testing and Materials
B.L.	Butt Line
C	Celsius
CAS	Calibrated Airspeed
cc	Cubic centimeter
CCW	Counterclockwise
CFR	Code of Federal Regulations
C.G.	Center of Gravity
C.L.	Center Line
cm	Centimeter
CPC	Corrosion Prevention Compound
CRFS	Crash Resistant Fuel System
°	Degree
EA	Each
EASA	European Union Aviation Safety Agency
EFIS	Electronic Flight Instrument System
EMI	Electromagnetic Interference
F	Fahrenheit
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
Fig.	Figure
FIM	Full Indicator Movement
FLT	Flight
FPM	Feet per Minute
FSII	Fuel System Icing Inhibitor
ft	Foot
ft-lb or *ft-lbs*	Foot-Pound (Force)
ft/min	Feet per Minute
FWD	Forward
gal	Gallon
gal/hr	Gallon per Hour
GCU	Generator Control Unit
GW	Gross Weight
hr or hr(s)	Hour(s)
Hz	Hertz (Cycles per Second)

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Table 1-2. List of Abbreviations - Continued

I/A/W or *IAW*	In Accordance With
IAS	Indicated Airspeed
I.D.	Inner Diameter
in or ”	Inch
in-lb or *in-lbs*	Inch-Pound (Force)
in Hg	Inches of Mercury
IVSI	Instantaneous Vertical Speed Indicator
Kg	Kilogram
KIAS	Knots Indicated Airspeed
km	Kilometer
KT	Knot
kW	Kilowatt
l or L	Liter
LH	Left Hand
lb	Pound
lb/hr	Pound per Hour
LED	Light Emitting Diode
m	Meter
MAX	Maximum
MB	Millibars
ml or *mL*	Milliliter
MIN	Minimum
MIN	Minute
MM	Maintenance Manual
mm	Millimeter
mv	Millivolt
N_1	Gas Producer Turbine Speed
N_2	Power Turbine Speed
NICAD	Nickel Cadmium
NO.	Number
NM	Nautical Mile
Nm	Newton Meter
N_R	Rotor Speed (measured in RPM)
OAT	Outside Air Temperature
O.D.	Outer Diameter
ORC	Overrunning Clutch
oz	Ounce
P/N	Part Number

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Table 1-2. List of Abbreviations - Continued

Para.	Paragraph
pt	Pint
PTO	Power Take-Off
PRESS	Pressure
psi	Pounds per Square Inch
psig	Pounds per Square Inch Gauge
R/S	Right Side
Ref.	Reference
Rev.	Revision
RFI	Radio Frequency Interference
RFM	Rotorcraft Flight Manual
RH	Right Hand
RPM	Revolutions per Minute
S/N	Serial Number
SDB	Service Directive Bulletin
SHP	Shaft Horsepower
SIL	Service Information Letter
STA	Station
sq ft	Square Feet
STC	Supplemental Type Certificate
TEMP	Temperature
TOT	Turbine Outlet Temperature
TRQ	Torque
TT or *T-T*	Tension-Torsion
VDC	Volts, Direct Current
V_H	Velocity Maximum Speed (Level Flying Condition under Maximum Power)
V_{NE}	Velocity Never Exceed (Airspeed Limitation)
WT	Weight
XMSN	Transmission

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ENSTROM TH-28/480 SERIES MAINTENANCE MANUAL

SECTION 2

GENERAL INFORMATION

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SECTION 2

GENERAL INFORMATION

2-1. General Description

A. The TH-28, 480, and 480B helicopters are a 3 bladed, single engine helicopter manufactured by the Enstrom Helicopter Corporation and certificated by the FAA under FAR Part 27.

2-2. General Arrangement

A. Figure 2-1 depicts the general arrangement.

2-3. Principal Dimensions

A. Figure 2-2 depicts the principal dimensions of the aircraft.

2-4. Turning Radius

A. The turning radius is about 23 feet (7 meters) when pivoted about the mast.

2-5. Fuselage

A. The fuselage is the forward section of the airframe extending from the nose to the forward end of the tailcone. The fuselage primarily consists of the keel assembly (two longitudinal beams with transverse bulkheads) which is attached to a welded steel tubular truss structure called the pylon. All of the major components of the aircraft are attached to the pylon. The keel assembly is the main supporting structure for the cabin and forward landing gear cross tube. The pylon forms the supporting structure for the cabin, fuel cells, transmission, engine, aft landing gear cross tube, and the tailcone. The cabin shell is of composite construction with reinforcing where necessary to add structural stiffness.

2-6. Tailcone

A. The tailcone is bolted to the aft end of the pylon. It is a tapered, semi-monocoque structure comprised of skins, bulkheads, longerons, and stringers. The tailcone supports the tail rotor, tail rotor transmission, horizontal and vertical stabilizers, and the tail rotor guard. It houses the tail rotor drive shaft and some electronic equipment.

2-7. Landing Gear

A. Main Landing Gear: The main landing gear consists of two tubular aluminum skids attached to the airframe by means of the forward and aft cross tubes through four air-oil oleo struts. The struts cushion ground contact during landing. Drag struts give the gear stability and strength and prevent fore and aft movement during ground contact maneuvers. Replaceable hardened steel skid shoes are installed on each skid to resist skid wear on hard surfaces.

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B. Tail Rotor Guard: A tubular aluminum tail rotor guard is installed on the aft end of the tailcone. It acts as a warning to the pilot upon an inadvertent tail-low landing and aids in protecting the tail rotor from damage.

C. Ground Handling Wheels: Each landing gear skid tube has provisions for installing ground handling wheel assemblies. Each skid either has four lugs installed over which the wheel assemblies slide or a mounting plate onto which the ground handling wheels install. Each assembly has a manually operated over-centering device to lift the skids clear of the ground. The ground handling wheels must be removed before flight.

2-8. Cabin

A. The cabin contains the pilot and copilot/passenger seating, a complete set of dual flight controls, a lower radio console, and an instrument panel all enclosed by the composite cabin.

2-9. Cabin Doors

A. The two cabin doors are composite reinforced structure with transparent plexiglass windows in the upper section. Flow-through ventilation is either supplied by sliding vent windows (standard on the TH-28 and 480B) or pop-out vents (standard on the 480) to draw fresh air into the cabin. Positive retention door latches are used to secure the doors.

2-10. Seats

A. TH-28:

1. Pilot and Copilot Seats: The pilot and copilot seats are conventional crashworthy seats. The seats are capable of providing crew protection up to 20 "g's" at a crew weight of 170 pounds/77 kg. Both seats use a composite bucket and an aluminum frame. Included with the seat are pan, back, and headrest cushions. A five point restraint system with a rotary buckle, adjusters in the lap and shoulder belts, and an inertia reel mounted on the back of the headrest are an integral part of the seat. The main vertical structural members of the frame for both seats are built-up beams of formed sheet metal. Control of the seat during vertical stroking is accomplished by a sliding track arrangement. Vertical loads applied to the occupant are limited by a wire-bender energy absorber. Forward loads applied to the seat are reacted by the rear struts. Lateral loads applied to the seats are reacted by the diagonal braces.

2. Observer Seat: The observer seat uses the same bucket, cushions, restraint system (with the inertia reel on the bucket), and energy absorbers as the pilot/copilot seats. The same sliding track arrangement is used to guide the seat; however, the track interfaces with the cabin backwall.

B. 480/480B:

1. Pilot and Copilot/Passenger Seats: The pilot and copilot/passenger seats are adjustable for fore and aft positioning and are easily removed from the aircraft to facilitate

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maintenance on the seats or the cockpit area. Both seats use a composite bucket mounted on a pedestal assembly. A four point restraint system with adjusters in the lap and shoulder belts and an inertia reel mounted on the back of the seat pedestal are an integral part of the seat.

2. Passenger Seats: The passenger seats are mounted to the cabin backwall and fold up to the stowed position when not in use and use a combination diagonal shoulder harness and lap belt restraint system.

C. Inertia Reel Shoulder Harness: An inertia reel and shoulder harness is incorporated in all seats. There is no independent control to manually lock the harness. With the shoulder straps properly adjusted, the reel strap will extend to allow the occupant to lean forward; however, the reel automatically locks when the helicopter encounters an impact force of 2 to 3 "G" deceleration. To release the lock, it is necessary to lean back slightly to release tension on the lock.

2-11. Engine Assembly

A. The TH-28/480 series helicopters are equipped with a Rolls-Royce 250-C20W free turbine, turboshaft engine rated at 420 SHP (313 kW); however, engine power is limited depending on model and drive system configuration of the helicopter (Refer to Table 2-1). Refer to the Rolls-Royce 250-C20 Operation and Maintenance Manual (10W2) for a complete description of the engine assembly and its sub-components.

Table 2-1. Engine Power Limitations

Helicopter Model	Takeoff Rating (5 minute maximum)	Maximum Continuous Power
TH-28 and 480	285 SHP (213 kW)	256 SHP (191 kW)
480 equipped with Increased Rotor Speed Kit (P/N 4230002)	290 SHP (216 kW)	268 SHP (200 kW)
480B	305 SHP (227 kW)	277 SHP (206 kW)

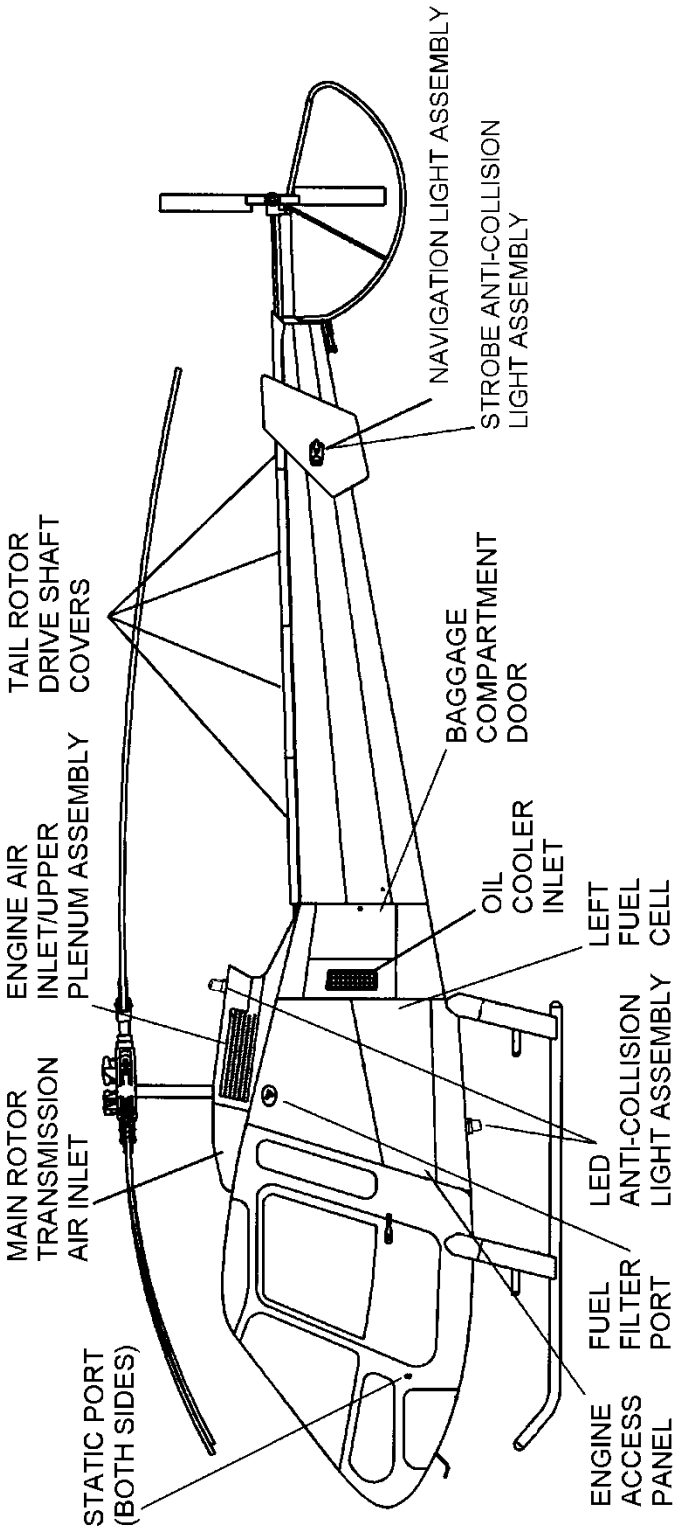
2-12. Engine Compartment Cooling

A. The engine compartment is convection cooled and augmented by air movement created by the airfoil shaped spokes in the upper pulley.

B. 480B serial number 5114 and subsequent are equipped with fuselage panels/cowls that have additional holes to increase the cooling efficiency of the engine compartment and can be equipped with Engine Access Panels, P/N 4220150, to allow aircraft operation at an increased maximum ambient temperature limit. 480B serial numbers 5087 through 5113 can be equipped with the Increased Cooling Kit, P/N 4230031, for operation at the increased maximum ambient temperature limit.

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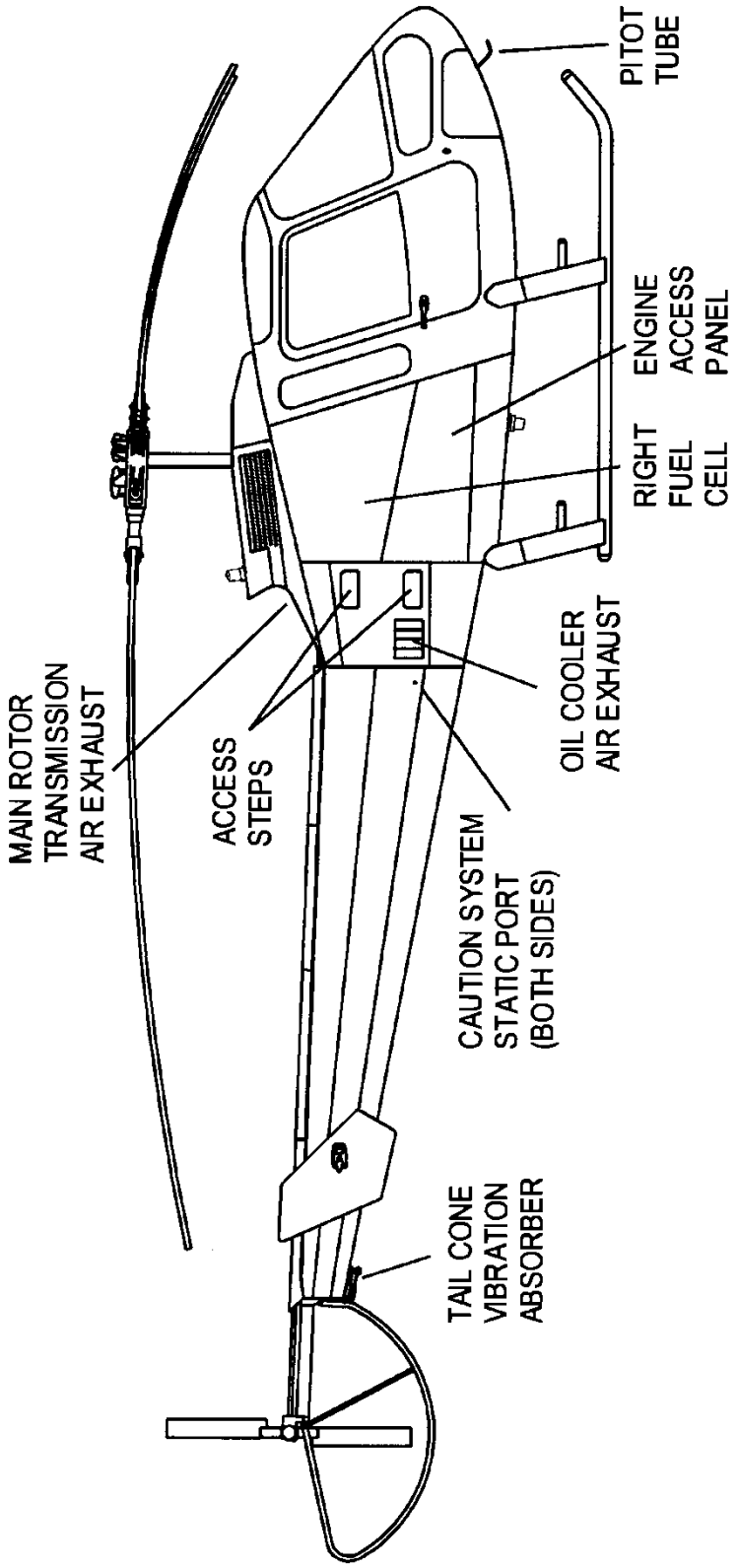
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Sheet 1 of 2

Figure 2-1. General Arrangement

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Sheet 2 of 2

Figure 2-1. General Arrangement

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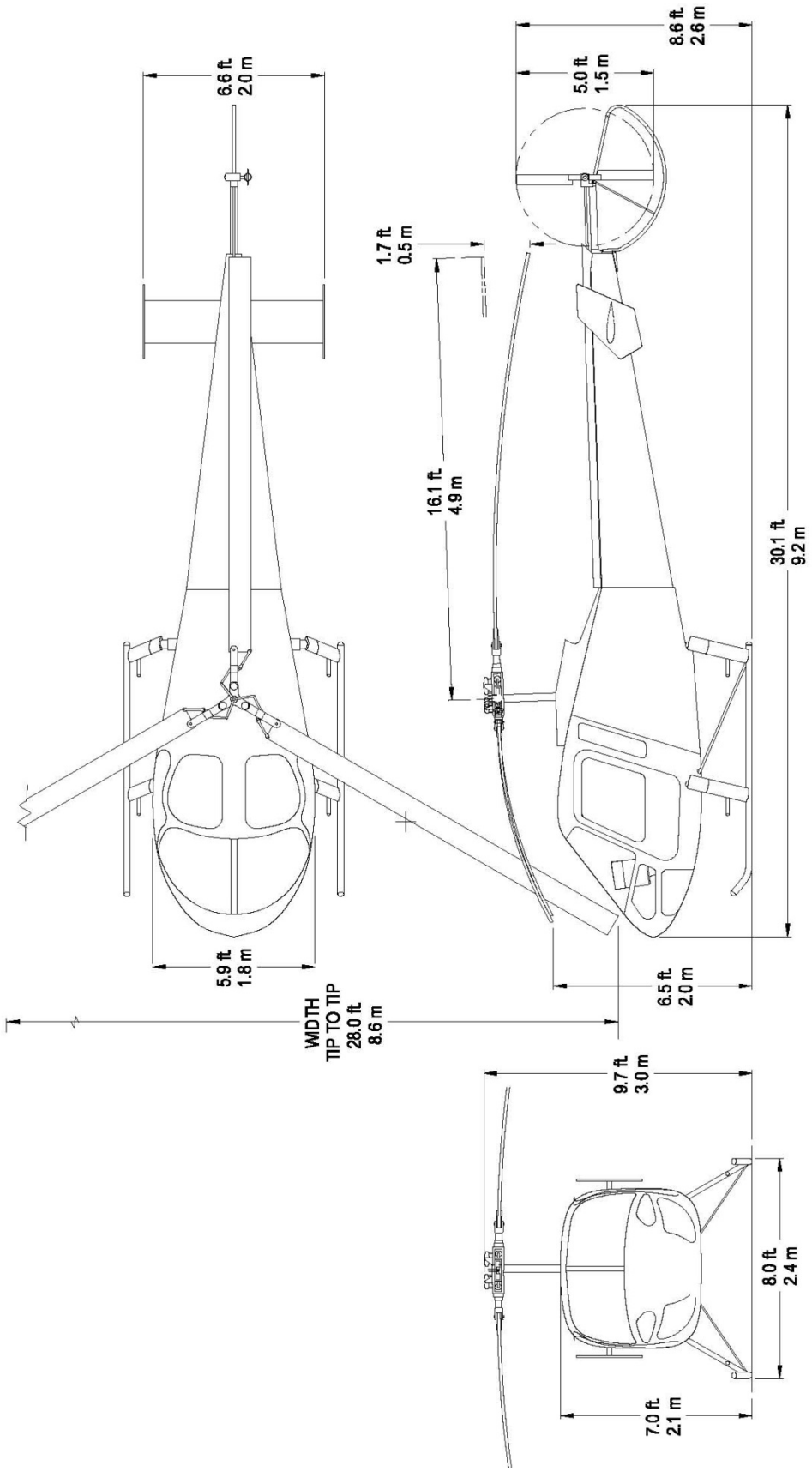


Figure 2-2. Principle Dimensions

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2-13. Flight Controls

A. The flight controls include three primary systems: the collective, cyclic, and anti-torque/directional controls. The flight control systems are not hydraulically boosted. The aircraft also has fixed horizontal and vertical stabilizers mounted on the tailcone to provide additional stability and attitude control during high speed flight.

2-14. Power Train (Figure 2-3)

A. The power train includes the main rotor transmission, upper pulley, "H" - strut, drive belt, lower pulley, lower pulley drive shaft, overrunning clutch, power output drive shaft, short tail rotor drive shaft, long tail rotor drive shaft, and the tail rotor gearbox.

2-15. Main Rotor Assembly

A. The main rotor assembly is a three bladed, high inertia, fully articulated rotor system.

2-16. Tail Rotor Assembly

A. The tail rotor assembly is a two bladed, wide cord, teetering, delta hinged rotor assembly.

2-17. Heating and Ventilation

A. Cabin ventilation is provided by pop-out vents, sliding vent windows, or an optional ram air ventilation system. Cabin heating and windshield defrosting can be provided by an optional bleed air type system. Air conditioning can be provided by an optional air conditioner installation. Refer to the TH-28/480 Series Maintenance Manual Supplement 1 for air conditioning maintenance procedures.

2-18. Operating Limitations and Restrictions

A. Refer to the TH-28, 480, or 480B Rotorcraft Flight Manual for the aircraft operating limitations and restrictions.

1. If available, refer to the applicable rotorcraft flight manual supplement for aircraft operating limitations and restrictions if the aircraft is equipped with an installation configuration or equipment option not covered by the basic rotorcraft flight manual.

a. A listing of available rotorcraft flight manual supplements can be found on the Enstrom Helicopter website. Navigate to the *SUPPORT* drop-down menu at the top of the web page, locate the *Technical Publications* information, and select link, *Enstrom Optional Equipment Supplement Publications Status.*

2-19. Placards

A. Refer to the TH-28, 480, or 480B Rotorcraft Flight Manual or relevant rotorcraft flight manual supplement for the required placards.

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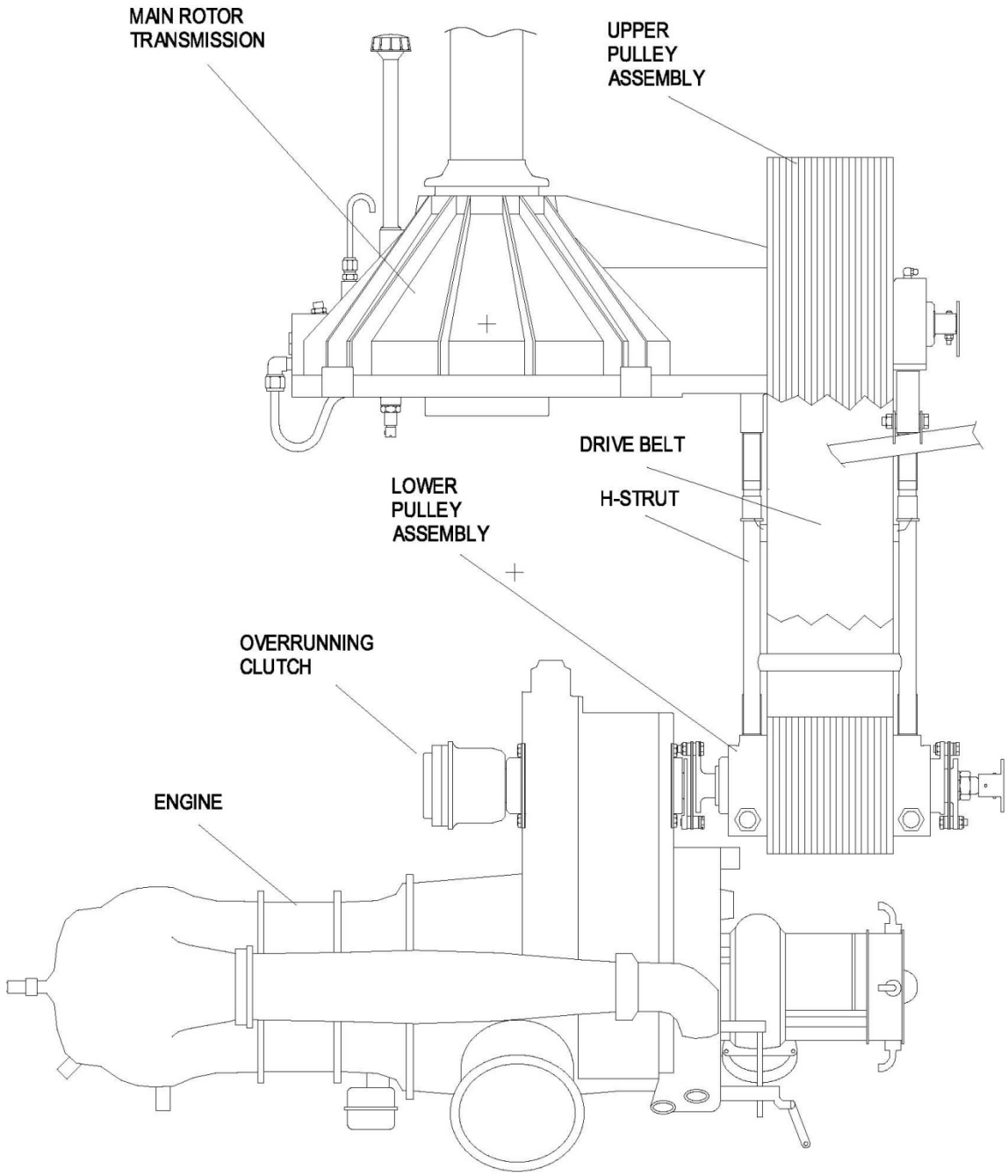


Figure 2-3. Power Train (Simplified)

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2-20. Vendor Information

A. The following components listed in Table 2-2 are to be maintained I/A/W the manufacturer's instructions to ensure the continued airworthiness of the aircraft.

B. The owner/operator is responsible for ensuring that current maintenance publications are available to ensure continued airworthiness of the aircraft.

Table 2-2. Vendor Contact Information

Component	Part Number	Manufacturer
Engine	250-C20W	Rolls-Royce 450 S. Meridian Street Indianapolis, IN 46206 Tel: (317) 230-2000 http://www.rolls-royce.com/
Starter/Generator	524-080	Thales Avionics Inc. (Auxilec) 140 Centennial Avenue Piscataway Township, NJ 08854 Tel: (732) 494-6300 https://customeronline.thalesgroup.com/en
Starter/Generator	150SG117Q-3-1 150SG117Q-4-1	Skurka Aerospace, Inc. 4600 Calle Bolero Camarillo, CA 93011 Tel: (805) 484-8884 http://www.skurka-aero.com/
Generator Control Unit (GCU)	VR1528-11B	Thales Avionics Inc. (Auxilec) 140 Centennial Avenue Piscataway Township, NJ 08854 Tel: (732) 494-6300 https://customeronline.thalesgroup.com/en
Generator Control Unit (GCU)	GCSG501-2	Avionic Instruments, LLC 1414 Randolph Avenue Avenel, NJ 07001 Tel: (732) 388-3500 http://www.avionicinstruments.com/
Battery(1)	TSP-1728-20-17SP100	Marathon Power Technologies P.O. Box 8233 Waco, TX 76712-8233 Tel: (254) 776-0650 http://www.mptc.com/
Battery(2)	G-641	Teledyne Battery Products (Gill Batteries) 840 West Brockton Avenue Redlands, CA 92374 Tel: (800) 456-0070 Tel: (909) 793-3131 http://www.gillbatteries.com/
Fuel Cells (Standard)	4122052-"X"	Floats & Fuel Cells, Inc. 4010 Pilot Drive, Suite 103 Memphis, TN 38118 Tel: (800) 647-6148 https://www.ffcfuelcells.com)

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Table 2-2. Vendor Contact Information

Component	Part Number	Manufacturer
Fuel Cells (Standard)	4122052-"X"	United Fuel Cells Corporation 853 Adams Road Eagle River, WI 54521 Tel: (715) 479-6149 https://unitedfuelcells.com/contact/
Fuel Cells	4122009-"X"	Zodiac Aerazur Caudebec 4, rue Lesage-Maille Caudebec 76320, France Tel: +33 (1) 6486-6922 http://www.zodiacaerospace.com/en/zodiac-aerosafety-systems-elastomer
Fuel Cell Crossover	500123	
Vent Crossover	500122	Zodiac Aerazur Caudebec 4, rue Lesage-Maille Caudebec 76320, France Tel: +33 (1) 6486-6922 http://www.zodiacaerospace.com/en/zodiac-aerosafety-systems-elastomer
Tension-Torsion (TT Strap) (STC SR03465CH)	AA-ECD-084-480	Airwolf Aerospace LLC 15369 Madison Rd. Middlefield, OH 44062-8404, U.S.A. Tel: (440) 632-1687 / Fax: (440) 632-1685 www.airwolfaerospace.com / info@airwolfaerospace.com
Cargo Hook (option)	2A20B-17149-2	Breeze-Eastern Corporation 35 Melanie Lane Whippany NJ, 07981 U.S.A. (800) 929-1919 / (973) 602-1083 / (973) 602-1090 Fax: (973) 739-9344 customerserives@breeze-eastern.com www.breeze-eastern.com
	528-023-01	Onboard Systems International, Inc. 13915 NW 3rd Court Vancouver, WA 98685 U.S.A. Tel: (800) 275-0883 / (360) 546-3072 Fax: (360) 546-3073 www.onboardsystems.com
Roll Over Valve Assembly(3)	549448	SAFRAN AEROSYSTEMS 4, rue Lesage Maille 76320 Caudebec-lès-Elbeuf, France Tel: +33 (0) 2.32.96.56.00 https://www.safran-group.com/companies/safran-aerosystems
Breakaway Coupling, Vent(3)	ECD115-11	
Breakaway Coupling, Fuel Line(3)	ECD115-15	
Breakaway Coupling, Cross Fill(3)	ECD115-17	
LH Fuel Bladder(3) (CRFS)	ECD4097-1	
RH Fuel Bladder(3) (CRFS)	ECD4097-3	
Frangible Ring(3)	ECD4098-11	

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Notes:

1. This is the standard battery for the TH-28 and 480. Refer to the correct publication if an optional or special battery is installed.
2. This is the standard battery for the 480B. Refer to the correct publication if an optional or special battery is installed.
3. Refer to the following Safran Aerosystems reports for instructions for continued airworthiness:
   a. Report DT-00013426, *Maintainability Analysis Report Enstrom B480*, latest revision.
   b. Report DT-00013493, *Storage and Condition Requirement Sheet 480 Series*, latest revision.

2-21. Special Tools

A. The special tools listed in Table 2-3 are used for removal, installation, and overhaul of components used on the TH-28/480 Series aircraft:

NOTE

The special tools listed in Table 2-3 are available through Enstrom's Tool Rental Program. Contact Enstrom Helicopter Product Support for details.

Table 2-3. Special Tools

Part Number	Nomenclature
T-0003	Main Rotor Lead/Lag Lower Nut Tool
T-0005	Damper Rod End Removal Tool
T-0009	Main Rotor Blade Bolt Guide Bullet
T-0011	Main Rotor Hoist Sling
T-0013	Main Rotor Lamiflex Nut Socket
T-0014	Needle Point Grease Adapter
T-0016	Lower Swashplate Gimbal Tool
T-0017	Transmission Hoist Eye
T-0022	Collective Spring Capsule Retainer Tool
T-0026	Main Rotor Blade Tab Bending Tool
T-0027	Main Rotor Blade Tab Angle Tool
T-0035	Oleo Disassembly Tool (Holding)
T-0036	Blade Grip Seal Installation Tool
T-0045-1	Lower Swashplate Dogleg Puller
T-0048	Main Rotor Mast Nut Tool

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Table 2-3. Special Tools

Part Number	Nomenclature
T-0051-3	Main Rotor Flapping Nut Tool
T-0054	Swashplate Dogleg Alignment Tool
T-0056-3	Tail Rotor Thrust Bearing Retention Nut Tool
T-0057	Damper Bleeding Fixture
T-0068-3	Tail Rotor Xmsn Output Shaft Runout Tools
T-0079-1	Swashplate Swaging Tool
T-0086	Upper Guidetube Nut Tool
T-0087-15	Tail Rotor Assembly Static Balance Mandrel
T-0092-5	Taper Pin Removal Tool
T-0095	Damper Tool
T-0100-1	Swashplate DU Bushing Removal Tool
T-0102-1	Guidetube Disassembly Tool
T-0104	Swashplate Bushing Installation Tool
T-0121-1	Tail Rotor Static Balance Stand
T-0134	Plate Assembly (Lower Swashplate Assembly)
T-0135-1-SET	Main Rotor Transmission Pinion Crows Foot
T-0136-1	Clutch Removal/Installation Wrench
T-0137-1	Engine Hoist Assembly
T-0139-1	Belt Tension Tool
T-0140	Tail Rotor Rigging Tool
T-0141	Drive Pulley Alignment Tool
T-0143-1	Tail Rotor Driveshaft Alignment Tool
T-0149	Seal Installation Tool (T-T Strap)
T-0151-1	Universal Block Bearing Tool Set (Grease Lubricated)
T-0152	Tail Rotor Balance Tool (Photo Cell Bracket)
T-0160-1	Damper Ring Seal Installation Tools
T-0161-1	Seal Installation Tool
T-0162-1	Universal Block Bearing Tool (Oil Lubricated)
T-0164-1	Upper Pulley Wrench
T-0166-11	Alignment Tool, Oil Cooler Shaft

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Table 2-3. Special Tools

Part Number	Nomenclature
T-0168-1	Tail Rotor Assembly Holder
T-0169-1	Oleo Disassembly Tool
T-0172-1	Seal Installation Tool (Double Lip Seal)
T-0174-1	Hub Puller
T-0186-1	Overrunning Bearing Seal Tool Set
T-0194-1	Bore Concentricity Indicator Tool Set
T-0197-7	Torque Multiplier
T-0198-11	Main Rotor Gearbox Oil Draining Enabler
T-0199-1	Laser Alignment Emitter
T-0200-5	Target (Laser) Fixture
T-0203-1	Seal Puller Assembly
T-1575	Swashplate Centering Tool
T-1656-3	Main Rotor Blade Plug Tool
T-1709	Guidetube Bearing Collar Tool
T-1758	Guidetube Clamps
T-2889	Tail Rotor Transmission Rigging Tool
T-2893	Tail Rotor Needle Teeter Bearing Removal/Installation Tool Kit
T-2896-1	Damper Bleeding/Servicing Tool (2 Required)
T-4122100-1	Fuel Bladder Install Tool (CRFS)
RBT18560(2)	Seal Removal Tool (Double Lip Seal)
(1)	Engine Stand
(1)	Main Rotor Transmission Stand
(1)	Main Rotor Hub Stand

Notes:

1. Contact the Enstrom Helicopter Product Support for assistance in obtaining these tools.
2. Available from Dart Helicopter Services

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2-22. Torque Data

A. Unless specified in Table 2-4 and/or in this manual's maintenance procedures or as called out in the component manufacturer's specifications, all hardware should be torqued to the recommended torque values listed in Tables 2-5 through 2-14.

NOTE

The following table does not contain all of the special torque values found in this maintenance manual.

Table 2-4. Special Torque Values

	Location	Torque Value
1.	**Airframe**	
	a. Tailcone Attachment Bolts	240 in-lb/27.3 Nm
	b. Landing Gear Oleo Pivot Points (all)	([1])
	b. Landing Gear Leg/Drag Strut Pivot Points (all)	40-60 in-lb/4.5-6.8 Nm
2.	**Flight Controls**	
	a. Dogleg to Lower Swashplate Nut	40-60 in-lb/4.5-6.8 Nm
	b. Dogleg to Push/Pull Rod Nut	130-140 in-lb/14.7-15.8 Nm
	c. Upper Swashplate Guidetube Nuts	240 in-lb/27.3 Nm
3.	**Main Rotor Transmission**	
	a. Mast Nut	450 ft-lb/613.6 Nm
	b. Attachment Bolt Nuts	240 in-lb/27.3 Nm
	c. Pinion Nut	250 ft-lb/340.9 Nm
	d. Tail Rotor Coupling Bolt	100-140 in-lb/11.3-15.8 Nm
	e. Magnetic Pick-up	60-65 in-lb/6.8-7.3 Nm
4.	**Main Rotor Hub**	
	a. Blade Attachment Nut	50 ft-lb/68.2 Nm
	b. Damper Pivot Nut	190 in-lb/21.6 Nm
	c. Drag Link Nut	140 in-lb/15.8 Nm
	d. Flapping Bearing Reservoir Cap	10-20 in-lb/1.1-2.3 Nm
	e. Flapping Pin Nut	150-175 ft-lb/204.5-238.6 Nm
	f. Lamiflex Bearing Retention Nut	5-15 in-lb/0.6-1.7 Nm
	g. Lower U-block Nut	50 ft-lb/67.8 Nm
5.	**Tail Rotor**	
	a. Assembly Retention Bolt	300 in-lb/34.1 Nm
	b. Blade Grip Bolts[2]	75 in-lb/8.5 Nm
	c. Driveshaft Taper Pins	25 in-lb/2.8 Nm
	d. Pitch Change Plate to Grip Attachment Bolts	50-70 in-lb/5.7-8.0 Nm
	e. Thrust Bearing Retention Nut	80-90 ft-lb/109.1-122.7 Nm

1 Inch-Pound = 0.113 Newton Meter
1 Newton Meter = 8.851 Inch-Pound
1 Foot-Pound = 1.3558 Newton Meter
1 Newton Meter = 0.7376 Foot-Pound

[1] Refer to (para. 8-70.A).
[2] Torque for oversize bolts: 140 in-lbs/15.8 Nm maximum.

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Table 2-5. Torque Values for Nuts and Bolts

CAUTION THE FOLLOWING TORQUE VALUES ARE DERIVED FROM OIL FREE CADMIUM PLATED THREADS.				
	TORQUE LIMITS RECOMMENDED FOR INSTAL-LATION (BOLTS LOADED PRIMARILY IN SHEAR) (inch-pounds)		MAXIMUM ALLOWABLE TIGHTENING TORQUE LIMITS (inch-pounds)	
Thread Size	Tension type nuts MS20365 and AN310 (40,000 psi in bolts)	Shear type nuts MS20364 and AN320 (24,000 psi in bolts)	Nuts MS20365 and AN310 (90,000 psi in bolts)	Nuts MS20364 and AN320 (54,000 psi in bolts)
FINE THREAD SERIES				
8-36	12-15	7-9	20	12
10-32	20-25	12-15	40	25
1/4-28	50-70	30-40	100	60
5/16-24	100-140	60-85	225	140
3/8-24	160-190	95-110	390	240
7/16-20	450-500	270-300	840	500
1/2-20	480-690	290-410	1100	660
9/16-18	800-1000	480-600	1600	960
5/8-18	1100-1300	600-780	2400	1400
3/4-16	2300-2500	1300-1500	5000	3000
7/8-14	2500-3000	1500-1800	7000	4200
1-14	3700-5500	2200-3300*	10,000	6000
1-1/8-12	5000-7000	3000-4200*	15,000	9000
1-1/4-12	9000-11,000	5400-6600*	25,000	15,000
COARSE THREAD SERIES				
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4-20	40-50	25-30	75	45
5/16-18	80-90	48-55	160	100
3/8-16	160-185	95-100	275	170
7/16-14	235-255	140-155	475	280
1/2-13	400-480	240-290	880	520
9/16-12	500-700	300-420	1100	650
5/8-11	700-900	420-540	1500	900
3/4-10	1150-1600	700-950	2500	1500
7/8-9	2200-3000	1300-1800	4600	2700

The above torque values may be used for all cadmium-plated steel nuts of the fine or coarse thread series which have approximately equal number of threads and equal face bearing areas. * Estimated corresponding values.

Table 2-6. Fittings, Tubing



Aluminum Alloy Tubing



Steel Tubing

Fitting Size	Tubing OD (inches)	6061-O & 5052-O Aluminum-Alloy Tube: Fitting or Nut Torque (in-lb)	Steel Tube: Fitting or Nut Torque (in-lb)
-2	1/8	20-30	75-85
-3	3/16	25-35	95-105
-4	1/4	50-65	135-150
-5	5/16	70-90	170-200
-6	3/8	110-130	270-300
-8	1/2	230-260	450-500
-10	5/8	330-360	650-700
-12	3/4	460-500	900-1000

Table 2-7. Fittings, Hose Assemblies





Flexible Hose or Tube Fittings (excluding nylon pitot static lines) Measurements based on Hose Inside Diameter or Fitting Size						
Fitting Size	Tube Size (inches)	Thread	Flex Hose and 6061-T6 Aluminum Alloy Torque Limits (in-lb)		Steel (Torque Limits (in-lb)	
			Min	Max	Min	Max
-3	3/16	3/8-24	30	70	90	140
-4	1/4	7/16-20	70	120	135	185
-5	5/16	1/2-20	70	120	180	230
-6	3/8	3/4-16	130	180	270	345
-8	1/2	3/4-16	300	400	450	525
-10	5/8	7/8-14	430	550	650	750
-12	3/4	1-1/6-12	650	800	900	1,100

Table 2-8. Fittings



AN924 Nut
Flared Tube



AN814
Plug and Bleeder



AN6289 Nut (Undercut)
Flared Tube

Nominal Tube O.D. (inches)	Fitting Thread Size	Torque Limits (inch-pounds)									
		For Gasketed Aluminum or Steel Fittings*						For Jamnuts and Fittings Without Gaskets* *			
		AN924 Nut AN815 Union		AN814 Plug		AN6289 Nut		Aluminum		Steel	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1/8	5/16-24	25	35	10	16	25	35	35	50	-	-
3/16	3/8-24	50	75	30	40	50	75	65	80	70	90
1/4	7/16-20	55	80	40	65	75	100	90	105	110	130
5/16	1/2-20	75	100	60	80	90	120	105	125	140	160
3/8	9/16-18	100	150	80	120	150	200	125	145	225	275
1/2	3/4-16	180	230	150	200	200	250	240	280	400	450
5/8	7/8-14	250	350	200	350	275	400	330	370	550	650
3/4	1-1/6-12	420	600	300	500	450	650	540	660	800	960

* For use with O-rings and aluminum, asbestos, leather, Teflon, gaskets, or washers.
* * For combinations of materials (either jamnut, fittings, or boss), use the lowest applicable values shown.

Table 2-9. Steel Fittings Using Jam Nuts or Straight Thread O-Ring Boss



AN814
Plug and Bleeder
(Steel)



MS51525
Flared AN to Straight Pipe
Thread Male Adapter

Tube Size	Thread Size (inches)	Torque Limits (inch-pounds)	
		Min	Max
-02	5/16-24	72	84
-03	3/8-24	95	105
-04	7/16-20	155	180
-05	1/2-20	170	180
-06	9/16-18	275	290
-08	3/4-16	480	515
-10	7/8-14	515	575

Table 2-10. Pitot Static System Nylon Fittings



268N04X02: Adapter



264N04: Union Tee



269N04X02: Male Elbow

Nominal Tube O.D. (inches)	Thread Size (inches)	Torque Limits (inch-pounds)	
		Min	Max
1/4	7/16-20	7	10

Table 2-11. Pipe Plugs



MS20822
90° AN to Pipe
Fitting



MS20823
45° AN to
Pipe Fitting



AN816
Nipple, Flared
Tube and Pipe
Thread



AN932 Plug



MS20913
Plug, Square
Head

Thread Size (inches)	Torque Limits (inch-pounds)
1/16-27 NPT	40 to 44
1/8-27 NPT	40 to 44
1/4-18 NPT	85 to 94
3/8-18 NPT	110 to 121
1/2-14 NPT	160 to 176
3/4-14 NPT	230 to 252
1-11-1/2 NPT	315 to 347

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Table 2-12. Crush Type Gaskets

NOTE

Turn the part until the sealing surfaces are in contact and then tighten to the angle of turn listed for the appropriate thread size.





Thread Pitch On Part to be Tightened (Threads per Inch)	Angle of Turn	
	Aluminum	Copper
8	135°	67°
10	135°	67°
12	180°	90°
14	180°	90°
16	270°	135°
18	270°	135°
20	270°	135°
24	360°	180°
28	360°	180°

Table 2-13. Minimum Prevailing Torque Values for Re-used Self-Locking Nuts

Bolt, or Screw Thread Size (inches)	Seating Torque (in-lb ±10%)	Prevailing Torque Max. On or Off (in-lb)	Prevailing Torque Min. On or Off (in-lb)
4-40	8	5	0.5
6-32	15	8	1.0
8-32	28	12	1.5
AN3	45	18	2.0
AN4	110	40	3.0
AN5	190	85	5.0
AN6	345	110	9.0
AN7	545	150	12.0
AN8	850	220	16.0

If not listed in Table 2-13, a self-locking nut can be reused as long as a wrench is required to turn it on the bolt.

Table 2-14 Brass Bolts

Bolt Thread Size (Inch)	Coarse Thread	Bolt Thread Size (Inch)	Fine Thread
2-56	2 in-lb	2-64	2.5 in-lb
4-40	4.3 in-lb	4-48	5.4 in-lb
5-40	6.3 in-lb	5-44	7.7 in-lb
6-32	7.9 in-lb	6-40	9.9 in-lb
8-32	16.2 in-lb	8-36	18.0 in-lb
10-24	18.6 in-lb	10-32	25.9 in-lb
1/4”-20	61.5 in-lb	1/4"-28	77 in-lb
5/16”-18	107 in-lb	5/16”-24	116 in-lb
3/8”-16	16.0 ft-lb	3/8”-24	17.7 ft-lb
7/16”-14	26.4 ft-lb	7/16”-20	27.3 ft-lb
1/2”-13	35.2 ft-lb	1/2"-20	37 ft-lb
5/8”-11	76 ft-lb	5/8”-18	85 ft-lb
3/4”-10	104 ft-lb	3/4”-16	102 ft-lb
7/8”-9	159 ft-lb	7/8”-14	158 ft-lb
1”-8	235 ft-lb	1”-14	212 ft-lb

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2-23. Consumable Parts List

A. Table 2-15 lists the consumable parts and lubricants that are normally used during servicing or periodic inspection of the aircraft. The quantities listed reflect normal inspection intervals; however, they may need to be adjusted if adverse operating conditions require more frequent servicing or inspections.

B. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) and the Rolls-Royce 250-C20 Series Illustrated Parts Catalog (10W4) for the consumable parts required for servicing or periodic inspection of the engine.

NOTE

Obtain engine parts through the Rolls-Royce Parts Distribution System. Enstrom does not stock engine parts for customer service use.

Table 2-15. Consumable Parts List

Interval	Item		Part Number (Notes 1, 2)	Quantity
50 Hour (Note 3)	1.	Grease	C008, C011	As Required
	2.	Silicon Oil	C007	As Required
	3.	Oil	C009	As Required
	4.	Oil	C005	As Required
	5.	O-ring	NAS1612-2	7 EA (Note 4)
100 Hour (Note 5)	1.	Same as 50 hour requirements	--	--
	2.	Crush Washer	AN900-8 or MS35769-9	1 EA
	3.	Crush Washer	AN900-10 or MS35769-11	1 EA
	4.	Oil Filter	HP-1003	1 EA
	5.	Oil (engine)	C004, C005	6 QT (US)
	6.	Oil	C006	7 PT (US)
	7.	Oil (TRGB)	C006	5 FL OZ (US)
	8.	O-ring	NAS1612-2	2 EA (Note 4)
	9.	O-ring	NAS1612-8	4 EA (Note 4)
	10.	O-ring	MS28778-6	1 EA (Notes 4, 6)
200 Hour (Note 5)	1.	Same as 100 hour requirements	--	--
	2.	Filter Element – APM	AC-B283F-107	1 EA
	3.	O-ring – APM	M83248/1-138	1 EA
	4.	Filter Element – Purolator/Facet	038088-08	1 EA
	5.	Seal Kit – Purolator/Facet	1741125	1 EA
	6.	O-ring	NAS1612-2	3 EA (Note 4)
	7.	Oil (ORC)	C004, C005	7 FL OZ (US)
300 Hour (Note 5)	1.	Same as 100 hour requirements	--	--
	2.	Fuel Filter Kit	1743645-02	1 EA (Note 7)
	3.	Gasket	28-13107-15	1 EA (Note 4)

NOTES:

1. Verify configuration, part number, and quantity with latest revision of illustrated parts catalog, service letters, and service bulletins as required.
2. Refer to Table 4-1 for C-00# index listing.
3. Service only.
4. Replace on condition.
5. Service and inspection.
6. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) for engine oil change requirements.
7. The external fuel filter is optional equipment and might not be installed on the aircraft.

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2-24. Taper Pin Size Chart

Table 2-16 lists information pertaining to taper pin part numbers and physical properties.

NOTES

Always check the condition and security of taper pins at every inspection.

The dash number of the 28-16323 series taper pins is vibro-etched on the head of the taper pin.

Table 2-16. Taper Pin List



Old Enstrom P/N	Current Enstrom P/N	Head Diameter	Grip Length
AN386-2-7A [1]	AN386-2-7A [1]	0.296 in / 7.5 mm	1.00 in / 25.4 mm
AN386-2-8A [1]	AN386-2-8A [1]	0.302 in / 7.6 mm	1.12 in / 28.4 mm
AN386-2-9A [1]	AN386-2-9A [1]	0.308 in / 7.8 mm	1.26 in / 32 mm
28-13600-3 [2]	28-13623-25 [2]	0.302 in / 7.6 mm	1.00 in / 25.4 mm
28-13600-4 [2]	28-13623-27 [2]	0.307 in / 7.7 mm	1.00 in / 25.4 mm
28-13600-5 [2]	28-13623-29 [2]	0.314 in / 7.9 mm	1.00 in / 25.4 mm
NA	28-13623-31 [2]	0.316 in / 8 mm	1.00 in / 25.4 mm
28-13600-7 [3]	28-13623-13 [3]	0.310 in / 7.8 mm	1.12 in / 28.4 mm
28-13600-8 [3]	28-13623-17 [3]	0.318 in / 8 mm	1.12 in / 28.4 mm
NA	28-13623-15 [3]	0.315 in / 8 mm	1.12 in / 28.4 mm
28-13600-6 [3]	28-13623-11 [3]	0.305 in / 7.7 mm	1.12 in / 28.4 mm

[1] Standard
[2] Tail Rotor Transmission
[3] Main Rotor Transmission

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SECTION 3

AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is FAA approved and specifies inspections and other maintenance required under 14 CFR §§ 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved.

For EASA approval, this Airworthiness Limitations section is approved, and variations must also be approved.

FAA APPROVED BY Joseph H McGarvey DATE 4-30-01

for MANAGER
CHICAGO AIRCRAFT CERTIFICATION OFFICE
CENTRAL REGION
FEDERAL AVIATION ADMINISTRATION

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SECTION 3
LOG OF REVISIONS

Rev. Num.	Rev. Date	Pages Affected	Approval Date	FAA Approved
1	Oct 10/03	MM-3-2, MM-3-40, MM-3-41	Oct 28/03	Joe McGarvey
2	Jun 2/04	MM-3-2, MM-3-5, MM-3-13, MM-3-14, MM-3-40	Sep 8/04	Joe McGarvey
3	Oct 13/04	MM-3-2, MM-3-11 thru MM-3-18, MM-3-40	Nov 09/04	Gregory Michalik
4	Mar 15/05	MM-3-2, MM-3-8, MM-3-33, and MM-3-40	Mar 25/05	Gregory Michalik
5	Aug 4/06	MM-3-2, MM-3-7, MM-3-8, MM3-31 thru MM-3-36	Aug 30/06	Shawn Malekpour
6	Apr 16/07	MM-3-2, MM-3-15 thru MM-3-18, MM-3-31 thru MM-3-36, MM-3-39 thru MM-3-42	Apr 24/07	Shawn Malekpour
7	Feb 20/08	MM3-1 through MM-3-8	Oct 2/08	Gregory Michalik
8	N/A	None	N/A	N/A
9	Dec 12/08	MM-3-7 through MM-3-8	Mar 3/09	Gregory Michalik
10	N/A	None	N/A	N/A
11	Dec 21/09	MM-3-1, MM-3-2, MM-3-5 thru MM-3-8	Jan 6/10	Gregory Michalik
12	N/A	None	N/A	N/A
13	N/A	None	N/A	N/A
14	N/A	None	N/A	N/A
15	N/A	None	N/A	N/A
16	N/A	None	N/A	N/A
17	Jun 24/11	MM-3-6	Jul 15/11	Gregory Michalik
18	N/A	None	N/A	N/A
19	Dec 10/12	MM-3-6	Jan 10/13	Gregory Michalik
20	Apr 25/13	MM-3-1, MM-3-2, MM-3-6, MM-3-7	May 9/13	Gregory Michalik
21	Apr 30/14	None	N/A	N/A
22	Jun 25/14	None	N/A	N/A
23	Jul 3/15	None	N/A	N/A
24	Dec 4/15	MM-3-2 through MM-3-10	Dec 15/15	Gregory Michalik
25	Aug 22/16	MM-3-2, MM-3-3	Aug 26/16	Gregory Michalik
26	Feb 28/20	None	N/A	N/A
27	27 Jan 2025	MM-3-1 through MM-3-3, MM-3-5, MM-3-9	25 Feb 2025	Boubacar Felix T. Diakhite
28	20 May 2025	MM-3-2, MM-3-3	1 Aug 2025	John Raspanti

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SECTION 3
EASA LOG OF REVISIONS

Rev. Number	Date	EASA Approved
1	May 29/05	2005-4678
2	May 29/05	2005-4678
3	May 29/05	2005-4678
4	Sep 16/10	EASA 10031817
5	Sep 16/10	EASA 10031817
6	Sep 16/10	EASA 10031817
7	Sep 16/10	EASA 10031817
8	N/A	N/A
9	Sep 16/10	EASA 10031817
10	N/A	N/A
11	Mar 9/11	EASA 10033495, Rev. 1
12	N/A	N/A
13	N/A	N/A
14	N/A	N/A
15	N/A	N/A
16	N/A	N/A
17	May 8/14	EASA 10044744
18	N/A	N/A
19	Apr 1/14	FAA/EASA T.I.P.,FAA Approved on Behalf of EASA by G. Michalik*
20	Apr 1/14	FAA/EASA T.I.P.,FAA Approved on Behalf of EASA by G. Michalik*
21	May 24/17	EASA 10061805
22	N/A	N/A
23	N/A	N/A
24	Jun 22/17	FAA/EASA T.I.P.,FAA Approved on Behalf of EASA by M. Javed♦
25	N/A	N/A
26	N/A	N/A
27	25 Feb 2025	FAA/EASA T.I.P.▼
28	TBD	TBD

* T.I.P., Rev. 3 dated April 23, 2013, Section 3.2.11
♦ T.I.P., Rev. 5 dated September 15, 2015, Section 3.2.11
▼T.I.P., Rev. 7 dated October 19, 2023, Sections 3.3 and 3.5.12.4

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SECTION 3

AIRWORTHINESS LIMITATIONS

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SECTION 3

AIRWORTHINESS LIMITATIONS

3-1. Retirement Life Items

A. The items listed in Table 3-1 require mandatory retirement at the hours or calendar time established by Enstrom Helicopter Corporation and other component manufacturers.

NOTE

Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for the retirement life items associated with the engine.

B. Retirement life components authorized for installation on the TH-28,480, and 480B must use the shorter retirement life limit for the life of the component if the component is removed from one model of aircraft and installed on a model with a different retirement life.

3-2. Mandatory Inspection Items

A. The items listed in Table 3-2 require inspections at the intervals listed in the table. The inspection requirement is part of the certification basis and is temporary in nature pending the analysis of the inspection data.

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Table 3-1. Retirement Life Items

PART NUMBER	COMPONENT	RETIREMENT LIFE (Hours)		
		TH-28	480	480B
ECD084-1	Tension-Torsion Strap	1,200*	1,200*	1,200*
ECD100 (All dash numbers)	Tail Rotor Gear Set	1,000	1,200	1,000
ECD101 (All dash numbers)	Tail Rotor Gear Set	1,000	1,200	1,000
ECD4000 (All dash numbers)	Drive Belt	5,500	5,500	5,500
ECD4056 (All dash numbers)	Bearing Lower Pulley Assembly	1,200	1,200	1,200
20368	Reservoir Cylinder (Pop-Out Floats)	N/A	♦	♦
28-13106-3	Ring Gear Carrier	2,500	2,500	2,500
28-13108 (All dash numbers)	Main Rotor Ring Gear and Pinion Set	3,700	3,700	2,300
28-14207-9	Pitch Change Bellcrank Assembly (Cyclic Walking Beam)	3,130	3,130	N/A
28-14280-1	Main Rotor Hub Plate (Upper)	5,000	5,000	N/A
28-14280-3	Main Rotor Hub Plate (Upper)	+	+	N/A
28-14280-5	Main Rotor Hub Plate (Upper)	+	+ , ∞	4,592 ∞
28-14281-1	Main Rotor Hub Plate (Lower)	5,000	5,000	N/A
28-14281-3	Main Rotor Hub Plate (Lower)	+	+	N/A
28-14281-5	Main Rotor Hub Plate (Lower)	+	+ , ∞	4,592 ∞
28-14320-15	Thrust Bearing (Lamiflex)	ΔΔ	ΔΔ	N/A
28-150074-11, -13	Tail Rotor Spindle	1,200	1,200	1,200
4110006-17, -18 †	Pylon/Keel Attachment Plate	10,000	10,000	N/A
4112034-11++	Vibration Absorber Beam (Tailcone)	3,835	3,835	3,835
4130002-11	Ring Gear Carrier	1,200	1,200	N/A
4130045 (All dash numbers)	Main Rotor Ring Gear and Pinion Set	3,700	3,700	2,300
4131003 (All dash numbers)	Splined Driveshaft, Overrunning Clutch	3,500	3,500	3,500
4166024-15, -23**	Vibration Absorber Beam (Cyclic Installation)	1,200	1,200	1,200

ΔΔ Retire from service 5 calendar years from date of manufacture all Lamiflex bearings serial number 5997 and prior.

Retire from service 5 calendar years from date of installation (see notes below) or 8 calendar years from date of manufacture, whichever occurs first, all Lamiflex bearings serial numbers 5998 and subsequent.

Note 1: Date of installation is defined as the date the Lamiflex bearing packaging is opened.

Note 2: This service life limit is only applicable to Main Rotor Thrust (Lamiflex) Bearings received with the "Double Bag" packaging. The service life starts when the original packaging is opened **or** after the 36 month shelf life.

\+ No time limit. Remove Component on condition per Maintenance Manual inspection criteria.

* Retire from service 24 months after date of installation or 1,200 hours, whichever occurs first.

♦ Retire from service 15 years from the original test date marked on the manufacturer's label.

∞ Hours reduced to 3,969 hours on aircraft that were equipped with elastomeric damper, P/N J-23717-2.

† Applies to TH-28, S/N 3004 & 3006; and 480, S/N 5001-5004, 5006-5008, and 5015.

++ Detail part contained in assembly P/N 4112034-3.

** Detail part contained in assembly P/N 4166024-1 and -3 (-15) and P/N 4166024-103 (-23), respectively.

N/A Not approved for installation.

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Table 3-2. Mandatory Inspection Items

PART NUMBER	COMPONENT	INSPECTION CYCLE (Hours)		
		TH-28	480	480B
4130060 (All dash numbers)	Main Rotor Transmission	Not Applicable	Not Applicable	600*

* Temporary restriction pending data analysis from the component tear-down inspections. Components must be returned to Enstrom Helicopter Corporation for the tear-down inspection **or** field-inspected in accordance with Service Information Letter (SIL) T-064.

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SECTION 4

SERVICING, RECOMMENDED OVERHAULS, INSPECTIONS, AND GENERAL MAINTENANCE

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SECTION 4

SERVICING, RECOMMENDED OVERHAUL CYCLES, INSPECTIONS, AND GENERAL MAINTENANCE

4-1. Servicing

4-2. Description - Servicing

Servicing of the TH-28 and 480/B is normally accomplished at specified hourly intervals. Operators should take into consideration the environmental conditions and determine whether more frequent servicing intervals are necessary. Refer to Tables 4-1 and 4-2 and Figure 4-1 for approved fuels, oils, lubricants, intervals, and locations.

Table 4-1. Index – Fuels, Lubricants, Specifications

NOTE

Refer to Table 4-2 for system capacities and approved product codes.

Code	Nomenclature	Specification	Commercial Description	Notes
C001	Fuel, kerosene	ASTM D1655	Grade Jet A	(1)
		ASTM D1655	Grade Jet A-1	
		ASTM D6615	Grade Jet B	
		MIL-DTL-5624	Grade JP-4	
		MIL-DTL-5624	Grade JP-5	
		MIL-DTL-83133	Grade JP-8	
C004	Lubricating oil, turbine engine, synthetic base	MIL-PRF-7808	American PQ Lubricant 689 Brayco 880 Eastman Chemical ETO 2389 Exxon Turbo Oil 2389 Mobil Avrex S Turbo 256 Mobil RM-201A Mobil RM-184A Stauffer Jet I	(2, 3)
C005	Lubricating oil, turbine engine, synthetic base	MIL-PRF-23699	Aeroshell Turbine Oil 500 Royco Turbine Oil 500 American PQ Lubricant 6700 BPTO 2380 Caltex RPM Jet Engine Oil 5 Castrol 5050 Chevron Jet Engine Oil 5 Eastman Chemical ETO 2380 ExxonMobil MJO II Mobil Jet Oil II Stauffer Jet II (Castrol 205) Turbonycoil 600 Mobil Jet Oil 254 and Mobil Jet Oil 291 (HTS Oil) Royco 560 (HTS Oil) Aeroshell Turbine Oil 560 (HTS Oil) Eastman Chemical ETO 2197 BPTO 2197	(2, 3)

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Table 4-1. Index – Fuels, Lubricants, Specifications - continued

Code	Nomenclature	Specification	Commercial Description	Notes
C006	Lubricant, gear	MIL-PRF-2105/API GL-5	Mobil 1 Synthetic Gear Lubricant LS 75W-90 Mobil Delvac 1 Synthetic Gear Oil 75W-90 Mobilube HD LS 80W-90 Mobilube HD Plus 80W-90 Shell Helix Racing Gear Oil 75W-90 Shell Spirax HD 80W90 Castrol Syntrax Limited Slip 75W-90 (Syntec Gear Oil)	(4)
C007	Lubricant	Silicone Oil/Fluid	SF96-20 L-45	(5)
C008	Grease, general purpose	MIL-PRF-81322	Royco 22CF Aeroshell 22 Aeroshell 22CF	(6)
C009	Engine oil			(7)
C010	Hydraulic fluid	MIL-PRF-5606	Aeroshell Fluid 41	
C011	Grease	MIL-G-25537	Aeroshell Grease 14	
C012	Fuel system icing inhibitor	MIL-DTL-85470	Prist Hi-Flash Hi-Flo	(1)
C013	Corrosion prevention compound	MIL-PRF-81309, Type II or III	ACF-50 Corrosion X Aviation	

NOTES

1. At ambient temperatures below 4°C (40°F), all fuels used shall contain fuel system icing inhibitor (FSII) additive (C012) conforming to MIL-DTL-85470. The FSII additive shall be added to all commercial fuel not already containing a FSII additive during refueling operations. Refueling operations shall be accomplished in accordance with accepted commercial procedures. Refer also to the 480B Rotorcraft Flight Manual and the Rolls-Royce M250-C20 Series Operation and Maintenance Manual (10W2) for FSII additive requirements.

   WARNING: ENGINE FLAMEOUT COULD RESULT FROM FAILURE TO USE ANTI-ICE PROTECTION AT AMBIENT TEMPERATURES BELOW 4°C (40°F).

2. CAUTION: REFER TO THE ROLLS-ROYCE M250-C20 SERIES OPERATION AND MAINTENANCE MANUAL (10W2) FOR INFORMATION CONCERNING USE AND MIXING OF APPROVED TURBINE ENGINE OILS IN THE ROLLS-ROYCE M250-C20W ENGINE.
3. Reference Special Airworthiness Information Bulletin (SAIB) NE-14-30 regarding former BP products.
4. Mobil Delvac 1 75W-90 supersedes former products Mobil Delvac 75W-90 and Mobil SHC 75W-90.
5. SF96-20 replaces L-45. Oils may be mixed.
6. Enstrom advises against using Mobilgrease 28.
7. Any grade internal combustion engine motor oil.

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Table 4-2. Servicing Intervals, Methods, and Locations

System	Location	Consumable Identification	Frequency (hr) 25	50	100	Other	As Required	Capacity	Method
Fuel, Standard (P/N 4122052)	1	C001					X	91.7 gal (US) (90.0 gal (US) usable) 347.08 L (340.65 L usable) (Note 1)	
Fuel, Aerazur (P/N 4122009)	1	C001					X	90.0 gal (US) (89.7 gal (US) usable) 340.65 L (339.51 L usable) (Note 1)	
Fuel, CRFS (P/N 4122100)	1	C001					X	90.2 gal (US) (89.5 gal (US) usable) 341.44 L (338.79 L usable) (Note 1)	
Engine Oil	2	C004 (Note 2) C005 (Note 2)			X		X	6.0 qt (US) 5.7 L	Oil can
Overrunning Clutch	3	C004 C005	X (3) (4)			X (3) (4)	X	3.8 fl oz (US) 110 mL	Oil can Syringe
Overrunning Clutch with Vented Clutch Oil Reservoir	3	C004 C005	X (5)			X (5)	X	6.5 fl oz (US) 192 mL	Oil can Syringe
Main Rotor Transmission	4	C006			X		X	6 pt (US) 2.8 L (dry) 5.5 pt (US) 2.6 L (reservicing)	Oil can
Main Rotor Transmission (equipped with oil filter and cooling installation)	4	C006			X		X	6.5 pt (US) 3.1 L (dry) 6.0 pt (US) 2.8 L (reservicing)	Oil can
Tail Rotor Transmission	5	C006			X		X	5 fl oz (US) 0.15 L	Oil can
Main Rotor Dampers	6	C007		X			X	Until full	Tool T-2896
Main Rotor Blade Grips (T-T strap)	7	C011 primary C008 alternate (Note 6)		X				As required	Grease gun
Main Rotor Lead-Lag Bearings	8	C011 primary C008 alternate (Note 6)		X				As required	Grease gun
Main Rotor Flapping Bearings (grease-lubricated)	9	C011 primary C008 alternate (Note 6)		X				As required	Grease gun

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Table 4-2. Servicing Intervals, Methods, and Locations - continued

System	Location	Consumable Identification	Frequency (hr) 25	50	100	Other	As Required	Capacity	Method
Main Rotor Flapping Bearings (oil-lubricated)	9	C005				X (7)	X	As required	Oil can
Pitch Change Bellcrank Pivot Bearing	10	C011 primary C008 alternate (Note 6)		X				As required	Grease gun
Upper Pulley Bearing	11	C008			X			As required	Grease gun
Lower Pulley Bearings (grease-lubricated)	12	C008			X			As required (Note 8)	Grease gun
Lower Pulley Bearings (oil-lubricated)	12	C005			X			0.27 fl oz (US) 8 mL (dry) 6 mL (reservicing)	Syringe
Blower Assembly Bearings	13	C008				X (9)		As required (Note 10)	Syringe
Tail Rotor Drive Shaft Bearings	14	C008		X				As required	Grease Gun
Tail Rotor Pitch Control Bearing	15	C008			X			As required	Syringe
Tail Rotor Feathering Bearings	16	C011 primary C008 alternate (Note 6)	X (11)	X				As required	Grease Gun
Tail Rotor Teeter Bearings	17	C011 primary C008 alternate (Note 6)		X				As required	Grease Gun
Collective Guidetube Bearing	18	C008		X				As required	Grease Gun
Cyclic Swashplate Bearing	19	C008		X				As required	Grease Gun
Tail Rotor Control Pivot Points	20	C009			X			As required	Oil Can
Pitch Change Bellcrank Inboard Pivot Points	21	C009		X				As required	Oil Can
Collective Walking Beam Pivot Strap Bushings	22	C009			X			As required	Oil Can

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Table 4-2. Servicing Intervals, Methods, and Locations - continued

System	Location	Consumable Identification	Frequency (hr) 25	50	100	Other	As Required	Capacity	Method
Lateral Push/Pull Rod	23	C009		X				As required	Oil Can
Trim Motor Attachment Points	24	C009		X				As required	Oil Can
Tail Rotor Pedal Pivot Points	25	C009			X			As required	Oil Can
Landing Gear Oleos	26	C010			X		X	As required	Oil Can
Battery	27 (Note 12)	(Note 13)				X			(Note 13)
Ground Handling Wheels	28	C008					X	As required	Hand pack
Main Rotor Blades	29	C013				X (14)		As required	Pump or Aerosol

NOTES

1. Differences in the open cell foam (standard), baffle (Aerazur), and open cavity (CRFS) fuel bladder systems will result in a slight variance in total fuel capacity between aircraft (refer to Paragraph 10-2 for serial number effectivity).

2. Recommended oil for the specified average daily temperatures:

Outside Temperature	Recommended Oil
-40°C (-40°F) and above	MIL-PRF-23699 (C005) or MIL-PRF-7808 (C004)
-40°C (-40°F) and below	MIL-PRF-7808 (C004)

3. If the overrunning clutch (ORC) cover is equipped with a sight glass, service the ORC when oil does not fill the sight glass.

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4. If the overrunning clutch (ORC) cover is equipped with a sight glass and oil completely fills the sight glass, the servicing interval can be extended to 100 hours. If the ORC cover is equipped with a sight glass and the ORC requires servicing after less than 10 flight hours, inspect the ORC bearing housing seal and power output shaft seal for leaks and replace the seal(s) as required. If the ORC bearing housing and power output shaft seals are not leaking, replace the double lip seals (2 each) in the engine gearbox assembly at or before the next 100 hour/annual inspection.
5. If the overrunning clutch (ORC) is equipped with a vented clutch oil reservoir, the servicing interval can be extended to 100 hours. Service the vented clutch oil reservoir if oil does not fill the reservoir sight glass. The oil level between the reservoir sight glass and the ORC cover sight glass should be the same. Service the reservoir until the oil level is just below the reservoir service port. Allow sufficient time for the oil to flow into the ORC.
6. Do not mix alternate greases unless component is purged of existing grease.
7. 600 hr
8. Do not purge lubricate the lower pulley bearings. Refer to Paragraph 4-33.
9. 300 hr
10. Do not purge lubricate the blower assembly bearings. Refer to Paragraph 4-39.2.
11. Applicable for helicopters operating with infrequent inputs to the tail rotor pitch control system (for example: extended flight with unchanging blade pitch).
12. The battery is located in the right side of the engine compartment in a TH-28 and 480/B. An alternate location is in the baggage box.
13. Service in accordance with manufacturer's instructions.
14. Refer to Paragraph 4-48, 6.

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Table 4-3. [Deleted]

NOTE

Content previously contained in Table 4-3 has been incorporated into Table 4-1.

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Table 4-4. [Deleted]

NOTE

Content previously contained in Table 4-4 has been incorporated into Table 4-1.

Table 4-5. [Deleted]

NOTE

Content previously contained in Table 4-5 has been incorporated into Table 4-1.

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Table 4-6. [Deleted]

NOTE

Content previously contained in Table 4-6 has been incorporated into Table 4-1.

Table 4-7. [Deleted]

NOTE

Content previously contained in Table 4-7 has been incorporated into Table 4-1.

Table 4-7.1. [Deleted]

NOTE

Content previously contained in Table 4-8 has been incorporated into Table 4-1.

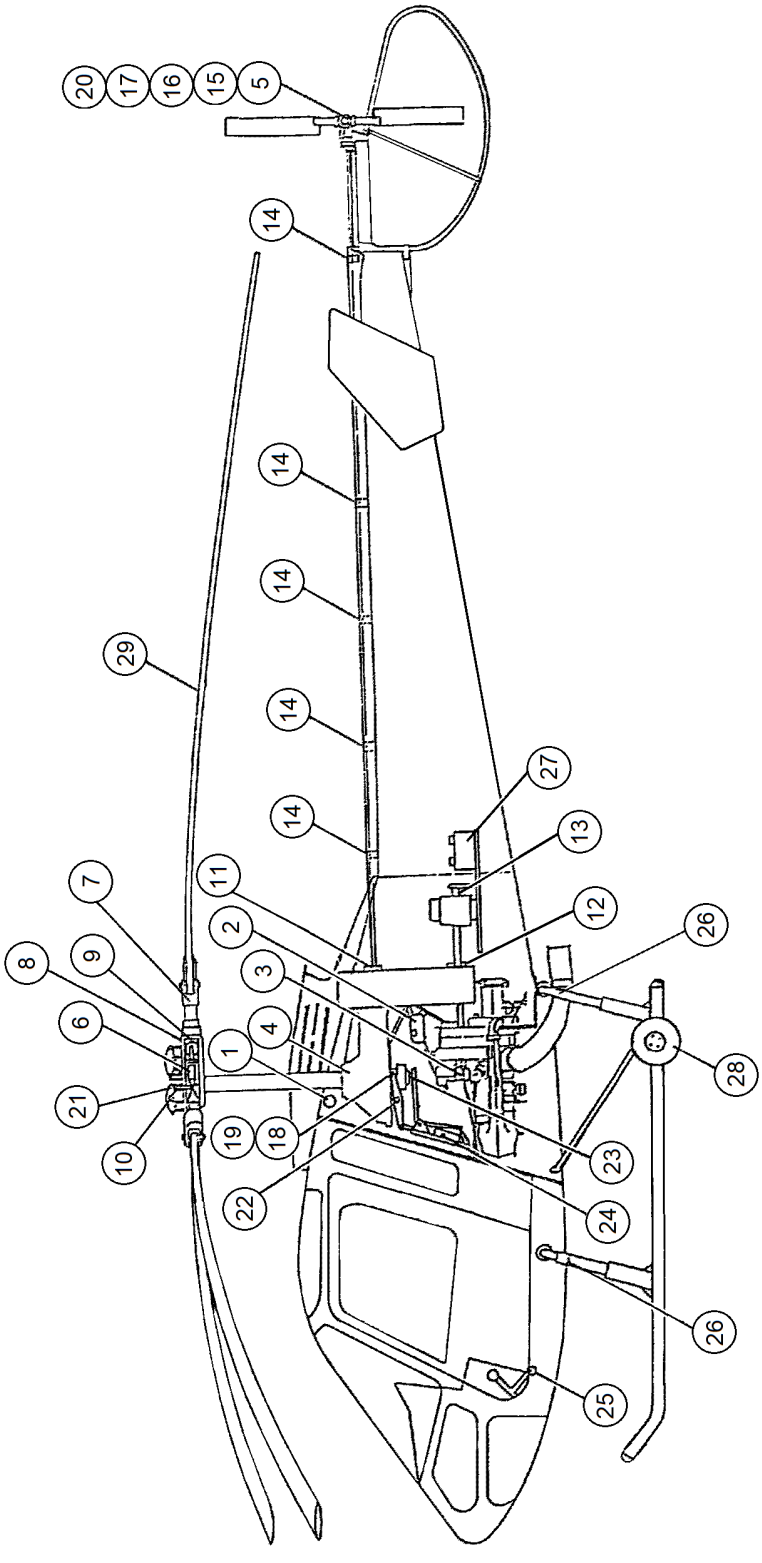
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1. Fuel
2. Engine Oil
3. Overrunning Clutch
4. Main Rotor Transmission
5. Tail Rotor Transmission
6. Main Rotor Dampers
7. Main Rotor Blade Grips
8. Main Rotor Lead-Lag Bearings
9. Main Rotor Flapping Bearings
10. Pitch Change Bellcrank Pivot Bearing
11. Upper Pulley Bearing
12. Lower Pulley Bearings
13. Blower Assembly Bearings
14. Tail Rotor Drive Shaft Bearings
15. Tail Rotor Pitch Control Bearing
16. Tail Rotor Feathering Bearings
17. Tail Rotor Teeter Bearings
18. Collective Guidetube Bearing
19. Cyclic Swashplate Bearing
20. Tail Rotor Control Pivot Points
21. Pitch Change Bellcrank Inboard Pivot Points
22. Collective Walking Beam Pivot Strap Bushings
23. Lateral Push/Pull Rod
24. Trim Motor Attachment Points
25. Tail Rotor Pedal Pivot Points
26. Landing Gear Oleos
27. Battery
28. Ground Handling Wheels
29. Main Rotor Blades

Figure 4-1. Servicing Locations

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4-3. Fuel System

4-4. Servicing - Fuel System

NOTE

Refer to Table 4-1 for system capacity and approved fuels.

WARNING

In the event of a major spillage of fuel, all powered equipment must be shut down. All personnel should leave the vicinity and be positioned to prevent any sources of possible ignition from entering the area. The appropriate authorities should be notified to contain and disperse the spill.

A. Ground the aircraft, truck, and fuel nozzle.

B. Remove the fuel cap.

C. Position the nozzle into the fuel cell filler port.

D. Fill to the required amount.

E. Remove the nozzle and replace the fuel cap.

F. Disconnect the nozzle ground and rewind the hose.

G. Disconnect the truck and helicopter grounds.

4-5. Draining - Fuel System

WARNING

In the event of a major spillage of fuel, all powered equipment must be shut down. All personnel should leave the vicinity and be positioned to prevent any sources of possible ignition from entering the area. The appropriate authorities should be notified to contain and disperse the spill.

A. Pull fuel shutoff handle "OFF".

B. Open the left side engine access panel.

CAUTION

Cap all open lines/fittings to prevent contamination of the systems.

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NOTE

If the optional external fuel filter is installed, drain the fuel from the lines using the drain at the bottom of the bowl assembly and disconnect the fuel line from the inlet side of the filter assembly.

C. Disconnect the fuel supply line at the engine fuel pump.

NOTE

Drain the fuel into suitable containers if not using a defueling vehicle

D. Connect the line to the suction pickup of the defueling vehicle.

E. Remove the fuel cell cap.

F. Push the fuel shutoff handle "ON".

G. Defuel the aircraft.

H. Disconnect the defueling vehicle and reconnect the fuel supply line to the engine.

NOTE

Standard fuel cells will retain approximately 1 gallon/3.785 l of fuel due to the foam baffling installed in the fuel cells. This fuel can be drained from the cells after defueling the aircraft and letting the aircraft stand for a 24 hour period.

I. Drain the remaining fuel from the aircraft via the fuel cell sump drains and the low point drain.

4-6. Engine Oil System (See Figure 4-2)

CAUTION

Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for information concerning use and mixing of approved turbine engine oils in the Rolls-Royce 250-C20W engine.

4-7. Servicing - Engine Oil System

NOTE

Refer to Table 4-1 for system capacity and approved oils.

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NOTE

Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual if reservicing the engine oil reservoir due to an oil change.

A. Open the right side engine access panel.

B. Remove the engine oil reservoir cap and check the oil level using the dip stick attached to the cap.

C. Service as required.

D. Reinstall the reservoir cap and close the engine access panel.

4-8. Draining - Engine Oil System

NOTE

If changing from MIL-PRF-23699 to MIL-PRF-7808 oil, refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for specific maintenance instructions.

A. Place a suitable container under the drain plug in the bottom of the engine oil reservoir.

B. Remove the lockwire from between the drain plug and the plug installed in the side of the reservoir. Retain the anti-chaffing material installed on the lockwire.

C. Remove the drain plug and drain the engine oil reservoir.

D. Replace the O-ring (ref. para. 13-148) on the drain plug and reinstall the drain plug (torque 80-120 in-lb/9-13.6 Nm).

E. Lockwire the drain plug to the plug installed in the side of the reservoir. Install the anti-chaffing material onto the lockwire before completing the installation.

F. Remove the forward sheet metal structure from the baggage compartment to gain access to the lower drain plug on the oil cooler.

G. Drain the oil cooler by placing a suitable container under the cooler drain plug and removing the plug. Reinstall the drain plug and lockwire after draining the oil cooler.

H. Reinstall the forward sheet metal structure in the baggage compartment.

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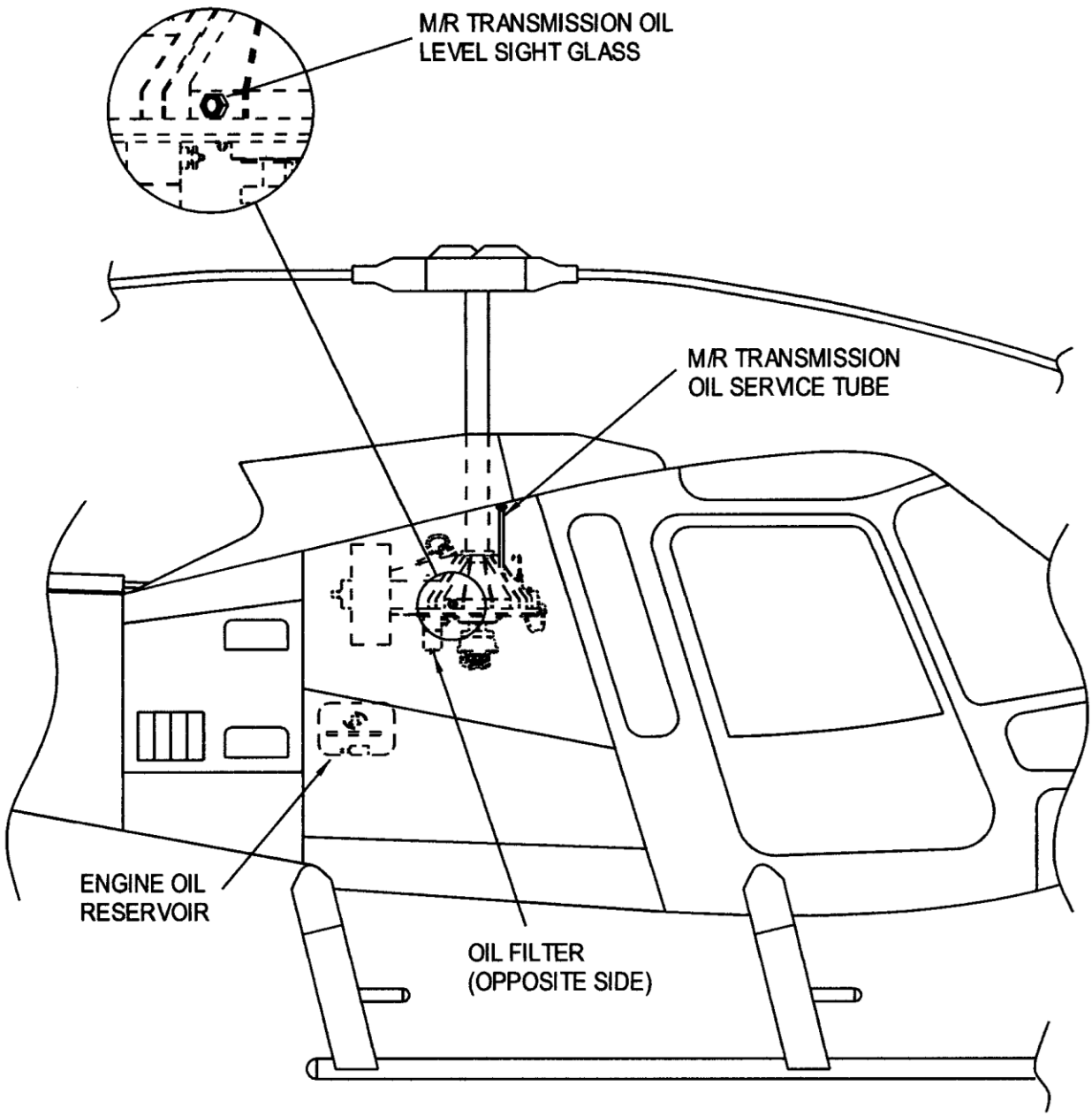


Figure 4-2. Engine Oil Reservoir and Main Rotor Transmission Servicing

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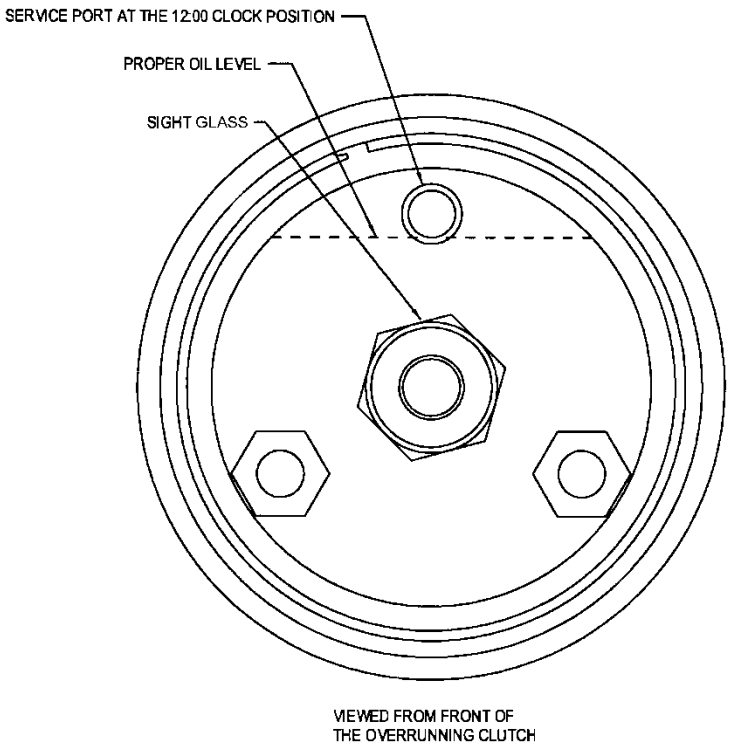


Figure 4-3. Overrunning Clutch Servicing

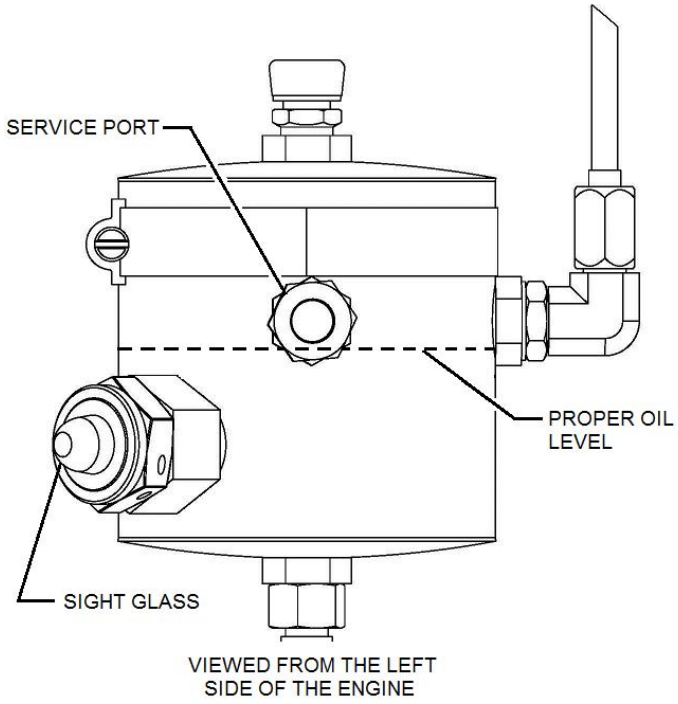


Figure 4-3.1. Vented Clutch Oil Reservoir Servicing

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4-9. Overrunning Clutch (See Figure 4-3 and Figure 4-3.1)

4-10. Servicing - Overrunning Clutch

NOTE

Refer to Table 4-1 for system capacity and approved oil.

NOTE

If the overrunning clutch (ORC) cover is equipped with a sight glass, service the ORC when oil does not fill the sight glass.

NOTE

If the ORC cover is equipped with a sight glass and oil completely fills the sight glass, the scheduled servicing interval can be extended to 100 hours. If the ORC cover is equipped with a sight glass and the ORC requires servicing after less than 10 flight hours, inspect the ORC bearing housing seal and power output shaft seal for leaks and replace the seal(s) as required. If the ORC bearing housing and power output shaft seals are not leaking, replace the double lip seals (2 each) in the engine gearbox assembly at or before the next 100 hour/annual inspection.

NOTE

If the overrunning clutch is equipped with a vented clutch oil reservoir, the scheduled servicing interval can be extended to 100 hours. Service the reservoir when oil does not fill the reservoir sight glass.

A. Open the left side engine access panel.

NOTE

If the overrunning clutch is equipped with a vented clutch oil reservoir, proceed to Step E.

B. Rotate the clutch until one of the cap plugs is at the 12 o'clock position (as seen by looking aft) and remove the plug.

C. Slowly rotate the clutch clockwise until oil drains from the port. Note the position of the oil level. The clutch is properly serviced if the level is between the 12:00 and 3:00 positions.

D. Service the clutch by rotating the port to the 12:00 position and slowly adding oil with a squirt can/syringe until oil flows from the port. Reinstall the plug (torque 20 in-lb/ 2.3 Nm) and lockwire (.025"). Wipe up the excess oil.

E. Remove the reservoir service port plug. Service the reservoir by slowly adding oil with a squirt can/syringe until oil flows from the port. Allow sufficient time for the oil to fill the ORC.

F. Reinstall the service port plug (torque 20 in-lb/ 2.3 Nm) and lockwire (.025"). Wipe up the excess oil.

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4-10.1. Draining - Overrunning Clutch

A. Place a suitable container under the clutch cover and under the vented clutch oil reservoir, if equipped.

B. Remove the safety from the service plugs in the clutch cover.

C. Remove one of the service plugs and drain the oil from the clutch by rotating the open port to the 6 o'clock position. Remove a second plug to help vent the system as the oil drains.

D. Inspect for metal flakes (see also paragraph 11-6).

E. If equipped with the vented clutch oil reservoir, disconnect the oil line from the base of the vented clutch oil reservoir and drain the oil.

F. Connect the oil line to the base of the vented clutch oil reservoir.

G. Replace the O-ring on the second drain plug and reinstall plug. Torque 20 in-lb/ 2.3 Nm and lockwire (.025").

H. Service the clutch (para. 4-10.D) and vented clutch oil reservoir, if equipped (para. 4-10.E).

I. Lockwire the plugs (.025").

4-11. Main Rotor Transmission (See Figure 4-2)

4-12. Servicing - Main Rotor Transmission

NOTE

Refer to Table 4-1 for system capacity and approved oils.

A. Check the oil level in the transmission using the sight glass located in the aft right side of the transmission. View the sight glass by looking through the upper pulley or through the upper maintenance step in the right side of the aircraft. The transmission is properly serviced when the oil level is between the middle of the sight glass and until a bubble is visible at the top of the sight glass. Raise and lower the tail to change the attitude of the aircraft to verify the oil level if in question.

NOTE

Check the transmission for leaking seals if servicing is required between periodic inspections.

B. Service the transmission via the filler port in front of the main rotor shaft in the ram air access area.

C. Add 5.5 pints/2.6 liters of oil if servicing the transmission after draining or service to bring the oil level to the proper level. If the transmission is equipped with the oil filtration/cooling system, service the transmission with 6.0 pints/2.84 liters of oil.

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D. If the transmission is equipped with the oil filtration/cooling system, turn the battery switch on and check the system for oil leaks and proper operation of the oil pump and pressure switch. If required, prime the oil pump by disconnecting the oil line between the pressure switch tee and the pump inlet and filling the line with oil. Reconnect the line and check the oil pump and pressure switch for proper operation.

4-13. Draining - Main Rotor Transmission

A. Open the left side engine access panel.

NOTE

The chip detector is located on the front side of the oil filter housing if the transmission is equipped with the oil filter and cooling installation.

NOTE

Transmissions equipped with an oil filter may be drained by removing the oil filter (para. 4-14).

B. Place a trough under the chip detector located by the aft left side transmission mount and use a suitable container to collect the oil.

C. Remove the chip detector from the quick disconnect receptacle.

NOTE

Tool T-0198-11 may be inserted in the base of the chip detector to drain the oil.

D. Remove the quick disconnect receptacle from the transmission or the oil filter housing to drain the oil.

E. When the transmission is drained, replace the crush washer on the receptacle and reinstall until finger tight. Tighten an additional 90° and lockwire the receptacle.

F. Reinstall the chip detector.

4-13.1 Flushing - Main Rotor Transmission

A. Install the ground handling wheels and lower the wheels.

B. Set 1-1/2”/38 mm blocks under the left and right forward skid shoes and raise the left side wheel.

C. Remove the upper plenum (para. 13-28).

D. Drain the oil from the gearbox (para. 4-13). (The oil may be drained by removing the filter.)

E. Remove the oil filter from the gearbox.

F. Remove the pinion inspection plate from the transmission.

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G. Inspect the gears in accordance with SIL T-064 paragraph 6.1 (C).

H. Use a syphon sprayer with kerosene, mineral spirits or equivalent oil based solvent to spray down the interior of the gearbox. Direct the aim of the sprayer around the inside of the gearbox and the ring gear and carrier while turning the gearbox. (The objective is to introduce sufficient volume of solvent to flush any debris out of the gearbox and drain it out the oil filter housing.)

I. Allow the gearbox (main rotor) to drain completely.

NOTE

The previously installed oil filter may be reinstalled.

J. Reinstall the gearbox (main rotor) oil filter and hand tighten.

K. Add 4 quarts/3.9 l of the gear lube that is currently being used in the gearbox.

L. Rotate the gearbox (main rotor) by hand 7-10 revolutions.

M. Remove the oil filter and drain the gearbox while rotating the gearbox.

N. Allow gearbox (main rotor) to drain completely.

O. Inspect and clean the chip plug.

P. Install and secure the pinion cover plate in accordance with SIL T-064 paragraph 6.1 (E).

Q. Install a new oil filter (para. 4-14).

R. Service the gearbox (para. 4-12).

S. Remove the blocks and the ground handling wheels.

T. Install the upper plenum (para. 13-31).

4-14. Oil Filter Replacement - Main Rotor Transmission

NOTE

The following maintenance procedures only apply to aircraft equipped with the main rotor transmission oil filter/cooling system.

A. Drain the oil from the transmission.

B. Remove the lockwire from the oil filter and remove the oil filter.

C. Lubricate the seal on the replacement filter with oil (MIL-PRF-2105).

D. Install the filter until the seal contacts the seal surface on the filter housing. Turn the filter an additional ¾ turn and lockwire (.025) the filter to the chip detector assembly.

E. Service the transmission.

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F. Turn the battery switch on and check the system for oil leaks and proper operation of the oil pump and pressure switch. If required, prime the oil pump by disconnecting the oil line between the pressure switch tee and the pump inlet and filling the line with oil. Reconnect the line and check the oil pump and pressure switch for proper operation.

4-15. Tail Rotor Transmission (See Figure 4-4)

4-15.1 Oil Level Check – Tail Rotor Transmission

NOTES

If the helicopter is undergoing scheduled or unscheduled maintenance, proceed to paragraph 4-16 to service the gearbox.

During routine maintenance checks and prefight inspections, check the tail rotor gearbox oil level in accordance with the following procedure.

The tailcone of the helicopter should be approximately level when servicing the tail rotor gearbox.

The sight glass should be transparent and free of any bubbles for the oil level check.

A. Check oil level by using the sight glass located in the aft side of the tail rotor gearbox.

(1) If the sight glass is dirty, opaque, or cloudy:

a. Remove, clean, and reinstall the sight glass (torque 60 in-lb/6.8 Nm).

b. Proceed to paragraph 4-16 to service the gearbox.

(2) If bubbles are present in the sight glass, raise and lower the tail to change the attitude of the helicopter to clear any bubbles from the sight glass.

(3) The minimum required oil level is when the oil fills half the sight glass.

a. If the oil level fills half or more than half of the sight glass, the gearbox is adequately filled for operation.

b. If the oil level fills less than half of the sight glass, proceed to paragraph 4-16 to service the gearbox.

4-16. Servicing – Tail Rotor Transmission

NOTES

“Servicing”, as used in this procedure, means “topping off” or filling the gearbox to capacity.

Service the tail rotor gearbox if oil level is low, as indicated by a check of the sight glass (paragraph 4-15.1), and any time the helicopter is undergoing scheduled or unscheduled maintenance.

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NOTES

Refer to Table 4-1 for system capacity and approved oils. It may require less than 5 fl oz (US)/(0.15 L) to service the gearbox because the oil might not drain completely. A small amount of residual oil remaining in the gearbox is not a cause for concern.

The tailcone of the helicopter should be approximately level when servicing the tail rotor gearbox.

A. Remove the filler port located directly above sight glass.

B. Add oil until the oil begins to flow from the filler port.

NOTE

The sight glass should be free of any air bubbles.

C. Install a new O-ring (MS28778-2).

D. Install the filler plug (torque 20 in-lb/2.3 Nm).

E. Lockwire (MS20995C32) the filler plug to the magnetic plug/chip detector and the sight glass.

4-17. Draining - Tail Rotor Transmission

NOTES

Draining the tail rotor gearbox is required for the 100 hour/annual inspection, gearbox flushing, and when returning the helicopter to service after a six-month or longer storage period.

Refer to paragraph 4-16 for servicing the tail rotor gearbox.

A. Remove the chip detector from the quick disconnect receptacle.

B. Place a suitable container under the receptacle.

C. Remove the quick disconnect receptacle and drain the transmission.

D. When the transmission is drained, replace the crush washer and secure magnetic plug/chip detector (finger tight plus 135° but not to exceed 35 in-lb/4 Nm) and lockwire the receptacle/magnetic plug to the sight glass and the filler plug after the transmission has been serviced.

(1) Apply lubricant (MIL-PRF-2105) to the threads the chip detector prior to installation.

E. Reinstall the chip detector.

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4-17.1 Flushing - Tail Rotor Transmission

A. Drain the oil (para. 4-17).

B. Remove the filler plug, sight glass, and top visual inspection plug (if not already removed) from the gearbox.

C. Inspect the gears closely for cracked or missing teeth and the gearbox for damage.

D. Use a syphon sprayer with kerosene, mineral spirits, or equivalent oil-based solvent to spray down the interior of the gearbox and flush any debris out of the gearbox. Direct aim the sprayer around the inside of the gearbox to flush the input and output bearings, while rotating the gearbox.

E. Loosely install the bottom drain plug, sight glass, and fill plug.

F. Add oil that is currently used in the gearbox (Table 4-1).

G. Rotate the gears at least ten times to circulate the oil.

H. Remove the drain plug and drain the gearbox while rotating the gears.

I. Allow the gearbox to drain completely.

J. Install sight glass (60 in-lb/6.8 Nm).

K. Install new crush washer and secure magnetic plug/chip detector (finger tight plus 135° but not to exceed 35 in-lb/4 Nm).

L. Service the gearbox (para. 4-16).

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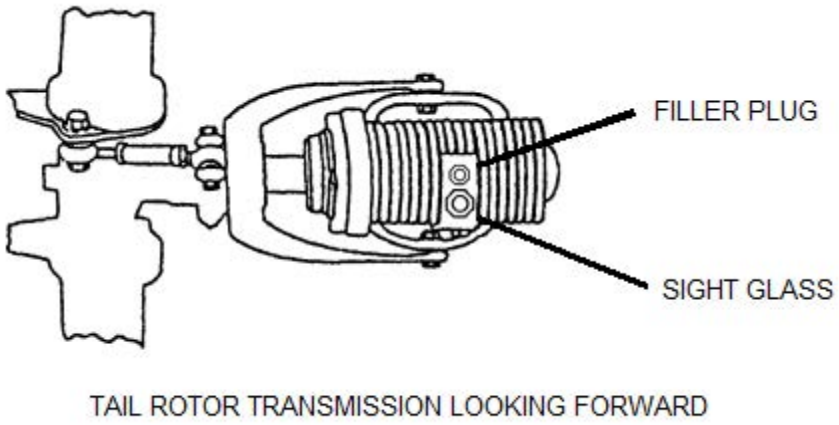


Figure 4-4. Tail Rotor Transmission Servicing Location

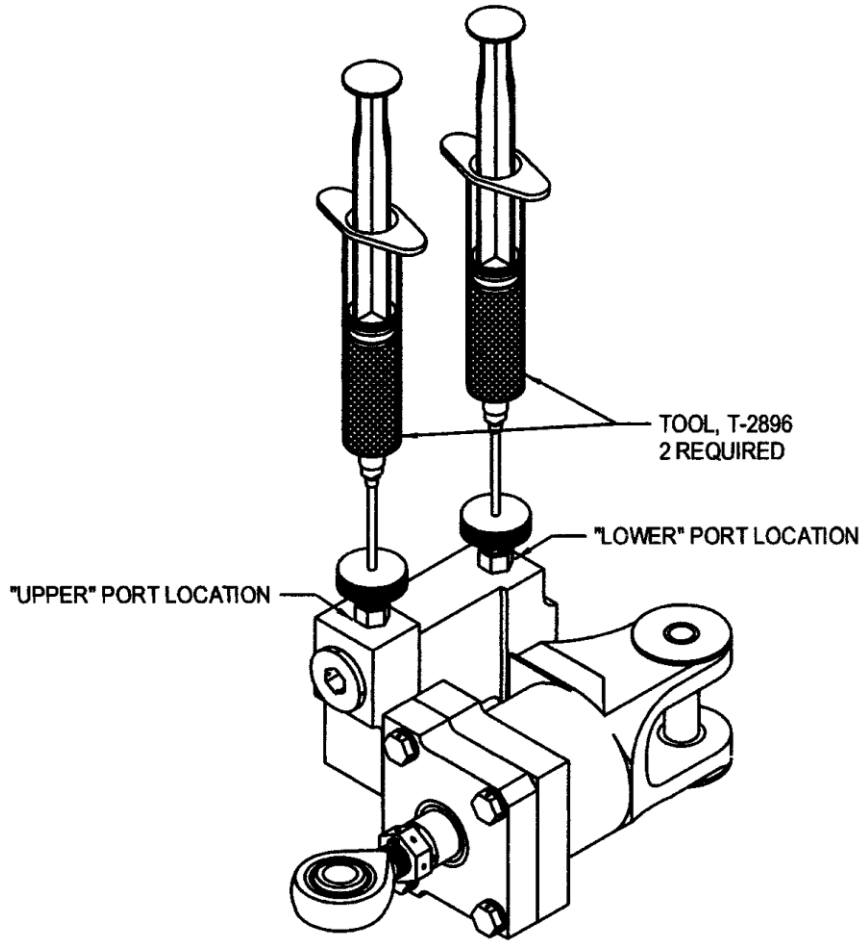


Figure 4-5. Main Rotor Damper Servicing

4-18. Main Rotor Dampers (See Figure 4-5)

4-19. Servicing - Main Rotor Dampers

NOTE

Refer to Table 4-1 for system capacity and approved oil.

NOTE

The dampers may be serviced installed on or removed from the aircraft.

A. Servicing the dampers with tools T-2896 (Figure 4-5):

(1) Fill the tools approximately half full with L-45/SF96-20 Silicone Oil.

(2) Remove the reservoir plugs and replace the O-rings as required.

(3) Install the tools into the reservoir.

(4) Slowly cycle the plungers until all the air bubbles are purged from the damper.

(5) Remove the tool from the “lower” port of the reservoir and install the plug.

(6) Remove the tool from the “upper” port of the reservoir and completely fill the reservoir before installing the plug.

(7) Tighten and lockwire (.025) the plugs.

B. Alternate method of servicing the dampers:

NOTE

Do not cycle the blades back and forth during this procedure as it will mix any air that is in the reservoirs and distribute it through the damper.

(1) **Slowly** cycle the three blades in one direction until the damper piston is fully compressed.

(2) Remove all of the caps from the reservoirs and fill the reservoirs to the top of the port. Reinstall the caps.

(3) **Slowly** cycle the three blades in the other direction until the damper piston is fully extended.

(4) Remove all of the caps from the reservoirs and fill the reservoirs to the top of the port. Reinstall the caps.

(5) Perform this procedure three times or until the reservoirs show full when the caps are removed.

(6) Install the reservoir plugs and lockwire (.025). Replace the plug O-rings as required.

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4-20. Main Rotor Flapping Bearings (See Figure 4-6)

4-21. Servicing - Main Rotor Flapping Bearings

NOTE

Refer to Table 4-1 for system capacity and approved oil. Refer to paragraph 4-37 if the main rotor hub assembly is equipped with grease lubricated flapping bearings.

A. Remove the reservoir cap and replace the O-ring or seal as required.

B. Fill the reservoir until the reservoir is half (1/2) to three quarters (3/4) full.

CAUTION

Do not over tighten the reservoir caps. Damage to the reservoirs will result.

C. Install the cap until the O-ring or seal on the cap contacts the reservoir. Tighten the O-ring equipped cap an additional one half (1/2) turn **maximum** by hand (Figure 4-6, Sheet 1). Torque the seal equipped cap 10-20 in-lb/1.1-2.3 Nm or tighten an additional one sixteenth (1/16) turn **maximum** by hand (Figure 4-6, Sheet 2).

D. Lockwire (.025) the cap to the appropriate screw in the reservoir cover.

NOTE

Replace defective O-rings and/or seals if the reservoir is empty after less than four (4) hours of flying.

4-22. Draining - Main Rotor Flapping Bearings

A. Remove the reservoir cap and replace the O-ring as required.

B. Place a suitable container under the drain plug location.

C. Remove the drain plug and replace the O-ring as required.

D. Reinstall the drain plug after draining the oil from the universal block. Service the universal block and reservoir (para. 4-21). Reinstall the reservoir cap. Do not lockwire the caps until after the maintenance ground run.

NOTE

The universal block will self-bleed during the ground run causing the oil level to decrease.

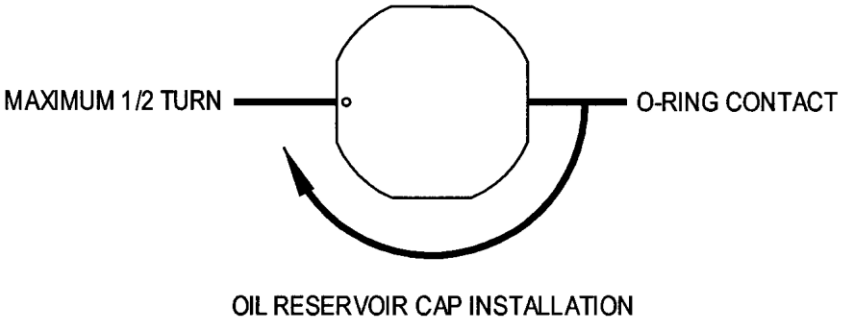
E. Perform a ground run for 10 minutes to allow the reservoirs to self-bleed.

F. Service the oil reservoirs (para. 4-21).

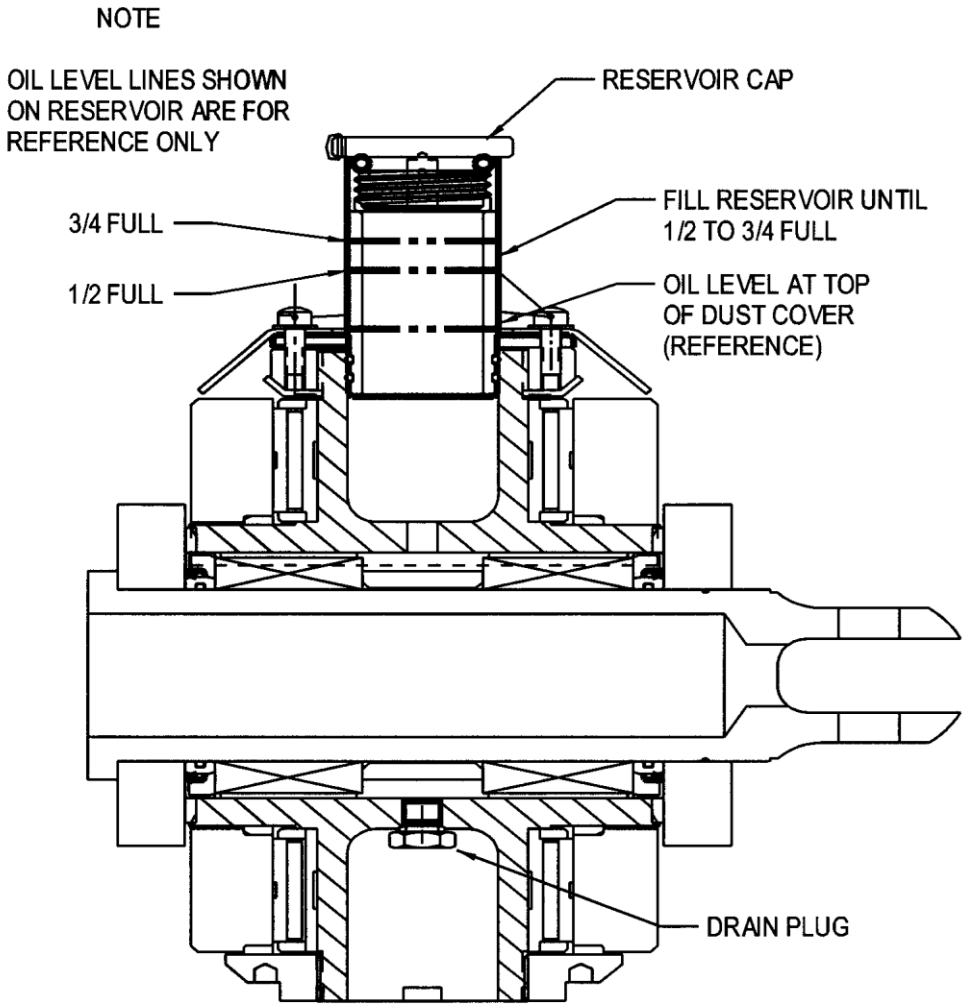
G. Reinstall the reservoir cap and lockwire (0.025).

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OIL RESERVOIR CAP INSTALLATION

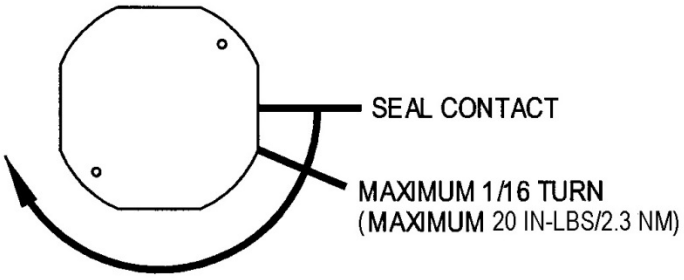


CUT AWAY VIEW OF OIL LUBRICATED FLAPPING BEARING RESERVOIR AND DRAIN PLUG

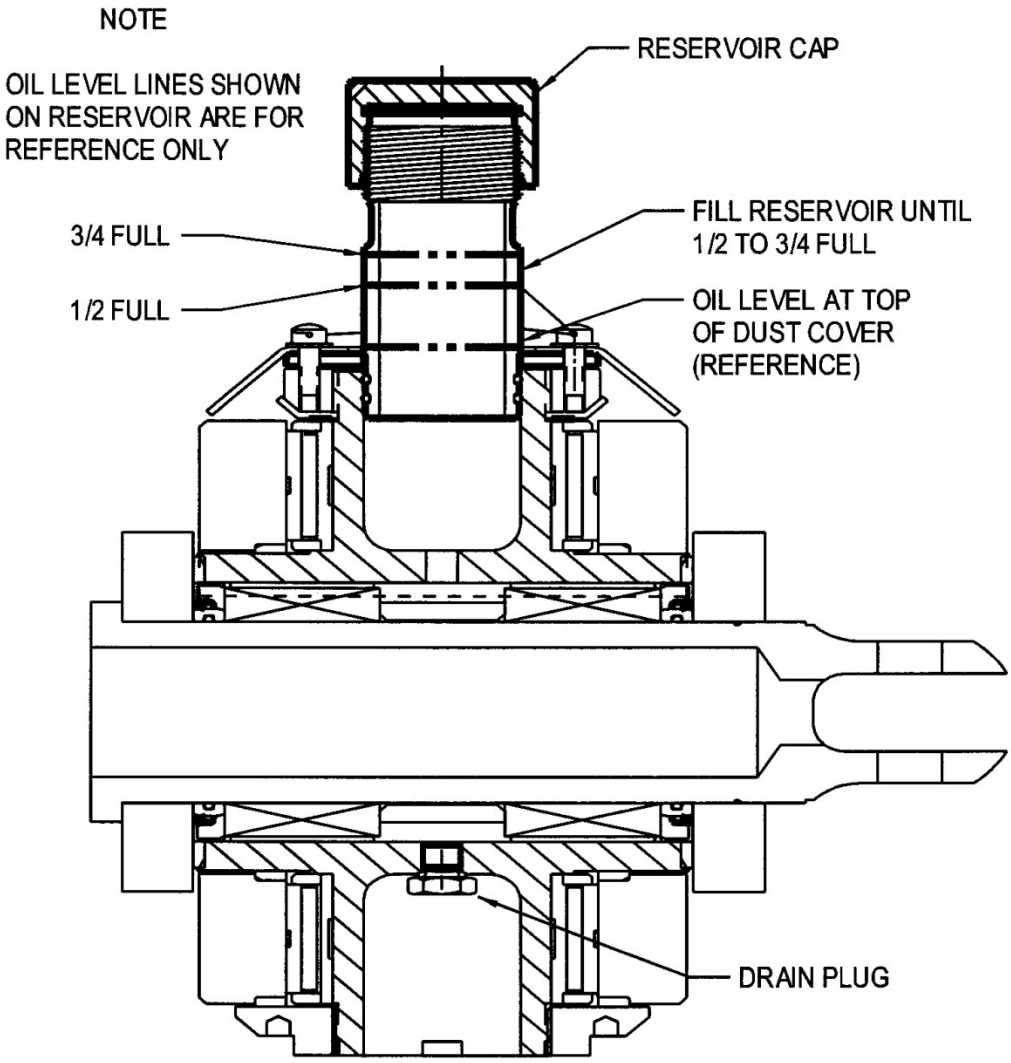
Internal Thread Oil Reservoirs Sheet 1 of 2

Figure 4-6. Oil Lubricated Main Rotor Flapping Bearings

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OIL RESERVOIR CAP INSTALLATION



CUT AWAY VIEW OF OIL LUBRICATED FLAPPING BEARING RESERVOIR AND DRAIN PLUG

External Thread Oil Reservoirs Sheet 2 of 2

Figure 4-6. Oil Lubricated Main Rotor Flapping Bearings

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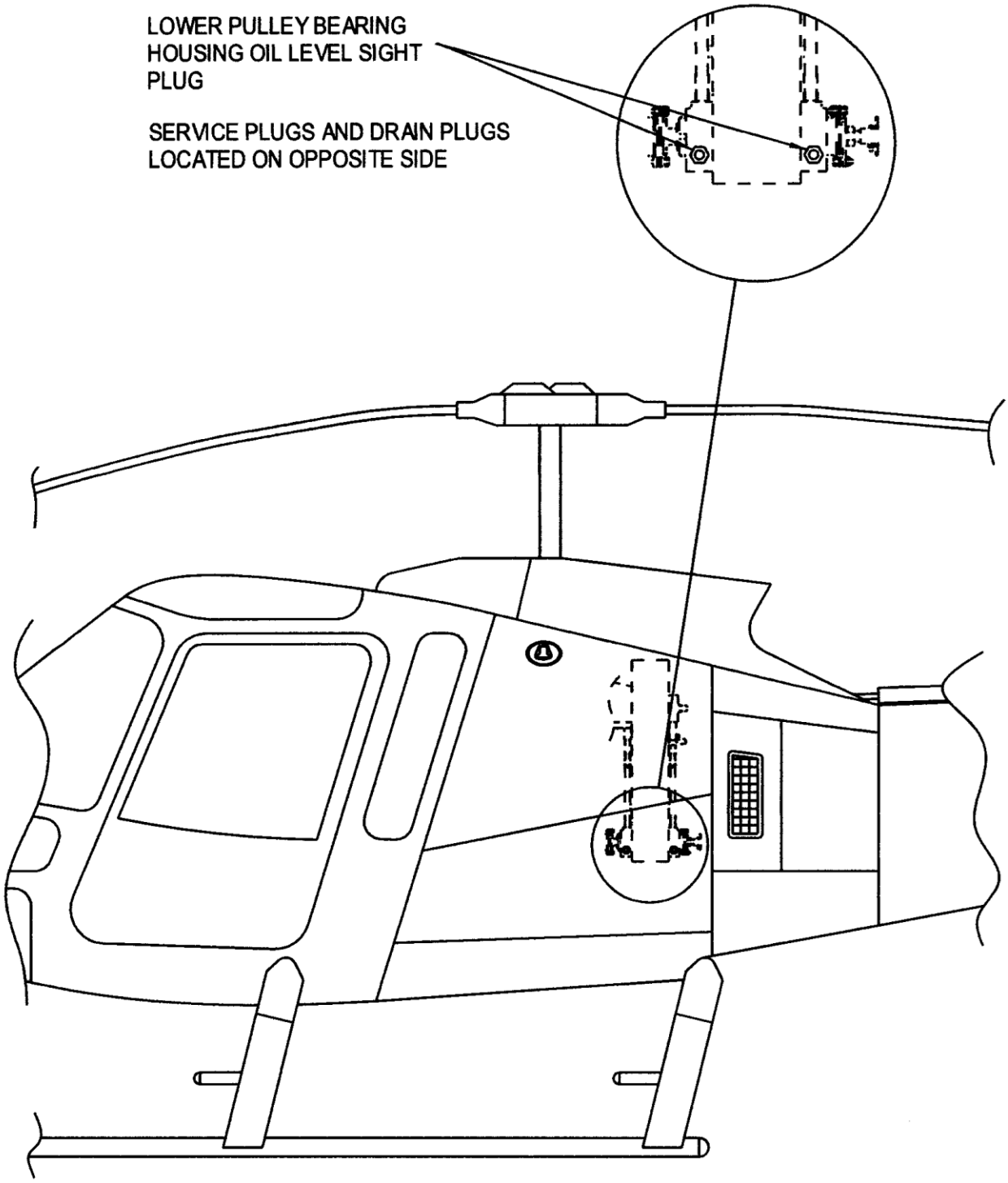


Figure 4-7. Oil Lubricate Lower Pulley Bearings

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4-23. Lower Pulley Bearings (See Figure 4-7)

NOTE

The following procedures only apply to aircraft equipped with oil lubricated lower pulley bearings. Refer to paragraph 4-33 for grease lubricated lower pulley bearings.

4-24. Servicing - Lower Pulley Bearings

NOTE

Refer to Table 4-1 for system capacity and approved oil.

NOTE

The lower pulley bearings do not require servicing if the oil level is in the lower half of the sight glass.

NOTE

Servicing procedures are the same for both of the lower pulley bearings.

A. Open the right side engine access panel.

B. Remove the service plug from the bearing housing.

C. Using a syringe or other suitable device, **slowly** service the lower pulley bearing. The lower pulley bearing is properly serviced when the oil level is in the middle of the sight glass.

D. Replace the O-ring on the service plug as required. Install the service plug to the drain plug.

E. Close the right side engine access panel.

4-25. Draining - Lower Pulley Bearings

NOTE

Draining procedures are the same for both of the lower pulley bearings.

A. Open the left side engine access panel.

B. Place a suitable container under the lower pulley bearing assembly and remove the sight plug.

C. Replace the O-ring on the sight plug as required. Install the sight plug.

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D. Inspect the sight plugs for staining. Remove and clean or replace the sight plugs as required.

E. Replace the O-ring on the sight plug as required. Install the sight plug and torque (150 in-lbs/17 Nm). Install a torque slippage mark.

4-26. Oleos

4-27. Servicing - Oleos

NOTE

Check the serviceability of the oleos by rocking the aircraft to distribute the weight of the aircraft evenly. The oleos are serviceable if 3/4"(19 mm) to 2"(51 mm) of the chromed piston extends past the seal retainer (Figure 4-8, Dimension "A").

NOTE

If the oleos are not installed on the aircraft or the aircraft is jacked or hoisted off the ground, pressurize the front oleos to 250 lbs and the aft oleos to 550 lbs.

NOTE

The oleo struts should be serviced as pairs such that either both front or both aft oleos are serviced at the same time.

A. Service the oleos using the following procedure:

(1) Remove the screw(s) securing the top landing gear fairing on the oleo and allow the fairing to slide down exposing the servicing valve and the piston.

NOTE

The use of nitrogen is recommended for servicing, as it has no moisture content.

(2) Sling or jack the helicopter. The helicopter may be jacked from the jack points or from the individual cross tubes if the oleos are to be serviced individually.

(3) Remove the valve cap and connect the servicing equipment pressure line to the oleo valve. Set the nitrogen tank regulator pressure to 250 psi for the front oleos or 550 for the aft oleos.

WARNING

The oleo may extend when the valve is opened.

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(4) Slowly open the oleo valve.

(5) After the pressure in the oleo has equalized to the regulator pressure, close the oleo valve.

(6) Turn off the nitrogen tank and set the regulator pressure back to zero.

(7) Disconnect the service equipment and install the valve cap.

(8) Slide the landing gear fairing into position and install the retaining screws.

(9) Remove the helicopter from the sling or the jacks, as necessary.

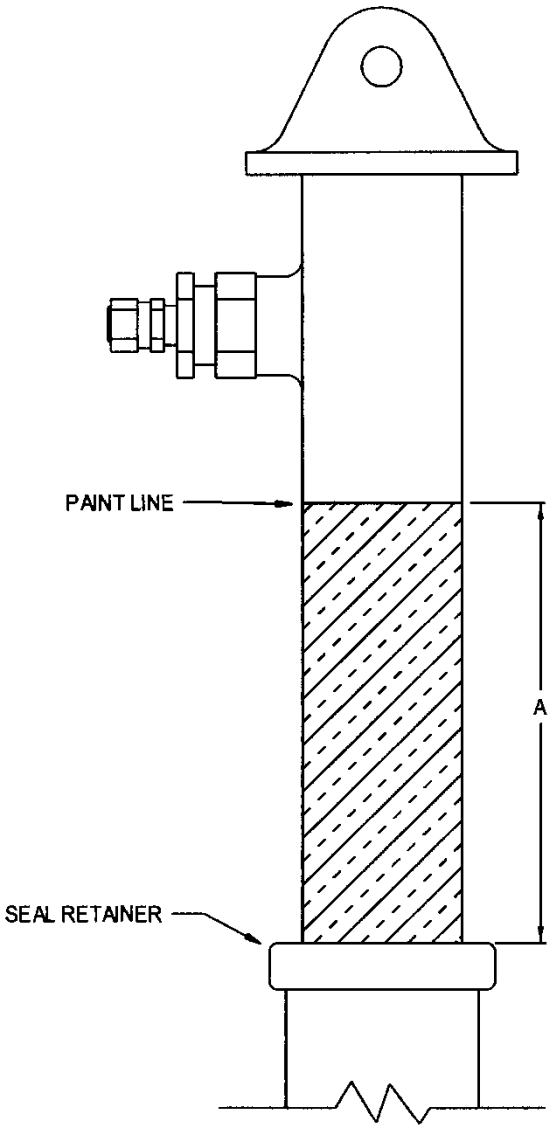


Figure 4-8. Oleo Serviceability

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4-28. Battery

4-29. Servicing - Battery

A. Service the battery I/A/W the manufacturer's instructions.

4-30. Lubrication

4-31. Description - Lubrication

A. Lubrication of the TH-28/480 is normally accomplished at specified hourly intervals. Operators should take into consideration the environmental conditions and determine whether more frequent lubrication intervals are necessary. Refer to Tables 4-1 to 4-5 and Figure 4-1 for approved lubricants, intervals, and locations.

B. Purge lubricate all bearings and remove the excess grease before performing the post maintenance ground run. Follow the procedures listed below for lubricating the lower pulley, main rotor blade grips, main rotor flapping bearings, and the tail rotor pitch control bearing.

(1) For tail rotor feathering bearing lubrication, refer also to paragraph 4-39.4.

C. Lubricate the flight control pivot points sparingly to prevent the accumulation of dirt.

D. Remove the following panels and covers as required to service and lubricate the aircraft:

(1) Keel access panels.

(2) Engine access panels.

(3) Transfer duct access panel.

(4) Tail rotor drive shaft covers.

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4-32. Lower Pulley

4-33. Lubrication - Lower Pulley

NOTE

Do not purge lubricate the lower pulley bearings.

A. Service the lower pulley bearing with only 2 pumps/squirts of grease for each bearing.

4-34. Main Rotor Blade Grip

4-35. Lubrication - Main Rotor Blade Grip (See Figure 4-10)

NOTE

Purge all three blade grips when lubricating the hub to prevent an "out of balance" condition.

CAUTION

Disconnect the pitch links and before rotating the grips. Do not over-rotate.

A. Disconnect the pitch links and rotate grips a few degrees up and down to release pressure.

B. Remove the purge screw (2) and pump grease into the grease fitting (1) until grease purges through the screw hole. Install the screw (2).

C. Remove the purge screw (3) and pump grease into the grease fitting (1) until grease purges through the screw hole.

D. Pump grease into the fitting (4) until grease purges through the screw hole. Install the screw (3).

E. Pump grease into the grease fitting (4) until grease purges through the seal between the end of the grip and the spindle.

F. Remove the purge screws (2) (3) to relieve any internal pressure against the seals. Install the screws.

G. Check seal to determine that it has not been displaced.

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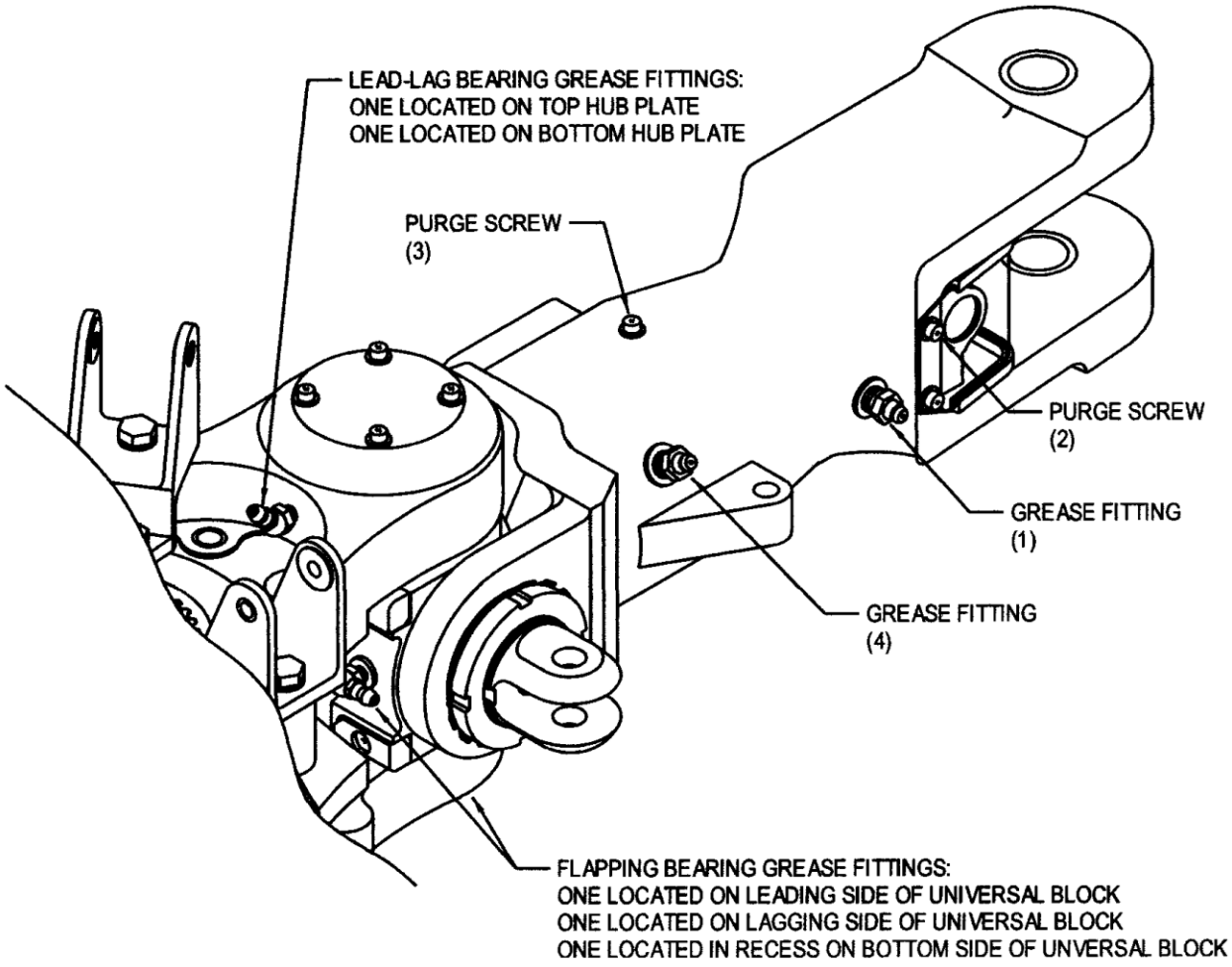


Figure 4-10. Main Rotor Blade Grip, Lead-Lag Bearing, and Flapping Bearing Lubrication

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4-36. Main Rotor Flapping Bearings (See Figure 4-10)

4-37. Lubrication - Main Rotor Flapping Bearings

NOTE

Refer to paragraphs 4-20 through 4-22 if the main rotor hub assembly is equipped with oil lubricated flapping bearings.

A. Purge lubricate the main rotor flapping bearings using the grease fitting located in the recess of the inboard side of the universal block (See Figure 4-10).

4-38. Tail Rotor Pitch Control Bearing

4-39. Lubrication, Preferred Method – Tail Rotor Pitch Control Bearing

NOTE

Purge the needle prior to each use and lubricate the external surface of the needle with grease to prevent seal damage.

A. Using a 6 cubic centimeter (cc) medical syringe and an 18 gauge hypodermic needle, inject .5cc of grease into the bearing in two places, approximately 180° apart. Carefully insert the tip of the needle under the lip of the seal where it contacts the inner race of the bearing. The tip of the needle can be worked under the lip of the seal and into the bearing between the balls. If the needle does not penetrate between the balls, the needle can be withdrawn and inserted in another position on the bearing (Figure 4-10.1).

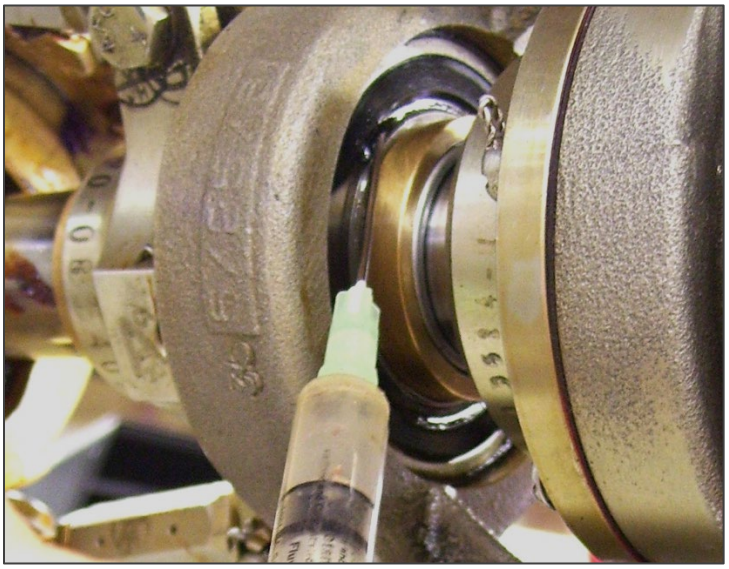


Figure 4-10.1. Tail Rotor Pitch Control Bearing Lubrication

B. Wipe the excess grease from the surface of the seal as necessary.

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4-39.1. Lubrication, Alternate Method – Tail Rotor Pitch Control Bearing

WARNING

Use extreme caution when removing the seal to prevent from injuring yourself or damaging the tail rotor pitch controls.

A. Using a small flat-blade screwdriver or small knife blade, remove the seal from the inboard side of the bearing.

B. Hand pack the bearing with grease.

C. Reinstall the seal. Ensure it is properly seated.

4-39.2. Blower Assembly Bearing

4-39.3. Lubrication – Blower Assembly Bearing

A. Wipe the seal clean on the accessible side of the bearing to reveal the four (4) servicing locations. These locations will either be a small holes in the metal seal or small raised rings in the non-metal seal.

NOTE

Purge the needle prior to each use and lubricate the external surface of the needle with grease to prevent seal damage.

B. Using a 6 cubic centimeter (cc) medical syringe and an 18 gauge hypodermic needle, inject 0.5 cc of grease into the bearing. Inject the grease into one of the holes in the seal. If the hypodermic needle does not fully enter the seal and bearing, remove the needle and rotate the blower assembly slightly to clear the bearing cage and reinsert the needle and inject the grease into the bearing.

C. Wipe excess grease from the exterior of the bearing and repeat the procedure on the other blower assembly bearing.

4-39.4. Tail Rotor Feathering Bearing

4-39.5. Lubrication – Tail Rotor Feathering Bearing

A. Disconnect the pitch change links from the tail rotor assembly (para. 12-121, A).

B. Lubricate the tail rotor blade and grip assemblies. Purge lubricate the blade and grip assembly at the normal 50 hour or 25 hour service interval, as applicable.

C. Rotate (one complete rotation on the feathering axis) the tail rotor blade grip assemblies eleven times.

D. Lubricate the tail rotor blade and grip assemblies again.

E. Reconnect the pitch change links to the tail rotor assembly (para. 12-126, C).

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4-40. Recommended Overhaul Cycles

A. Refer to Table 4-8 for components with recommended overhaul cycles established by Enstrom Helicopter Corporation and other component manufacturers.

NOTE

Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for the overhaul cycle items associated with the engine.

B. Overhaul cycle components authorized for installation on the TH-28,480, and 480B must use the shorter overhaul cycle for the duration of the component overhaul cycle if the component is removed from one model of aircraft and installed on a model with a different overhaul cycle.

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Table 4-8. Recommended Overhaul Cycles

COMPONENT	ITEM	OVERHAUL CYCLE		
		TH-28	480	480B
524-080 150SG117Q-3-1 150SG117Q-4-1	Starter/Generator	1,200 Hrs Not Authorized Not Authorized	1,200 Hrs 1,000 Hrs 1,000 Hrs	1,200 Hrs 1,000 Hrs 1,000 Hrs
20306-2	Valve Assembly (Optional Pop-Out Floats)	Not Authorized	3 years to coincide with hydrotesting of reservoir cylinder or after valve activation	3 years to coincide with hydrotesting of reservoir cylinder or after valve activation
28-13525-9	Tail Rotor Transmission	1,000 Hrs	1,200 Hrs	1,000 Hrs
4130020 (All dash numbers) 4130030-1 4130060 (All dash numbers)	Main Rotor Transmission	1,200 Hrs 1,200 Hrs (1) Not Authorized	1,200 Hrs 1,200 Hrs (1) Not Authorized	Not Authorized Not Authorized 1,200 Hrs (2)
4131001-101 4131001-105 4131001-131	Overrunning Clutch	2,400 Hrs 2,400 Hrs 2,400 Hrs	2,400 Hrs 2,400 Hrs 2,400 Hrs	2,400 Hrs 2,400 Hrs 2,400 Hrs
2A20B-17149-2 528-023-01	Cargo Hook (Optional)	(3)	(3)	(3)
549448	Roll Over Valve Assembly (4)	Not Authorized	(3)	(3)
ECD4097-1 ECD4097-3	Bladder Tank LH (4) Bladder Tank RH (4)	Not Authorized	(3)	(3)
ECD115-17 ECD115-11 ECD115-15	Breakaway Coupling (4)	Not Authorized	(3)	(3)

Notes:

1. These Main Rotor Transmissions can only be installed if the aircraft has been modified for installation of main rotor transmissions equipped with the oil filtration/cooling system.

2. Requires a 600 Hour Mandatory Inspection. This is a temporary restriction pending data analysis from the component tear-down inspections. Refer to paragraph 3-2 and Table 3-2 for more information.

3. Refer to the manufacturer's maintenance publications (See Table 2-2).

4. CRFS installation (Refer to Para. 10-2).

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4-41. Periodic Inspections

4-42. General Information

A. Periodic Inspection Checklists are set forth in paragraphs 4-44 through 4-48. These inspection checklists are intended to be used in conjunction with more detailed procedures presented in other sections of this manual, optional equipment maintenance manual supplements, or vendor manuals. Special inspections are set forth in paragraphs 4-49 through 4-59. These special inspections are required following such occurrences as a main rotor and/or tail rotor blade strike, a hard landing, or a rotor overspeed.

(1) The time extension for the periodic inspections is as follows:

a. 100, 200, and 300 hour periodic inspections – 10 hours.

(2) If the extension is used, the next scheduled inspection is due at the time applicable prior to using the extension. For example, if a 100 hour periodic inspection is due at 100 hours, but is performed at 108 hours, the next periodic 100 hour inspection is due at 200 hours not 208 hours.

(3) If the periodic inspection is performed early, the next periodic inspection is due based on when the inspection was performed. For example, if the periodic inspection was performed at 98 hours instead of 100 hours, the next periodic inspection is due at 198 hours, not 200 hours.

(4) The 10 hour extension does not apply to life limited components.

B. Mandatory component replacement times in flight hours are specified in paragraph 3-2.

C. Recommended component overhaul cycles are specified in paragraph 4-40.

4-43. Daily Inspection

The Enstrom TH-28, 480, or 480B do not require a mandatory daily (maintenance) inspection. Owner/Operators opting to have maintenance personnel check the aircraft should perform a preflight check I/A/W the TH-28, 480, or 480B Rotorcraft Flight Manual.

4-44. Periodic Inspection Checklists

A. These inspection checklists are intended for aircraft operating under normal conditions. More frequent inspections may be required should adverse operations be encountered.

B. For more detailed inspection procedures and tolerances, refer to the appropriate section in the maintenance manual, optional equipment maintenance manual supplements, or vendor manuals.

C. Perform a 100 hour inspection, as a minimum, to meet the requirements for an Annual Inspection (as required by 14 CFR Part 91).

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NOTE

Check with applicable certifying authorities for the region of operation for additional scheduled or special scheduled inspection requirements.

D. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for the specific inspection requirements for continued airworthiness of the engine.

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4-45. 100 Hour/Annual Inspection - Periodic Inspection Checklist

AIRCRAFT REGISTRATION NUMBER:		SIGNATURE:	
AIRCRAFT SERIAL NUMBER:		DATE:	
HOURS: Engine:	Flight:		
CYCLES (Start Counter):			

100 HOUR/ANNUAL INSPECTION CHECKLIST

INITIAL EACH ITEM AFTER ACCOMPLISHMENT	INITIAL	REF
1. GENERAL INSPECTION		
A. Inspect the aircraft records and discrepancy sheets	_____	
B. Check the aircraft and engine records for TBO and Retirement Life items	_____	
C. Check for special airframe or engine inspections	_____	
D. Check compliance with applicable Service Information Letters, Service Directive Bulletins, and Airworthiness Directives	_____	
E. Inspect the aircraft for evidence of fuel and oil leaks	_____	
F. Clean the aircraft thoroughly	_____	
G. Remove the following cowling, access panels, and components:		
1) Keel access panels	_____	
2) Engine access panels	_____	
3) Bottom engine access panel	_____	
4) Aft side access panels	_____	
5) Bottom aft access panel	_____	
6) Horizontal stabilizer spar access panels	_____	
2. AIRCRAFT STRUCTURE & FUSELAGE		
A. Inspect the structure and fuselage for:		
1) Cleanliness & corrosion	_____	
2) Evidence of damage	_____	
3) Cracks, tears, or buckling of skins	_____	
B. Inspect the fuel system for:		
1) Condition and security of the crossover, vent, and supply line	_____	Fig. 10-3
2) Proper operation of the drain valves and the fuel shutoff valve	_____	Fig. 10-3
a) CRFS: Condition, security, and open valve indication of the breakaway coupling valves	_____	Fig. 10-3.1
3) Scupper drain lines for obstructions	_____	Fig. 10-3
4) Condition and security of the fuel quantity and low fuel warning electrical connectors and fuel system electrical grounding connections	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
5) Verify fuel quantity at the indicator. If indication does not correlate to the fuel level, perform fuel quantity transmitter calibration check.	_____	Para. 7-85
6) Condition and security of the external fuel filter (if applicable)	_____	Para. 10-56
7) Condition of the fuel cell cap O-ring and proper operation of the cap	_____	
NOTE Step 8) below applies only to aircraft having an EMI/RFI shielding system (S/N 5134, 5136 through 5197).		
8) Transmit for 10 seconds on 136 MHz and observe the fuel gauge for movement.	_____	Para. 8-74 Para. 10-49,D
3. COMPONENTS (Equipment not specifically listed in this checklist)		
A. Inspect components for:		
1) Security of installation	_____	
2) Cleanliness and evidence of corrosion	_____	
3) Evidence of damage	_____	
4) Cracks, nicks, and scratches	_____	
4. ENGINE		
Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2), for the specific inspection requirements and procedures for the engine assembly.		
NOTE **The procedure for bleeding the engine oil system in the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) covers only top-mounted filters. Refer to paragraph 13-58.1 for bleeding the oil system.**		
A. Inspect the pylon for cracks and corrosion	_____	
B. Inspect the engine mounts for cracks, bends, corrosion, or wear marks and check the condition of the engine mount bolt torque stripes on the side mounts	_____	SDB T-038
C. Inspect the fuel control and power turbine governor controls for proper rigging, worn or loose connections, and freedom of operation	_____	Para. 13-109 Para. 13-111
D. Inspect the exhaust stacks and the eductor for condition, proper installation, and security	_____	Para. 13-8 Para. 13-17
E. Inspect the engine fire detector for condition, chaffing, and security	_____	
F. Inspect the engine panels for:		
1) Damage or chafing	_____	
2) Security of the hinges and fasteners	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
3) Condition and security of the fire curtain	_____	
5. LANDING GEAR ASSEMBLY		
A. Inspect the landing gear and crosstubes for:		
1) Damage or cracks	_____	SDB T-062
2) Condition of the skid shoes	_____	
3) Security of attachments	_____	
4) Condition of the end caps	_____	
5) Condition of the non-skid tape/paint	_____	
6) Condition of the ground handling wheel mounts	_____	
B. Inspect the landing gear oleos for:		
1) Evidence of corrosion	_____	
2) Evidence of leakage	_____	
3) Proper extension	_____	Para. 4-27
4) Security of attachments	_____	
5) Security of the steps	_____	
6. DRIVE BELT SYSTEM		
A. Inspect the upper pulley for:		
1) Evidence of roughness or looseness of the aft bearing or discoloration of the bearing housing	_____	
2) Condition and security of the taper pin and flex pack	_____	
3) Proper torque on the transmission pinion nut (250 ft-lbs)	_____	
4) Condition of the pulley	_____	Para. 11-49
5) Security and condition of the bearing support truss and attaching hardware	_____	
6) Condition of the pylon	_____	
B. Inspect the drive belt for:		
1) Cracked or missing sections	_____	Para. 11-28
2) Proper tension (2,500 - 1,750 pounds)	_____	SDB T-046
C. Inspect the lower pulley for:		
1) Evidence of roughness or looseness of the bearings or discoloration of the bearing housings	_____	
2) Evidence of bearing seal leakage	_____	
3) Condition of the pulley	_____	Para. 11-21
4) Condition and security of the "H" strut	_____	SDB T-018

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
5) Condition and security of the flex packs	_____	Para. 11-21
6) Condition and security of attaching hardware	_____	
D. Perform the following tasks if the aircraft is equipped with oil lubricated lower pulley bearing assemblies.		
1) Drain the oil from the lower pulley bearing	_____	
2) Inspect the sight plugs for cleanliness and staining. Remove and clean or replace the sight plugs as required.	_____	
3) Service the lower pulley bearing assemblies	_____	Para. 4-24
E. Inspect the overrunning clutch for evidence of oil leakage	_____	SDB T-022 SDB T-027
F. Drain the overrunning clutch and vented oil clutch reservoir (if equipped), inspect the drained oil for metal flakes, and service.		Para. 4-10.1
G. Inspect the vented clutch oil reservoir (if equipped) for evidence of oil leakage	_____	
H. Service the ORC or the vented clutch oil reservoir (if equipped)	_____	Para. 4-10
7. OIL COOLING SYSTEM		
A. Inspect the oil cooler for:		
1) Security of installation	_____	
2) Evidence of oil leakage or cracks	_____	
B. Inspect the scavenge/external oil filter assembly, oil lines, and fittings for condition and security of installation	_____	Para. 13-71
C. Inspect the oil cooler, blower, inlet, and exhaust ducting for condition and security	_____	SDB T-016
D. Inspect the blower shaft bearings for security of installation, excessive wear, and discoloration of the bearing mounts	_____	Para. 13-78,E
E. Remove and inspect the flex packs for cracks	_____	Para. 13-75 Para. 13-77 SDB T-013
F. Condition and security of the taper and roll pins and the flex packs (torque 25 in-lb/2.8 Nm)	_____	
8. AIR INTAKE SYSTEM		
A. Inspect the upper plenum/air inlet for cleanliness, condition, and security, and inspect for clearance between the drive belt and the upper plenum.	_____	Para. 13-29
B. Inspect the transfer ducts for cracks, cleanliness, and condition/bonding of duct boots.	_____	
C. Inspect the lower plenum for cleanliness, condition, security, and bonding of inlet seal and inspect the protective shield for condition and security).	_____	Para. 13-39

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
D. Inspect air particle separator perimeter for gasket condition, security, and seal.	_____	
9. TAIL CONE ASSEMBLY		
A. Inspect the tail cone for:		
1) Cracks in the tail cone mount fittings	_____	SDB T-033
2) Proper security to the pylon	_____	
3) Cracked or damaged bulkheads or doublers	_____	
4) Legibility of decals and markings	_____	
B. Inspect the tail rotor drive shaft for:		
1) Rough or worn bearings	_____	
2) Position of the rubber inserts	_____	
3) Condition and security of the taper pins and flex packs (torque 25 in-lb/2.8 Nm)	_____	
4) Security of the pillow blocks	_____	
C. Inspect the horizontal and vertical stabilizers for:		
1) Damage or cracks	_____	SDB T-004
2) Loose rivets	_____	
3) Security of attachment	_____	SDB T-031
D. Inspect the tail rotor guard for:		
1) Damage and loose rivets	_____	
2) Security of attachment	_____	
E. Inspect the stinger tube for:		
1) Evidence of loose rivets at the aft bulkhead	_____	SDB T-064
2) Security of mounting	_____	
F. Inspect the vibration absorber assembly for condition and security (if installed).	_____	
10. TAIL ROTOR TRANSMISSION		
A. Inspect the tail rotor transmission for:		
1) Evidence of leakage at the seals	_____	SDB T-012
2) Condition and security of the mounting screws	_____	
3) Evidence of a cracked or damaged housing	_____	
4) Condition and security of plugs and sight gauge		Para. 4-17
B. Drain the transmission and inspect the chip detector for the presence of magnetic particles	_____	Para. 4-57,B,(1)

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
C. Service the transmission	_____	Para. 4-16
D. Inspect the tail rotor pitch controls for:		
1) Worn bushings at the pivot points	_____	
2) Slider assembly for freedom of operation and wear	_____	
3) Condition and security of the control hardware	_____	
11. TAIL ROTOR ASSEMBLY		
A. Inspect the tail rotor assembly for:		
1) Cracks, nicks, dents, scratches, and bends	_____	Para. 9-47
2) Evidence of bond separations, corrosion, and bond line corrosion	_____	
3) Loose tip rivets	_____	
4) Condition and security of the teeter bearings	_____	
a) Purge lubricate the needle bearings (ref. Table 4-2)		
5) Condition and security of the pitch change bearing	_____	
6) Inspect the pitch change links for condition, worn rod end bearings, proper hardware, and security of installation	_____	Para. 12-123 Para. 12-124
7) Fretting of the blades and grips at the attachments	_____	SDB T-055
12. MAIN ROTOR TRANSMISSION		
A. Inspect the main rotor transmission for:		
1) Evidence of leakage	_____	SDB T-002
2) Cleanliness and corrosion	_____	
3) Cleanliness of the sight glass	_____	
4) Condition and security of the mounting bolts and plugs	_____	
5) Condition of the main rotor mast	_____	
6) Condition of the pylon assembly (transmission area)	_____	SDB T-065
B. Drain the transmission and inspect the chip detector and (if applicable) the oil filter for the presence of metal particles	_____	Para. 4-13
C. Replace the oil filter (if applicable)	_____	Para. 4-14
D. (If applicable) Condition and security of heat exchanger, filter housing, pressure switch, oil lines, drain line, fittings, oil pump, and mounting brackets	_____	Para. 11-42
E. Service the transmission	_____	Para. 4-12
13. MAIN ROTOR ASSEMBLY		
A. Inspect the main rotor blades for:		
1) Cleanliness and evidence of corrosion	_____	Para. 9-35
a) Review records for date of last CPC application. Re-apply, if required.	_____	Para. 4-48,6 Para. 4-88

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
2) Condition of the blade tape, if installed	_____	
3) Nicks, dents, or scratches	_____	
4) Evidence of bond line separation	_____	
5) Condition and security of the trim tabs	_____	
6) Evidence of loose rivets in the drag link attachment fittings	_____	
7) Proper security of the blades	_____	SDB T-029
B. Inspect the main rotor retention assemblies for:		
1) Condition of the up and down stops	_____	Table 9-2
2) Condition and security of the pitch horn and planipetal weight, if installed.	_____	
C. Inspect the universal block assemblies for:		
1) Condition of the lead/lag stops	_____	Table 9-3
2) Proper security of the lower nuts	_____	
3) Condition of flapping bearing oil seals (if applicable)	_____	
D. Inspect the hydraulic main rotor dampers for:		
1) Radial wear in the rod end bearing	_____	Table 9-4
2) Evidence of leakage	_____	
3) Condition (corrosion, corrosion protection and security of the rod end bearing	_____	SDB T-058 Para. 9-30,S
4) Proper security at the attachment points	_____	
5) Proper security of all hardware	_____	
E. Inspect the center hub section for:		
1) Evidence of cracks	_____	Table 9-1
2) Fretting at the upper and lower spline adapters	_____	
3) Inspect the torque stripe indicators on the mast nut. If the indicators show loss of torque on the mast nut or are not installed, check the torque on the mast nut	_____	
F. Inspect the pitch change bellcranks for:		SDB T-003 Para. 12-89
1) Evidence of cracks in the mounting brackets	_____	
2) Proper bearing operation and wear at the pivot points	_____	
3) Condition and security of the pitch change link rod end bearings	_____	
4) Proper security of all hardware	_____	
G. Inspect the upper control push-pull rods for:		
1) Evidence of loose rivets	_____	SDB T-025
2) Evidence of damage	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	
14. SWASHPLATE CONTROL SYSTEM		
A. Inspect the swashplate assembly for:		SDB T-007
1) Looseness of the universal points	_____	Para. 12-78
2) Looseness of the push rod dogleg bearings	_____	SDB T-024
3) Roughness in the cyclic bearing	_____	
4) Condition of the rod ends and the fitting on the push-pull rods at the cyclic bearing housing	_____	
5) Proper security of all hardware	_____	
B. Inspect the collective guide tube assembly for:	_____	Table 12-3
1) Radial wear of the DU bushings	_____	
2) Roughness in the collective bearing	_____	
3) Wear in the collective walking beam at the bushings in the straps at the transmission attachment and at the bearings in the collective bearing housing	_____	
4) Proper security of all hardware	_____	
15. CABIN SECTION	_____	
A. Inspect the cabin exterior for:		
1) Proper operation of the doors	_____	
2) Cleanliness, cracks or crazing of the door and cabin plexiglass	_____	
3) Obstructed or bent pitot tube	_____	
B. Inspect the cabin interior for:		
1) Cleanliness and evidence of corrosion	_____	
2) Presence and legibility of decals and placards	_____	
3) Condition and security of the seats	_____	
4) Deterioration of the seat cushions	_____	
5) Condition, operation, and security of attachment of the safety belts and shoulder harnesses	_____	
6) Date of the last inspection and security of the fire extinguisher	_____	
C. Inspect the instrument console for:		
1) Condition and security of all instruments	_____	
2) Condition and security of the console shrouds	_____	
3) Legibility of all decals and placards	_____	
D. Inspect the keel structure for:		
1) Cleanliness and corrosion	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
2) Evidence of loose rivets	_____	
3) Condition of the bulkheads	_____	
E. Inspect the cabin environmental control system for:		
1) Condition and security of the ducting	_____	
2) Obstruction of the outlets	_____	
3) Proper operation of the control valves and cable	_____	
16. FLIGHT CONTROLS		
A. Inspect the cyclic flight controls for:		
1) Proper range of travel (para. 4-60,B,4 through para. 4-60,B,6)	_____	Para. 4-60, B,4 through Para. 4-60, B,6
2) Freedom of operation	_____	
3) Condition and security of all rod ends, push-pull rods, bellcranks, and vibration absorber assemblies (if installed) forward of the swashplate.	_____	
4) Proper security at all connections forward of the swashplate	_____	
5) Condition and security of the trim assemblies	_____	Para. 12-71
B. Inspect the collective flight controls for:		
1) Proper range of travel (collective contacts up stop and down stop of the collective slider)	_____	
2) Freedom of operation	_____	
3) Proper operation of the collective friction	_____	Para. 12-30 Para. 12-32
4) Condition and security of the torque tube and push-pull rods	_____	
5) Condition and security of the spring capsule	_____	Para. 12-36
6) Proper operation, condition, and security of the droop compensator system	_____	Para. 13-111
7) Proper security at all connections	_____	
C. Inspect the tail rotor controls and cables for:		
1) Proper cable tension and correct range of travel	_____	Para. 12-99
2) Evidence of binding or ratcheting	_____	
3) Cable wear at the pulleys and fairleads	_____	Para. 12-107
4) Condition and security of all rod ends, push- pull rods, and bellcranks	_____	
5) Condition and security of the pedal assemblies	_____	
6) Proper security at all connections	_____	

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INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
17. BATTERY AREA		
A. Inspect the battery as required in accordance with the manufacturer's instructions	_____	
B. Inspect the preservation of the surrounding area	_____	
C. Inspect the condition of the battery cables, case, and hold down	_____	
D. Inspect for corrosion at the cable connections	_____	
E. Inspect the electrical components and wiring for condition and security	_____	
F. Inspect the battery vent tubes for condition, security, and clear of obstructions	_____	
18. ELECTRICAL SYSTEMS		
A. Inspect the starter/generator systems for:		
1) Condition and security of the wiring	_____	
2) Condition and security of the relays, generator shunt, and the current limiter	_____	
3) Condition and security of the GCU	_____	
4) Condition and security of the starter/generator	_____	
5) Condition of the starter/generator brushes (Refer to Paragraph 13-120)	_____	
6) Condition and security of starter/generator cooling duct installation and drain hole unobstructed in rigid air duct (480B S/N 5114 and subsequent & any 480B equipped with Cooling Kit 4230031)	_____	
B. Inspect the external power system for:		
1) Condition and security of the wiring	_____	
2) Condition and security of the external power receptacle and relay	_____	
C. Inspect the electrical bus or terminal strips for condition, security, loose connections, and evidence of arcing	_____	
D. Inspect the cockpit/map and instrument lighting systems for:		
1) Condition and security of the systems components and wiring	_____	
2) Operation of the cockpit/map light and instrument lighting	_____	
E. Inspect the landing, anti-collision, and position light systems for:		
1) Condition and security of the systems components and wiring	_____	
2) Operation of the landing, anti-collision, and position lights	_____	
F. Inspect the caution and warning systems for:		
1) Condition and security of the systems components and wiring	_____	
2) Perform a functional test of the caution system	_____	
3) Perform a functional test of the warning system	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
G. Inspect the power turbine governor trim system for:		
1) Condition and security of the wiring for the linear actuator	_____	
2) Operation of the linear actuator using the governor increase/ decrease switch(es)	_____	
H. Inspect the cyclic trim system for:		
1) Condition and security of the trim switch units and wiring	_____	SDB T-039
2) Operation of the trim actuators using the cyclic trim switch(es)	_____	
I. Inspect the idle stop system for: (S/N 5136 and subsequent)		
1) Condition and security of the switches, relay, solenoid and wiring	_____	
2) Operation of the idle stop using the idle stop switch(es)	_____	
J. Inspect all optional electrically powered instruments not covered in the checklist for operation	_____	
K. Inspect the switches, fuses, and circuit breakers for:		
1) Condition and security	_____	
2) Cycle the switches and circuit breakers	_____	
L. Inspect the pylon tabs at grounding hardware attachment for corrosion and condition.	_____	
19. EQUIPMENT WITH MAINTENANCE MANUAL SUPPLEMENTS		
A. Air Conditioning System:		
1) Inspect the air conditioning system I/A/W Maintenance Manual Supplement 1, Paragraph 4-4	_____	
B. Emergency Pop-Out Floats:		
1) Inspect the emergency pop-out floats I/A/W Maintenance Manual Supplement 2, Paragraph 4-12	_____	
C. Gyrocam Dual or Triple Sensor Camera System:		
1) Inspect the Gyrocam Dual or Triple Sensor Camera System I/A/W Maintenance Manual Supplement 3, Paragraph 4-6	_____	
D. Chelton Flightlogic EFIS System:		
1) Inspect the Chelton Flightlogic EFIS System I/A/W Maintenance Manual Supplement 4, Paragraph 4-5	_____	
E. Avionic Systems:		
1) Inspect the applicable Avionic System(s) I/A/W Maintenance Manual Supplement 5, Paragraph 3-3	_____	
F. Partial Wide Instrument Panel:		
1) Inspect the partial wide instrument panel I/A/W Maintenance Manual Supplement 6, Paragraph 4-2	_____	

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100 HOUR/ANNUAL INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
G. Bambi Bucket Interface Kit:		
1) Inspect the bambi bucket interface I/A/W Maintenance Manual Supplement 7, Paragraph 4-2	_____	
H. G1000H Integrated Flight Deck:		
1) Inspect the G1000H I/A/W Maintenance Manual Supplement 8, Paragraph 1.3.3	_____	
20. POST INSPECTION		
A. Lubrication and servicing:		
1) Ensure all required items have been lubricated and serviced per the maintenance manual lubrication and servicing charts	_____	Para. 4-30
B. Correct all discrepancies and install all cowling, access panels, doors, and other items removed for this inspection	_____	
C. Operation Check	_____	
1) Engine Run-Up:		
Check engine/post flight requirements in the Rolls-Royce 250-C20 Series Operation and Maintenance Manual. Run the aircraft I/A/W the Enstrom TH-28, 480, or 480B Rotorcraft Flight Manual. Check the engine instruments, fuel quantity and flow systems for proper operation.	_____	
2) Flight Control Check:		
Whenever disassembly of the flight controls, especially the removal of the main rotor hub, has been accomplished, it is recommended that a test flight be performed. See the Enstrom TH-28/480 Series Maintenance Manual for full details.	_____	
WARNING		
Test flight to be performed by authorized personnel only.		
3) Avionics and Flight Instruments: Check operation.	_____	
D. Post Operation Check:		
1) Inspect the engine compartment for oil and fuel leaks	_____	
E. Enter the inspection compliance in the airframe and engine logbooks as applicable	_____	
F. Perform a maintenance test flight		
WARNING	_____	
Test flight to be performed by authorized personnel only.		

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4-46. 200 Hour Inspection - Periodic Inspection Checklist

AIRCRAFT REGISTRATION NUMBER:		SIGNATURE:	
AIRCRAFT SERIAL NUMBER:		DATE:	
HOURS: Engine:	Flight:		
CYCLES (Start Counter):			

200 HOUR INSPECTION CHECKLIST

INITIAL EACH ITEM AFTER ACCOMPLISHMENT	INITIAL	REF
1. GENERAL INSPECTION		
A. Perform a complete 100 Hour/Annual Inspection	_____	
2. OIL COOLING SYSTEM		
A. Inspect and replace the scavenge/external oil filter element	_____	
3. MAIN ROTOR ASSEMBLY		
A. Inspect the main rotor retention assemblies for:		
1) Evidence of ratcheting or binding in the feathering bearings	_____	
2) Remove the retention assembly dust cover.		Fig. 9-7,(18)
a) Inspect the T-T strap retention block and pin assembly for condition and security	_____	Fig. 9-7, (29)
b) Inspect for evidence of O-ring/seal leakage	_____	
3) Evidence of a sheared roll pin at the hinge pin	_____	
4) Evidence of ratcheting or binding of the flapping bearings	_____	
5) Proper security of the hinge pin locking tang washer	_____	Fig. 9-6,(5)
B. Drain the flapping bearing oil and reservice (if applicable)	_____	

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4-47. 300 Hour Inspection - Periodic Inspection Checklist

AIRCRAFT REGISTRATION NUMBER:		SIGNATURE:	
AIRCRAFT SERIAL NUMBER:		DATE:	
HOURS: Engine:	Flight:		
CYCLES (Start Counter):			

300 HOUR INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
1. GENERAL INSPECTION		
A. Perform a complete 100 Hour/Annual Inspection	_____	
B. Remove the following components:		
1) Upper plenum/air inlet assembly	_____	
2. AIRCRAFT STRUCTURE & FUSELAGE		
A. Replace the airframe mounted fuel filter element (if applicable)	_____	
3. MAIN ROTOR TRANSMISSION		
A. Inspect the ring and pinion gears for wear and spalling	_____	

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4-48. Special Scheduled Inspection - Periodic Inspection Checklist

AIRCRAFT REGISTRATION NUMBER:		SIGNATURE:	
AIRCRAFT SERIAL NUMBER:		DATE:	
HOURS: Engine:	Flight:		
CYCLES (Start Counter):			

SPECIAL SCHEDULED INSPECTION CHECKLIST

INITIAL EACH ITEM AFTER ACCOMPLISHMENT	INITIAL	REF
1. MAIN ROTOR TRANSMISSION		
A. Retorque the aft pinion nut 20-25 hours after installation	_____	
2. DRIVE BELT SYSTEM		
A. Inspect the alignment of the Lower Pulley Drive System in accordance with paragraph 11-17 every 12 months	_____	Para. 11-17
B. Inspect the individual elements of the flex packs, P/N ECD4024-1, for cracks and general condition every 12 months	_____	
C. Inspect the drive belt every 50 hours for the following:		
1) Contact with the upper plenum/air inlet	_____	Para. 13-29, B
2) Protruding cord on both the forward and aft edges of the drive belt around the circumference of the lower pulley	_____	
3) Condition of the belt that has been edge-sealed	_____	SDB T-046
3. OIL COOLING SYSTEM		
A. Perform bypass indicator functional test on the Purolator/Facet scavenge/external oil filter assembly in accordance with paragraph 13-71, C every 600 hours	_____	Para. 13-71, C
B. For aircraft operated in dusty environments, inspect the blower impeller for dirt accumulation every 200 hours and clean as required	_____	
4. NEOPRENE COMPONENTS		
A. Inspect components comprised of neoprene materials when helicopter has been in temperatures below -20° C (-4 °F). Visually examine components for breaks, chips, cracks or other deteriorating indications and replace as needed. Neoprene locations:		
1) Vibration dampening pad in tailcone structure	_____	
2) Gasket installed between fuel bladder skin and spacer in installation of fuel cap assembly	_____	
3) Rubber absorber between drag link and pylon mount location in drive assembly	_____	

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SPECIAL SCHEDULED INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
4) Clamps attaching the tail rotor guard	_____	
5) Isolator on the oil tank support	_____	
5. TAIL ROTOR TRANSMISSION		
A. For aircraft used in agricultural operations (see SIL T-049):		
1) Inspect the tail rotor transmission gears for cracked or broken teeth every 50 hours.	_____	
2) In the event of a tail rotor transmission chip indication, inspect the chip detector for the presence of metal particles.	_____	Para. 4-57,B Para. 4-57,D
6. MAIN ROTOR BLADES		
A. Perform reapplication of corrosion prevention compound at a minimum once every two years. Shorter intervals may apply to aircraft operating in moderate and severe corrosion environments, as identified in SIL T-035.	_____	Para. 4-88 SIL T-035

4-48.1 Unscheduled Inspection Checklist

AIRCRAFT REGISTRATION NUMBER:		SIGNATURE:	
AIRCRAFT SERIAL NUMBER:		DATE:	
HOURS: Engine:	Flight:		
CYCLES (Start Counter):			

UNSCHEDULED INSPECTION CHECKLIST		
INITIAL EACH ITEM AFTER ACCOMPLISHMENT	**INITIAL**	**REF**
1. SPECIAL INSPECTIONS (See Paragraph 4-49 through Paragraph 4-59)		Para. 4-50
2. FUEL SYSTEM		
A. Aircraft equipped with CRFS:		
1) If the aircraft is tipped more than 25° while on the ground, remove the roll over valve and check for open status.	_____	Para. 10-18.9
2) If the aircraft experiences a 27° left or right roll during a take-off or landing maneuver (on one skid or an uncoordinated flight situation), remove the roll over valve and check for open status.	_____	Para. 10-18.9

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4-49. Special Inspections

4-50. General Information - Special Inspections

NOTE

Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for special inspections applicable to the engine.

A. This section contains guidelines for performing the required inspections, by qualified maintenance personnel, after experiencing any of the following occurrences: main rotor blade and/or tail rotor strikes, hard landings, main rotor overspeed, over torque, engine overspeed, or engine TOT exceeds the limits. It should be emphasized that other parts and/or adjacent components not listed may also be damaged, depending on the severity of the incident. Therefore, this guide should not be considered absolute and should be expanded as required by the inspecting maintenance personnel, as the occurrence may require, per the appropriate sections of this manual.

B. All aluminum and steel components must be inspected by the following processes after visual inspection has revealed a possible defect or as noted in the special inspections:

(1) Aluminum machined or cast components are to be inspected by liquid penetrant inspection (ASTM E165 or equivalent).

(2) Aluminum sheet metal components are to be inspected by liquid penetrant inspection (ASTM E165 or equivalent).

(3) Steel components are to be inspected by magnetic particle inspection (ASTM E1444 or equivalent).

C. All parts and components that may be affected by the specific occurrence are to be given a complete inspection for possible damage.

NOTE

The following inspections are mandatory.

4-51. Main Rotor Blade Strike/Sudden Stoppage (Minor) - Special Inspection

A. Blade damage does not exceed damage as defined in paragraph 9-35, and shows no visible kinks, ripples in the skin or the trailing edge. Perform the following:

(1) Repair the blade I/A/W paragraph 9-36.

(2) Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

B. Blade damage exceeds limits of paragraph 9-35, but has not contacted the airframe or other rigid object and shows no visible kinks, ripples in the skin or trailing edge. Perform the following:

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(1) Replace the blade(s).

(2) Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

(3) Check the main rotor shaft run out (paragraph 11-34). Maximum allowed is .012 inches/.305 mm FIM.

(4) Inspect the tail rotor driveshaft taper pins, taper pin holes and flex packs I/A/W paragraphs 11-71 & 11-80.

NOTE

If the main rotor shaft run out, taper pins, or flex packs do not meet inspection requirements, proceed to paragraph 4-52.

4-52. Main Rotor Blade Strike/Sudden Stoppage (Major) - Special Inspection

A. Obvious blade damage exceeding the limits of paragraph 9-35. Perform the following:

(1) Replace the damaged blade(s) and inspect the remaining blade(s).

(2) Remove the main rotor transmission including the upper pulley and tail rotor drive shaft hub and return to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

(3) Remove the main rotor hub and inspect by liquid penetrant method (ASTM E165 or equivalent and in accordance with the inspection tables (Table 9-1) or return to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

(4) Inspect all flight control push-pull rods and torque tubes for sheared/damaged rivets at the fittings, damaged rod ends, or sheared/damaged roll pins.

(5) Inspect all flight control bellcranks for buckling and elongated bolt holes.

(6) Inspect the lower swashplate for warped or cracked casting and for bent or damaged guidetubes in the upper swashplate. Inspect the tie rod and universal rod for straightness. Inspect the bolt holes for elongation.

(7) Replace all tail rotor driveshaft taper pins.

(8) Inspect the tail rotor driveshafts for damage at the taper pin holes.

(9) Magnetic particle inspect the tail rotor driveshafts (ASTM E1444 or equivalent).

(10) Inspect the pylon structure at the gearbox mounting areas for broken or bent tubes. Check the trueness of the four gearbox attachment points.

(11) Remove the overrunning clutch and return to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

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(12) Inspect all components of the drive system.

(13) Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operators and Maintenance Manual (10W2).

4-53. Tail Rotor Blade Strike/Sudden Stoppage - Special Inspection

A. Strike tab missing but no physical damage to the tail rotor blade(s).

(1) Inspect the tail rotor driveshafts for damage at the forward and aft coupling taper pin locations.

(1) Inspect the taper pins, flex packs, and drive shaft hubs at the forward and aft coupling locations I/A/W paragraphs 11-71 & 11-80.

(3) If no damage is found, make a log book entry and notify Enstrom Helicopter Corporation to order replacement strike tabs.

(4) If damage is found, proceed to the following paragraph for additional inspection procedures.

B. Obvious physical damage to the tail rotor blade. Perform the following:

(1) Remove the tail rotor transmission with the tail rotor controls and the input drive hub and the tail rotor assembly

a. Remove the tail rotor pitch controls and inspect in accordance with the inspection tables (Table 12-4).

b. Return the tail rotor transmission to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

c. Inspect the tail rotor assembly in accordance with the inspection tables (Table 9-5).

(2) Replace all tail rotor driveshaft taper pins.

(3) Inspect the tail rotor driveshafts for damage at the forward and aft taper pin holes.

(4) Inspect the taper pin hole in the main rotor transmission pinion for complete or partial failure. If damage is found, return the main rotor transmission to Enstrom Helicopter Corporation for overhaul/replacement.

(5) Inspect all coupling hubs and the pinion shaft by liquid penetrant method.

(6) Magnetic particle inspect the tail rotor driveshafts (ASTM E1444 or equivalent).

(7) Inspect the hangar bearing housings and attachments.

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(8) Inspect the tail rotor control cables and pulley attachments.

(9) Inspect the tail rotor pedal push-pull rods and bellcranks.

(10) Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operators and Maintenance Manual (10W2).

4-54. Hard Landing - Special Inspection

A. In the event of a hard landing which may or may not be associated with a main or tail rotor strike, perform the following:

(1) Inspect the forward and aft crosstube for bends or bowing. Replace the crosstube if bent or bow is greater than 0.5 inches/13 mm. It will be necessary to hoist the aircraft or remove the crosstubes to obtain a measurement.

(2) Inspect the landing gear leg assemblies for distortion or deformation. Inspect all fittings and bolt holes for elongation. Inspect all welds and gussets for cracks.

(3) Inspect the skid tubes for damage and straightness. Inspect all hardware attachment holes for elongation or tears.

(4) Inspect the oleos for damage, freedom of movement, and leakage.

(5) Inspect the tailcone to pylon, main rotor transmission to pylon, engine to pylon, crosstube to pylon, and cabin to pylon attachment points for deformation or hardware failures.

(6) Inspect the keel structure edges, beams, lightening holes, and intercostals for buckling or deformation. Closely inspect the keel structures for interference or contact with flight control mechanisms (torque tube, collective, etc.) or with the landing gear clamps.

(7) Check the main rotor shaft run out (paragraph 11-34). Maximum allowed is .012 inch/.305 mm FIM.

(8) Check the main rotor transmission mount bolt torque. If torque is lost, replace the hardware or remove and inspect the hardware using Magnetic Particle Inspection (ASTM E1444).

(9) Inspect the main rotor transmission mount lugs using Visible Dye Liquid Penetrant Inspection (ASTM E165).

(10) Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

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4-55. Main Rotor Overspeed - Special Inspection

A. Overspeeds from 385-405 rpm for 5 seconds or less. No inspection required.

NOTE

If any damage is found, remove the main rotor hub and return to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

B. Overspeeds from 385-405 rpm for more than 5 seconds or overspeeds from 406-420 rpm. Perform the following:

(1) Remove the main rotor blades and inspect flapping axis for proper drag, notchiness, and freedom of movement.

(2) Inspect the main rotor blade retention for any deformation.

(3) Inspect the lamiflex bearings for deformation, proper thickness, delamination or extruded brass. Inspect the nylatron strap for any damage or unusual wear.

(4) Inspect the main rotor spindles for pulled or distorted threads. (Lamiflex installation only)

(5) Inspect the tension-torsion straps and pins I/A/W paragraph 9-16.

C. Overspeeds exceeding 420 rpm. Perform the following:

(1) Remove the main rotor hub and return to Enstrom Helicopter Corporation for inspection and overhaul/replacement.

4-56. Overtorque - Special Inspection

A. Overtorques from 68-75 psi (TH-28 & 480) or 69-75 psi (480s equipped with the Increased Rotor Speed and Torque Limits Modification) or 73-79 psi (480B) for 3 seconds or less. No inspection required.

B. Overtorques from 68-75 psi (TH-28 & 480) or 69-75 psi (480s equipped with the Increased Rotor Speed and Torque Limits Modification) or 73-79 (480B) for more than 3 seconds or above 75 psi or 79 psi as applicable. Perform the following:

NOTE

Check the aircraft inspection records for any annotations about the condition of the main rotor transmission ring and pinion gears.

(1) Visually inspect the main rotor transmission ring and pinion gears for cracks, excessive pitting, excessive spalling, or a "hard wear" line.

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4-57. Main Rotor or Tail Rotor Transmission Chip Indication - Special Inspection

NOTE

New or recently overhauled transmissions will often make a magnetic "fuzz" which will collect on the magnetic plug as gray sludge. This is normal and may be cleaned off the plug. The plug may then be reinstalled and the helicopter returned to service. If any main rotor transmission chips are found which are larger than 1/16 inch/1.59 mm in cross-section or if any tail rotor transmission chips are found which are larger than .035 inch/.9 mm in cross-section, contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

A. Main rotor transmission chip indication. Perform the following:

(1) Inspect the chip detector for accumulation of metal particles as follows:

a. Main rotor transmission metal particles, flakes, or slivers exceeding 1/16 inch/1.59 mm: Contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

NOTE

Sludge normally will not cause a chip indication by itself. There is normally a small particle, flake, or sliver on the detector also.

b. Sludge (a mixture of oil and fine metal particles resulting from normal gear operation): Clean the detector and return the transmission to service.

(2) If the indication was caused by sludge or a particle, flake, or sliver not exceeding the maximum size, annotate the chip indication and results in the aircraft maintenance records.

(3) Return the transmission to service.

B. Tail rotor transmission chip indication. Perform the following:

(1) Inspect the chip detector for accumulation of metal particles as follows:

a. Tail rotor transmission metal particles, flakes, or slivers exceeding .035 inch/.9mm: Contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

NOTE

Sludge normally will not cause a chip indication by itself. There is normally a small particle, flake, or sliver on the detector also.

b. Sludge (a mixture of oil and fine metal particles resulting from normal gear operation): Clean the detector and return the transmission to service.

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(2) If the indication was caused by sludge or a particle, flake, or sliver not exceeding the maximum size, annotate the chip indication and results in the aircraft maintenance records.

(3) Return the transmission to service.

C. Three main rotor transmission chip indications occur within 10 flying hours. Perform the following:

NOTE

Check the aircraft inspection records for any annotations about the condition of the main rotor transmission ring and pinion gears.

(1) Drain the oil from the transmission and inspect the ring and pinion gears for cracks, excessive pitting, excessive spalling, or "hard wear" lines.

(2) Inspect the chip detector for accumulation of metal particles in accordance with para. 4-57, A, (1) and (2).

(3) If none of the above conditions are found, flush and service the main rotor transmission (para. 4-13.1) and return to service.

(4) If two chip indications occur within the next 10 flying hours, repeat the flush and servicing procedure. If two additional indications occur within the next 10 flying hours, contact Enstrom Helicopter Corporation for further instructions.

D. Two tail rotor transmission chip indications occur within 10 flying hours. Perform the following:

NOTE

Check the aircraft inspection records for any annotations about the condition of the tail rotor transmission input and output gears.

(1) Drain the oil from the transmission and inspect input and output gears (through the inspection port) for cracks, excessive pitting, excessive spalling, or "hard wear" lines.

(2) Remove the tail rotor assembly from the tail rotor transmission output shaft and the aft tail rotor drive shaft flex plate assembly. Turn the tail rotor transmission output shaft by hand. If indications of a rough bearing are felt, the transmission must be replaced.

NOTE

If the gearbox is to be returned to Enstrom Service, do not clean the metal from the chip detector.

(3) Inspect the chip detector for accumulation of metal particles in accordance with para. 4-57, B, (1) and (2).

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(4) If none of the above conditions are found, flush and service flush and service the tail rotor transmission (para. 4-17.1) and return to service.

(5) If two chip indications occur within the next 10 flying hours, repeat the flush and servicing procedure. If two additional indications occur within the next 10 flying hours, contact Enstrom Helicopter Corporation for further instructions.

4-58. Engine Overspeed - Special Inspection

NOTE

Perform the appropriate main rotor overspeed inspection if required.

A. Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual if the engine operating limitations are exceeded.

4-59. Engine Overtemp - Special Inspection

A. Inspect the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual if the engine operating limitations are exceeded.

4-60. Maintenance Ground Run

A. General

(1) Perform a maintenance ground run after conducting a periodic inspection or maintenance action that will require operation of the aircraft to verify satisfactory performance of the aircraft.

(2) The periodic inspection or maintenance action will determine the extent of the post maintenance ground run.

B. Perform the maintenance ground run as follows:

(1) Perform a preflight inspection.

NOTE

The maintenance performed on the flight control systems should determine the extent of the rigging check.

(2) Verify flight control rigging if any maintenance was performed on the flight controls.

(3) Position lateral and fore/aft trim motors to the neutral position.

(4) Move the cyclic stick around the cyclic stop in the floor. The stick must remain against the stop through the circle. If binding or interference is detected, re-check the basic rigging.

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(5) Move the fore/aft trim to full forward position and move the cyclic stick full aft. Stick should contact the cyclic stop. Reverse the trim motor and stick positions and check that stick contacts the cyclic stop.

(6) Repeat step (5) using the lateral trim motor and moving the stick in the lateral direction.

(7) Check the rigging of the throttle controls.

(8) Check the rigging of the droop compensator.

WARNING

The following checks are to be performed by authorized personnel.

(9) Run-up the aircraft I/A/W the Rotorcraft Flight Manual.

(10) With the engine at ground idle, collective full down, and pedals neutral, check the following instruments:

a. N_1 - 59-65%

b. Torque - 8-10 psi

c. Rotor RPM - approximately 215 rpm

d. All other instruments - normal range

(11) Slowly apply approximately 1 inch of left pedal. Check for an increase in the torque indication and corresponding aircraft movement. Neutralize the pedals.

WARNING

Clear all personnel from the tip path plane area as the blades may dip as low as 5 feet during this test.

(12) Slowly move the cyclic stick forward until there is a slight bumping of the rotor stops. Observe the position of the cyclic stick in relation to the cyclic stop ring. Repeat this check by bringing the cyclic stick aft, then right and left. The distance that the cyclic fitting is from the stop should be equal. If a noticeable difference exists, adjust the length of the push-pull rods located between the bellcranks in the engine compartment. The right side push-pull rod controls fore/aft movement and the left side push-pull rod controls the lateral movement.

(13) With the collective full down, cyclic centered, and pedals neutral, slowly increase the throttle to full throttle.

(14) Check the operation of the power turbine governor linear actuator. The minimum operating range is from 88% - 92% N_2. Maximum operating range is 100% - 103% N_2.

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(15) Set the N_2 rpm to 98% and check the torque indication. For aircraft without blade leading edge protection tape, the torque indication should be 15 - 18 psi to assure adequate rotor rpm during autorotation. The torque indication for aircraft equipped with blade leading edge protection tape should be 17 - 21 psi. Shorten the main rotor pitch change links to increase the torque indication and lengthen the pitch change links to decrease the torque indication. The maintenance test flight will determine what additional adjustments will be required.

WARNING

Clear all personnel from the tip path plane area as the blades may dip as low as 5 feet/1.52 meters during this test.

(16) Slowly move the cyclic forward, aft, right, and left and check for the proper response of the main rotor tip path.

(17) Trim the cyclic stick to neutral and release the cyclic grip. Visually watch the cyclic stick for motion. The cyclic stick should remain centered and still. Move the cyclic fore and aft without trimming and check for smoothness. No hard vibrations should be present.

NOTE

If hard vibrations are present or the cyclic wanders, either the aircraft will have to be tracked or a problem exists in the main rotor control system.

(18) Decrease the throttle to ground idle and shut the aircraft down I/A/W the Rotorcraft Flight Manual.

(19) Correct any discrepancies found.

NOTE

If required to determine proper operation of the aircraft, perform a maintenance test flight (para. 4-61).

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4-61. Maintenance Test Flight

WARNING

The maintenance test flight is to be performed by authorized personnel only.

NOTE

A maintenance test flight should be performed after maintenance has been performed on the flight controls or other aircraft system which requires the system to be checked in flight. The maintenance performed should dictate the extent (partial or complete) of the test flight.

NOTE

Parts of the maintenance test flight that have been performed as part of a maintenance ground run may be omitted

A. Preliminary Checks:

(1) Perform a preflight inspection.

NOTE

The maintenance performed on the flight control systems should determine the extent of the rigging check.

(2) Verify flight control rigging if any maintenance was performed on the flight controls.

(3) Position the lateral and fore/aft trim motors to the neutral position.

(4) Move the cyclic stick around the cyclic stop in the floor. The stick must remain against the stop through the circle. If binding or interference is detected, re-check the basic rigging.

(5) Move the fore/aft trim to full forward position and move the cyclic stick full aft. Stick should contact the cyclic stop. Reverse the trim motor and stick positions and check that stick contacts the cyclic stop.

(6) Repeat step (5) using the lateral trim motor and moving the stick in the lateral direction.

(7) Check the rigging of the throttle controls.

(8) Check the rigging of the droop compensator.

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B. Flat Pitch/Low RPM Checks:

(1) Run-up the aircraft I/A/W the Rotorcraft Flight Manual.

(2) With the engine at ground idle, collective full down, and pedals neutral, check the following instruments:

a. N_1 - 59-65%

b. Torque - 8-10 psi

c. Rotor RPM - approx. 215 rpm

d. All other instruments - normal range

(3) Slowly apply approximately 1 inch of left pedal. Check for an increase in the torque indication and corresponding aircraft movement. Neutralize the pedals.

WARNING

Clear all personnel from the tip path plane area as the blades may dip as low as 5 feet/1.52 meters during this test.

(4) Slowly move the cyclic stick forward until there is a slight bumping of the rotor stops. Observe the position of the cyclic stick in relation to the cyclic stop ring. Repeat this check by bringing the cyclic stick aft, then right and left. The distance that the cyclic fitting is from the stop should be equal. If a noticeable difference exists, adjust the length of the push-pull rods located between the bellcranks in the engine compartment. The right side push-pull rod controls fore/aft movement and the left side push-pull rod controls the lateral movement.

(5) With the collective full down, cyclic centered, and pedals neutral, slowly increase the throttle to full throttle.

(6) Check the operation of the power turbine governor linear actuator. The minimum operating range is from 88% - 92% N_2. Maximum operating range is 100% - 103% N_2.

(7) Set the N_2 rpm to 98% and check the torque indication. For aircraft without blade leading edge protection tape, the torque indication should be 15 - 18 psi to assure adequate rotor rpm during autorotation. The torque indication for aircraft equipped with blade leading edge protection tape should be 17 - 21 psi. Shorten the main rotor pitch change links to increase the torque indication and lengthen the pitch change links to decrease the torque indication. The maintenance test flight will determine what additional adjustments will be required.

WARNING

Clear all personnel from the tip path plane area as the blades may dip as low as 5 feet/1.52 meters during this test.

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(8) Slowly move the cyclic forward, aft, right, and left and check for the proper response of the main rotor tip path.

(9) Trim the cyclic stick to neutral and release the cyclic grip. Visually watch the cyclic stick for motion. The cyclic stick should remain centered and still. Move the cyclic fore and aft without trimming and check for smoothness. No hard vibrations should be present.

NOTE

If hard vibrations are present or the cyclic wanders, either the aircraft will have to be tracked or a problem exists in the main rotor control system.

C. Hover Checks:

(1) With the N_2 set at 97% ±1%, release the collective friction and slowly increase collective pitch. While making minor adjustments to the controls, watch for proper response as the aircraft becomes light on the skids. Check that the N_2 increased to 102% ±1%. Adjust the N_2 to 103%.

(2) Bring the aircraft to a hover. Check that the cyclic rigging appears normal for the wind, weight, and center of gravity conditions. Compare the torque indication to the predicted hover torque in the performance charts in the Rotorcraft Flight Manual.

(3) Check the flight controls as follows:

a. Hover into the wind.

b. Check all flight controls for the correct response using small inputs to each axis.

c. The cyclic position should be centered laterally and longitudinally with two personnel onboard.

d. The pedals should be nearly neutral, with the right pedal maybe only ½ inch forward of the left pedal.

(4) Check the engine and transmission instruments for normal operation indications.

(5) Check the flight instruments for normal operation indications.

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D. Engine Power Assurance Check:

NOTE

For the most accurate data, an engine power assurance check should be performed with the compressor bleed valve closed. If a higher TOT (higher than what is depicted in Figure 4-10 of the *480B Rotorcraft Flight Manual*) is required in a hover, refer to *Rolls-Royce M250-C20 Series Operation and Maintenance Manual*, Figure 22, *Compressor Bleed Control Valve Operation*, to verify the bleed valve was closed at the time of the check. In some instances, the helicopter may need to be at max gross weight to obtain a high enough N_1 operation to close the valve.

(1) Establish a stable hover.

(2) Record the pressure altitude, OAT, torque, and TOT.

(3) Compare the actual TOT with the TOT determined from the power assurance check chart (480 Rotorcraft Flight Manual, Figure 4-10, or 480B Rotorcraft Flight Manual, Figure 4-7, as applicable).

(4) Record the N_1 speed at the time of the power assurance check. Refer to the *Rolls-Royce M250-C20 Series Operation and Maintenance Manual*, Figure 22, *Compressor Bleed Control Valve Operation*.

E. Before Takeoff:

(1) N_2 - 103%

(2) Systems - Check engine, transmission, electrical, and fuel systems indications.

(3) Communications and navigation radios - Set.

(4) Transponder - ON and squawking altitude.

(5) Crew and unused seats - Check seat belts and shoulder harnesses fastened.

F. [Deleted]

G. Slow Speed Cruise Checks:

(1) Stabilize at 60 KIAS for 1 minute with the aircraft in trim. Record the N_2, torque, TOT, N_1, fuel flow and fuel remaining (optional equipment), pressure altitude, and OAT.

(2) The cyclic should be centered laterally and slightly forward of neutral longitudinally. The right pedal may be approximately neutral to ½ inch forward.

(3) Check the airspeed indicators. The difference should not be more than 5 KIAS (TH-28).

(4) Note any abnormal vibration level.

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H. High Speed Cruise Checks:

(1) Increase power to the Maximum Continuous Torque Limit. Do not exceed V_{NE}.

(2) Stabilize for 1 minute with the turn needle and ball centered. Record the N_2, torque, TOT, N_1, fuel flow, fuel remaining, pressure altitude, and OAT.

(3) The cyclic should be centered laterally and should have at least 1 inch of travel remaining longitudinally before contacting the stop ring at the base of the cyclic stick. The right pedal may be approximately 1 inch forward. The collective should have at least ¾ inch of slider gap remaining before the collective contacts the up stop on the slider.

(4) Check the airspeed indicators. The difference should not be more than 5 KIAS (TH-28).

(5) Note and record the pitch attitude. The V_H pitch attitude should not exceed 6° nose down as referenced to the moveable attitude reference symbol in the attitude indicator (optional equipment) when it is positioned at the zero pitch reference line.

(6) Note any abnormal vibration level.

I. Autorotation Checks:

NOTE

Perform the autorotation check with as light a gross weight as possible, i.e., pilot and minimum fuel.

(1) Climb to an altitude 1000 feet above the cruise altitude. Level off and stabilize at 60 KIAS.

NOTE

Perform the autorotation rpm check at an altitude that will allow for power recovery before reaching 500 feet AGL. Have a suitable forced landing area within range.

CAUTION

If the rotor rpm exceeds 385, adjust the collective to maintain rotor rpm below 385.

(2) Lower the collective full down and establish a stabilized 60 KIAS low power descent.

(3) Retard the throttle to ground idle.

(4) Record the stabilized autorotation rpm and fuel remaining (optional equipment 480) when passing through the target (cruise) altitude.

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(5) Check the airspeed indicators (TH-28). The difference should not be more than 5 KIAS.

(6) Note any abnormal vibration level.

(7) Advance the throttle to full ON and make a power recovery.

(8) Compare the autorotation rpm to the Autorotational RPM Correction Chart (Figure 4-11). The autorotation rpm should be within ±5 rpm as indicated on the chart.

J. Post Test Flight:

(1) Shut the aircraft down I/A/W the Rotorcraft Flight Manual.

(2) Perform a postflight inspection.

(3) Record any discrepancies found during the test flight and notify maintenance personnel for corrective action.

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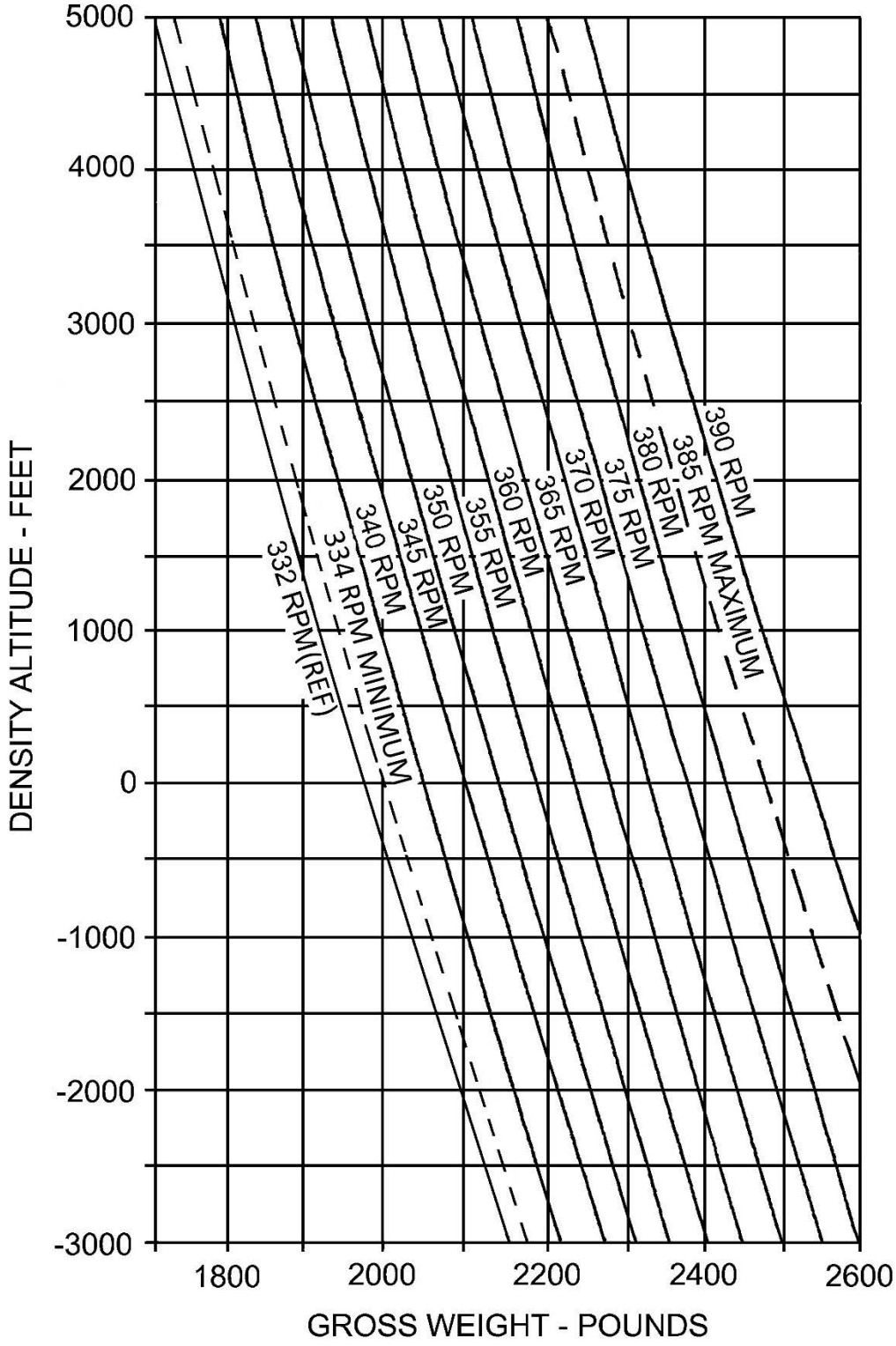


Figure 4-11. Autorotational RPM Correction Chart

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4-62. Ground Handling

WARNING

CRFS: Do not exceed 25° tip of the aircraft during ground operations. Exceeding 25° will close the roll over valve. If the roll over valve closes and sticks, the vent system will not operate properly. Maintenance action is required to ensure the roll over valve is open (reference para. 4-48.1 and para. 10-18.9).

4-63. Ground Handling Wheels

A. A set of dual ground handling wheels is provided for moving the aircraft on the ground. The ground handling wheels are attached to the skids at the lugs provided near the aft oleo struts. The wheels are an over center type. If the aircraft must be pushed by hand, do not push on the horizontal stabilizers. Push the aircraft using the aft crosstube. The aircraft may be pushed from the nose if extreme caution is used.

CAUTION

Pushing on the nose of the helicopter may cause the cabin nose to deform thereby weakening the cabin structure and causing extensive repair. Use extreme caution when pushing on the nose to move the aircraft backwards.

4-64. Installation/Removal - Ground Handling Wheels

WARNING

Use extreme caution when installing and removing the ground handling wheels to prevent injury to personnel and to prevent from damaging the aircraft.

NOTE

Two types of ground handling wheels are used. Early production ground handling wheels are installed on lugs located on the sides of the skid tubes. Later production ground handling wheels are installed on a mounting plate attached to the top of the skid tubes.

A. Install the ground handling wheels on the skid tubes as follows:

(1) Early production wheels: Align the slots on the ground handling wheel assembly with the lugs on the skid tube. Install the ground handling wheel and slide the assembly until the lugs are in the recesses in the wheel assembly.

(2) Later production wheels: Remove the safety pin from the ground handling wheel assembly and install the wheel assembly onto the mount lugs on the top of the skid tube. Insert the safety pin into the ground handling wheel assembly.

B. Support the aircraft at the tail rotor guard.

C. Insert the wheel bar into the wheel and lower the wheel by pulling towards the front of the aircraft. Ensure the over-center lock is engaged. Remove the wheel bar from the wheel. Repeat the process for the opposite wheel.

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D. Raise the wheel by inserting the wheel bar into the wheel. Release the over-center lock and carefully move the bar towards the aft end of the aircraft. Remove the bar from the wheel.

E. Remove the ground handling wheels by reversing the installation procedure.

4-65. External Power (See Figure 4-12)

NOTE

The external power system is standard equipment on the TH-28 and 480B.

NOTE

A 28-volt DC unit with a minimum output of 300 amperes is required for starting.

A. Use the following procedures for connecting external power:

(1) Turn the helicopter battery and generator switches "OFF".

(2) Turn the external power "OFF".

(3) Plug the external power source cable securely into the external power receptacle.

(4) Turn the external power source "ON".

(5) Turn the helicopter battery switch "ON".

4-66. Parking

A. Retract the ground handling wheels and remove, allowing the helicopter to rest on its skids.

B. Install the main rotor tiedowns.

C. Install the pitot tube cover (TH-28).

D. Install the tail rotor assembly cover.

E. Install the main rotor hub cover.

F. Install a static ground.

G. Secure the aircraft.

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4-67. Leveling (See Figure 4-13)

WARNING

Do not climb on or enter the aircraft while it is being leveled.

NOTE

The tail of the aircraft may have to be supported to maintain the aircraft in a level attitude.

A. Level the aircraft longitudinally by placing a level on the leveling location on the longitudinal pylon tube located on the left side of the pylon assembly. Adjust the attitude of the aircraft by using the ground handling wheels and/or shoring materials and by raising or lowering the tail of the aircraft. Level the aircraft laterally by placing the level on the cockpit floor and adjust the shoring materials under the skid tubes as required.

4-68. Hoisting (See Figure 4-14)

A. If the main rotor hub is installed, install the lifting sling (T-0011) so that the arms are between the pitch arm and the blade retention assembly, over the lead/lag retaining nut, and outboard of the main rotor damper rod-end. The sling arms are long enough to be double rapped if preferred.

B. If the main rotor hub is removed, install the lifting eye (T-0017) onto the main rotor mast.

WARNING

The lifting device must have a lifting rating equal to or greater than the actual weight of the aircraft to be hoisted.

C. Connect a suitable lifting device to the lifting sling or eye.

D. Station a person at the tail rotor guard to steady the aircraft when hoisted. If lifting beyond reach from the ground, two people and two steadying ropes will be necessary.

E. Slowly hoist the aircraft using a steady lifting force.

4-69. Jacking (See Figure 4-15)

NOTE

Jack pads are not installed on TH-28, S/N 3004-3006, and 480, S/N 5001 & 5002.

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A. Place suitable jacks under the jack pads located just aft of the forward cross tube. Place a suitable jack, tripod support, or other suitable device under the tail rotor guard support located at the aft end of the tailcone.

WARNING

Do not enter or climb on the aircraft while it is on the jacks.

NOTE

If practical, use a hoist as a secondary lifting/safety device for the aircraft if the landing gear or oleo assemblies are going to be disconnected or removed.

B. Raise the aircraft evenly.

C. If required, level the aircraft I/A/W paragraph 4-67.

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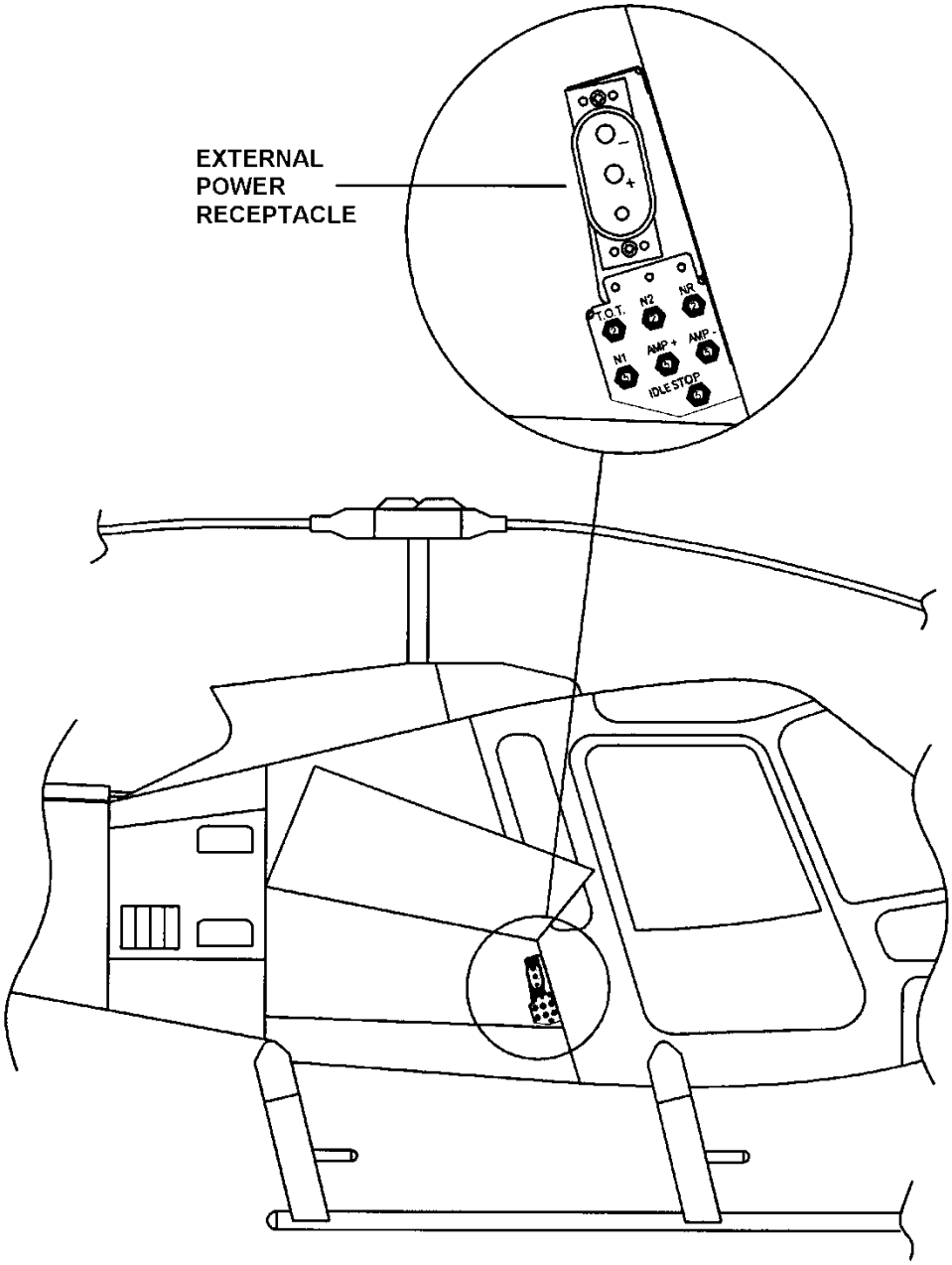


Figure 4-12. External Power Receptacle

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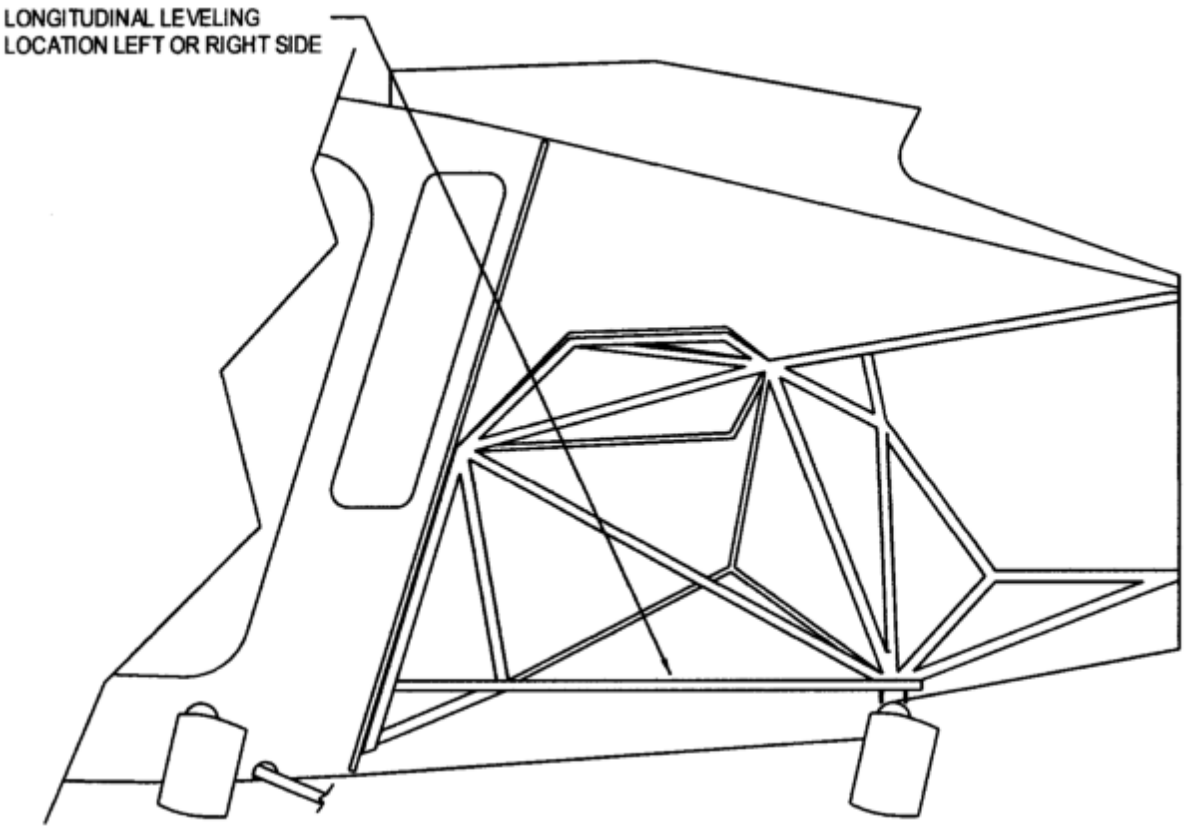
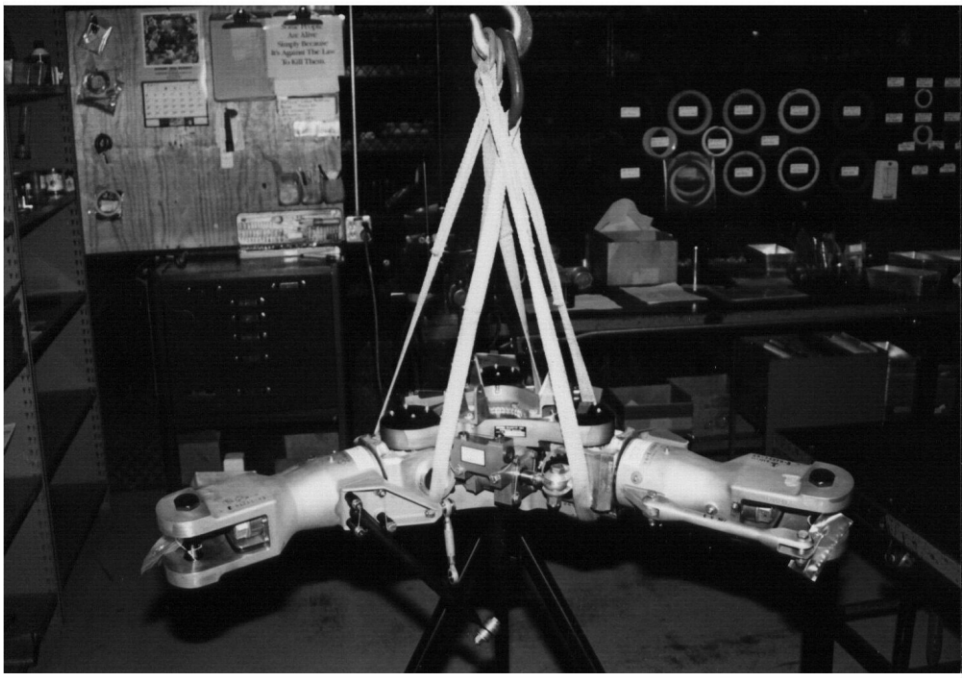
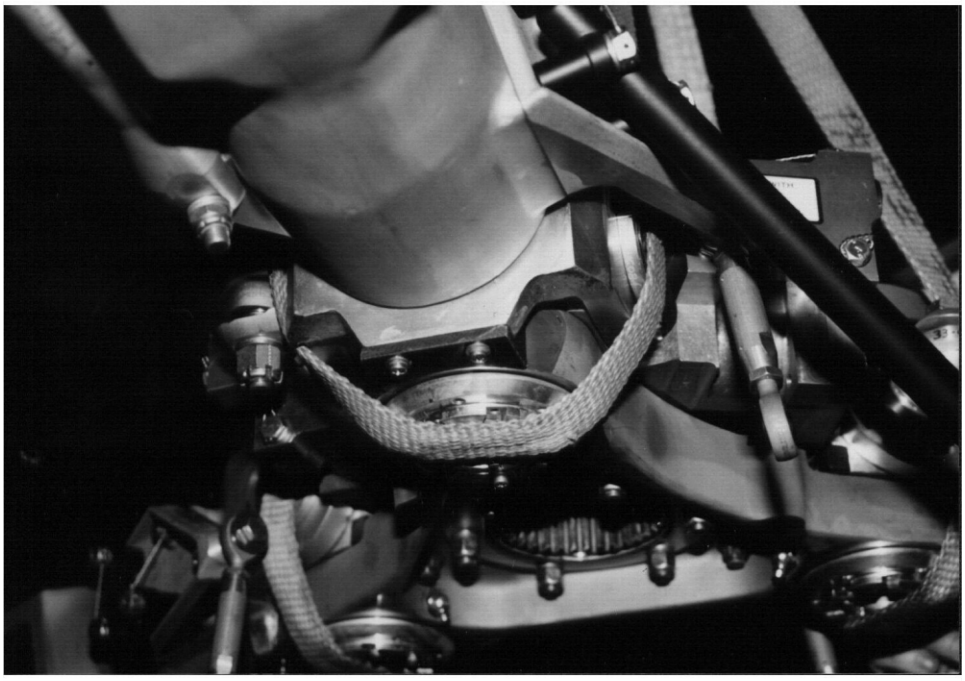


Figure 4-13. Longitudinal Leveling Location

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Lifting Sling Installation



Lifting Sling Arm Routing

Figure 4-14. Lifting Sling Installation

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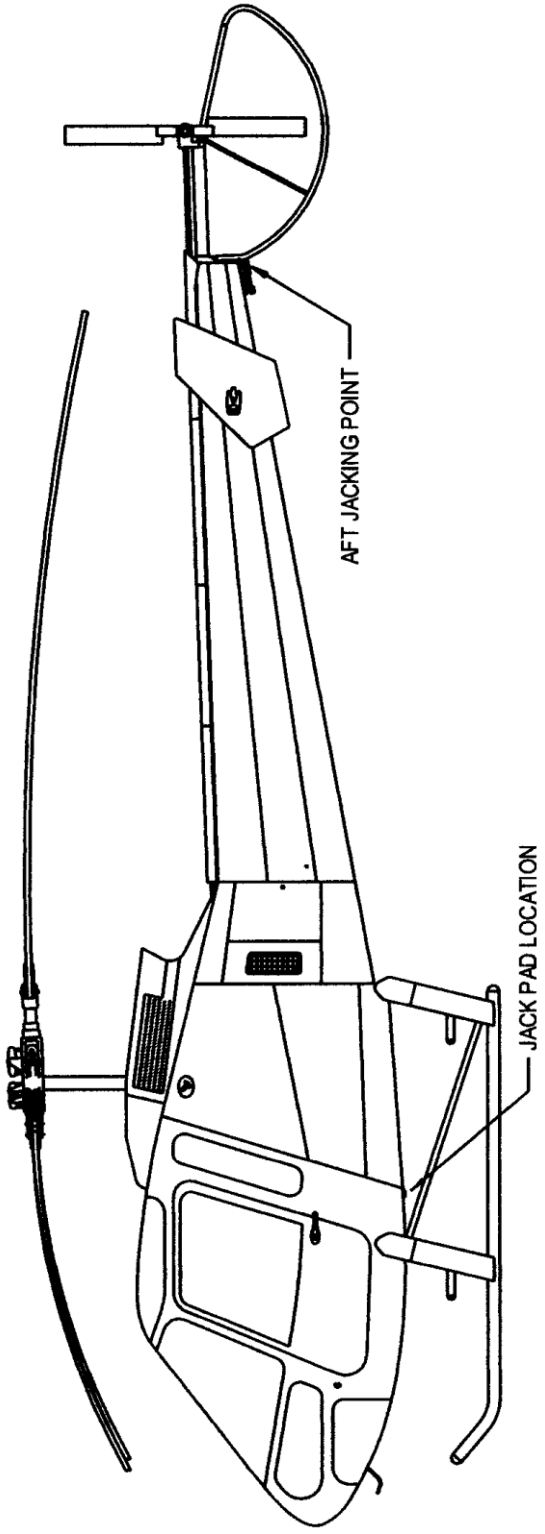


Figure 4-15. Jacking Locations

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4-70. Cleaning

4-71. Exterior - Cleaning

NOTE

The exterior of the aircraft is painted with a high quality paint. Proper maintenance of this finish will provide corrosion protection as well as an attractive finish.

NOTE

Do not wash the aircraft using pressure washing equipment.

A. Wash the exterior as follows:

(1) Check the security of all doors and access panels before starting the washing operation.

(2) Flush the entire aircraft free of dirt.

NOTE

Avoid direct spraying of the main rotor hub, tail rotor assembly, and tail rotor driveshaft bearings to prevent the loss of lubricant. These areas should be purged with grease after washing to eliminate any moisture.

(3) Using a soap and water solution and a soft cloth pad, wash a specific area using a circular motion.

(4) Flush the washed area immediately.

(5) Repeat steps c and d until the entire aircraft is clean.

(6) Rinse with clear water and dry with a chamois.

B. Wax the exterior as follows:

(1) Clean the aircraft exterior as described in the washing procedure.

(2) Using a soft cloth, apply a good quality paste wax to the painted exterior using a circular motion.

(3) Polish the waxed area to a high luster using a clean and dry soft cloth.

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4-72. Interior - Cleaning

NOTE

Do not use a solvent type cleaner to clean the inside of the cabin shell.

A. Clean the interior as follows:

(1) Clean the dirt and dust from the cabin using a small broom or brush.

(2) Vacuum the interior to remove any remaining dirt.

(3) Use a good quality upholstery cleaner to remove dirt and grease from the seat cushions and the floor covering.

4-73. Plexiglass - Cleaning

A. Wash the plexiglass using your bare hand or a clean, soft cloth and a mild soap and water solution. Rinse with clean water.

B. Dry the surface with a soft, clean cloth or tissue and polish it with a windshield cleaner especially approved for use on aircraft transparent plastics.

CAUTION

Do not use coarse abrasive type soaps as they can cause fine scratches in the plexiglass.

C. Removal of fine scratches from the plexiglass is accomplished by polishing and waxing the glass using Meguiar's Mirror Glaze - Plastic Cleaner MGH-17.

4-74. Aircraft Preservation and Storage

4-75. General - Aircraft Preservation and Storage

A. Aircraft that see low usage or are stored for extended periods exhibit an accelerated rate of corrosion damage. Special attention should be given to aircraft inactive in a corrosive atmosphere (coastal, high humidity, air pollution, or sandy areas) to assure components remain in a serviceable condition.

B. The following maintenance procedures are categorized in terms of aircraft with low usage and those scheduled to be inactive for an extended period. This information is intended to cover both hangered and outdoor conditions unless otherwise noted and is subject to owner/operator judgment regarding the helicopter's operating environment and should be considered in addition to the normal servicing requirements.

NOTES

Wash and wax the helicopter prior to any type of storage.

For fuel cell longevity, maintain a full fuel level during periods of low usage or extended storage.

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NOTE

Preserve or re-validate off-aircraft CRFS components I/A/W manufacturer's instructions. This includes, for example, the CRFS fuel cells, breakaway valve couplings, and roll over valve assembly.

4-76. Low Usage - Aircraft Preservation and Storage

NOTE

Aircraft flown for short periods several times a month.

NOTE

Preserve the engine compressor I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual if warranted by local corrosive conditions.

A. Ground run the aircraft every 14 days until normal operating temperatures for the engine are obtained.

B. Position the main rotor blades so that the tail rotor assembly is horizontal to the ground. Tie down the main rotor blades with the collective locked halfway up to relieve the steady load on the lamiflex bearings or T-T straps, as applicable.

C. Install the main rotor hub and tail rotor assembly covers.

D. Protect the windshields and interior equipment with suitable dust covers and/or solar shields.

NOTE

If the interior temperature of the cabin exceeds 150°F/66°C, ventilate the cabin by opening the doors or vents.

E. Cover the pitot and static air vents.

F. Wash and wax the aircraft monthly to remove contaminants.

G. Prior the next flight, complete the following:

(1) Remove all covers and tiedowns.

(2) Perform a preflight inspection.

NOTE

When inspecting oil levels, inspect for evidence of water contamination.

(3) If preserved, depreserve the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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4-77. Storage Up to 45 Days - Aircraft Preservation and Storage

A. Complete steps A through F of paragraph 4-76.

B. Disconnect the battery.

C. Remove the main rotor blades.

NOTE

Store the main rotor blades on wood racks cut out to the contour of the leading edge of the blades. Use care in handling the blades to prevent damage to the blades and trim tabs.

D. Return the aircraft to service using the following procedures:

(1) Remove all covers and tiedowns.

(2) Connect the battery.

(3) Install the main rotor blades.

(4) Perform a preflight inspection.

NOTE

When inspecting oil levels, inspect for evidence of water contamination.

(5) Lubricate the aircraft I/A/W the 50 Hour requirements.

(6) Depreserve the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

4-78. Storage from 45 Days to 6 Months - Aircraft Preservation and Storage

A. Complete steps A through C of paragraph 4-77.

B. Remove the battery and store in a cool dry area. Clean the battery shelf if required (AC 43.13-1B).

NOTE

The aircraft may require an annual inspection.

C. Return the aircraft to service following the procedures in step D of paragraph 4-77.

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4-79. Storage For Longer Than 6 Months - Aircraft Preservation and Storage

A. Complete steps A and B of paragraph 4-78.

B. Hangar the aircraft.

C. Return the aircraft to service using the following procedures:

(1) Remove all covers, tiedowns, and shields.

(2) Service the battery I/A/W the manufacturer's instructions. Install and connect the battery.

(3) Install the main rotor blades.

(4) Perform a 100 hour periodic inspection and lubricate I/A/W the 100 hour requirements.

NOTE

The aircraft may require an annual inspection.

(5) Depreserve the engine I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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4-80. Preventive Maintenance for Corrosion Control

4-81. General Information - Preventive Maintenance for Corrosion Control

The airframe is fabricated of high strength aluminum and steel alloys and should be inspected regularly for signs of corrosion. Any areas where the protective finishes may have been scuffed, scratched, chipped, or worn off should be treated temporarily to control the onset of corrosive action. Then at the earliest convenience a permanent refinish of the area should be accomplished. Another very important step in any corrosion prevention program is regularly scheduled washing and waxing of the aircraft surfaces.

It is extremely important that the main rotor and tail rotor blade coatings be maintained and protected against oxidation, erosion, and atmospheric residues which are continually attacking these components during their service life. Once this coating is breached and corrosive action is allowed to propagate unchecked, premature bond line corrosion will occur resulting in early retirement of these components. Refer to paragraph 4-88 for the corrosion prevention compound application procedure for the main rotor blades. Refer to the appropriate paragraphs in Section 9 of this manual for the inspection and repair procedures for the main and tail rotor blades. In coastal areas or wherever the air has a high moisture content, blade tape can be installed on the leading edge of the main rotor blades to help prevent the leading edge and bond line corrosion from occurring. In coastal areas, it is recommended that the blade tape be installed when the aircraft is placed into service.

4-82. Scheduled Field Preventive Maintenance Program

NOTE

This procedure is intended for the complete helicopter; however, give special attention given the main and tail rotor blades.

NOTE

Aircraft based in or near heavy industrial and/or metropolitan areas with heavy atmospheric pollution should use procedure "A" below.

NOTE

Do not wash the aircraft using pressure washing equipment.

A. Aircraft that are operated over salt water or coastal regions. Use the following procedures:

(1) Thoroughly flush the aircraft with fresh water daily.

(2) Wash the aircraft with mild soap and fresh water weekly.

NOTE

Use a good quality paste wax.

(3) Wax the aircraft every second week.

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B. Aircraft that are operated in tropical or semi-tropical high humidity regions. Use the following procedures:

(1) Wash the aircraft with mild soap and fresh water weekly.

(2) Wax the aircraft every second week.

C. Aircraft that are operated in arid, moderate, or cold regions. Use the following procedures:

NOTE

This procedure may be suspended during cold or winter months if step 3 was accomplished prior to the cold season.

(1) Flush with fresh water weekly.

(2) Wash the aircraft with mild soap and fresh water monthly.

(3) Wax the aircraft every second month.

4-83. Component Preservation and Storage

4-84. Main Rotor Transmission

NOTE

This procedure applies to an uninstalled main rotor transmission.

A. Service the main rotor transmission (para. 4-12), or alternatively, completely fill the transmission. Refer to Table 4-1 for system capacity and approved oils (30 weight engine oil is acceptable for storage).

B. Plug or cap the breather tube.

C. Plug the fitting on the pinion cover if the oil pump is removed.

D. Place the transmission in storage with the mast upright or placed sideways.

E. Every 90 days, move the transmission to allow oil to flow to all internal surfaces.

(1) Tip the transmission to horizontal or vertical, as appropriate, approximately 90° from its storage position.

(2) Tip the transmission back to storage position.

F. Turn the pinion approximately three times completely lubricate all moving parts.

G. Prior to returning the main rotor transmission to service:

(1) Remove the breather tube plug or cap, if installed.

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(2) Install the oil pump, if removed.

(3) Drain the oil (para. 4-13).

(4) Service the main rotor transmission (para. 4-12).

4-85. Tail Rotor Transmission

NOTE

This procedure applies to an uninstalled tail rotor transmission.

A. Completely fill the transmission. Refer to Table 4-1 for system capacity and approved oils.

B. Bag the gearbox with a desiccant pack and store in a position as it would be installed on the aircraft.

C. Rotate the gearbox 10 rotations every month to maintain lubrication on all wear surfaces of the gearbox.

D. Prior to returning the tail rotor transmission to service:

(1) Drain the oil (para. 4-17).

(2) Service the tail rotor transmission (para. 4-16).

4-86. Main Rotor Blades – Application of Corrosion Prevention Compound

4-87. General Information

Several factors may lead to bond line separation and corrosion of the blades. During operational service, the polyurethane topcoat applied to the blade may gradually wear away due to erosion from airborne particulate matter or precipitation. Special care should be taken to prevent nicking or chipping of the paint in the bond lines. Also, operation of the main rotor blades in wet or high humidity environments can also significantly accelerate bond line separation and the onset of corrosion through moisture intrusion into the blade. Improper storage of the blades for extended periods of time can foster corrosion.

Proper use of effective corrosion control products is central to all corrosion prevention programs. This procedure identifies a Corrosion Prevention Compound (CPC) compatible with the Enstrom main rotor blade. Enstrom recommends the application of MIL-PRF-81309, Type II or III water displacing soft film CPC (Table 4-1). The water displacing CPC acts on contact by spreading across the exterior blade surfaces, displacing any moisture present, and leaving behind a residue to act as a further barrier after the carrier solvent has evaporated.

Application of the CPC identified in this procedure will not affect the surface finish of the painted/waxed blade if the manufacturer’s recommendations for application and the instructions in this procedure are followed.

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WARNING

The CPC's listed in Table 4-1 do not affect the bonding agent in the main rotor blade. Enstrom does not recommend any other CPC's because their effect on the bonding agent is unknown.

NOTE

Blades delivered after March 5, 2010, have been treated with CPC during initial production and require repetitive CPC treatment (para. 4-88). Blades delivered before March 5, 2010, require an initial treatment of CPC (para. 4-88), the addition of the AN526C1032R6 screw, as well as repetitive CPC treatment (reference Table 4-2 and para. 4-48, 6).

4-88. Application of CPC

A. Remove the blades from the aircraft, if not already removed, and arrange them on a rack.

B. Prepare a P/N AN526C1032R6 screw, or equivalent, for insertion in the hole at the tip of each blade, 2.75" (69.9 mm) from the leading edge. (If a screw is presently installed, remove the screw.) Apply MIL-PRF-81309 Type II or III CPC (Table 4-1) to the threads of the screw and in the 1032 UNF tapped hole prior to torquing the screw. Standard torque values apply.

C. Remove the tip weight assemblies from the outboard end of each blade using the Main Rotor Blade Plug Tool (Enstrom P/N T-1656-3, or equivalent). Mark each assembly to designate its position as either the forward or aft location and which blade the assemblies were removed from.

D. Following the manufacturer's recommendations, using a pump or aerosol sprayer, spray a coating of CPC on the entire interior surface (i.e., interior blade cavity) of each blade.

E. Rotate or position the spray wand to coat all interior areas of the blade with particular attention given to the interior trailing edge structure.

F. Rotate and flip the blade to introduce a sloshing effect with the excess CPC. Ensure all interior areas of the blade are coated with the CPC.

G. Drain excess CPC from the blade.

NOTE

The CPC may produce toxic vapors. Use only in well ventilated areas. Avoid contact with skin and eyes. Avoid inhalation and ingestion. Follow the manufacturer's warning and safety recommendations.

Do not use synthetic wiping cloths or rags during application or clean up. The CPC will dissolve the fabric.

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H. Reinstall the tip weight assemblies making sure they are installed in the same location from which they were removed.

I. Wipe off dirt or excess moisture from the exterior blade surface.

J. Following the manufacturer's recommendations, apply a coating of CPC over the entire exterior surface of the blades including the trailing edge seam.

4-89. Storage of CPC

NOTE

Unless otherwise specified, do not store the CPC at temperatures greater than 50°C (120°F).

WARNING

Keep the CPC away from open flames, heat, or sparks as they may be flammable.

A. Follow the recommendations provided by the manufacturer.

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SECTION 5

WEIGHT AND BALANCE

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SECTION 5

WEIGHT AND BALANCE

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Paragraph Description Page

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SECTION 5

WEIGHT AND BALANCE

5-1. Maintenance Manual Arrangement

The aircraft empty weight and empty weight c.g. for this aircraft are found on Form F-511-2, Helicopter Weight And C.G. Calculation (Figure 5-3) or other similar form. Approved optional equipment installed by Enstrom Helicopter Corporation will be recorded on Form F-511-3, Enstrom TH-28, 480, 480B Optional Equipment List (Figure 5-4), and Form F-511-4, Enstrom TH-28, 480, 480B Optional Equipment List Continued (Figure 5-5). Removal or installation of approved optional equipment will change the aircraft empty weight and empty weight c.g. These changes will be recorded on Form F-511-5, Basic Weight and Balance Record (Figure 5-6) or other similar form. Repair or alteration of the aircraft may also change the aircraft empty weight and empty weight c.g. If the repair or alteration does change the empty weight and the new empty weight and empty weight c.g. can be mathematically calculated, the change can be recorded on Form F-511-5 or other similar form. The aircraft will have to be re-weighed if the change cannot be mathematically calculated. Removal or addition of minor items of equipment such as nuts, bolts, rivets, washers, and similar standard parts of insignificant weight do not require a weight and balance check.

NOTE

Forms F-511-1, F-511-2, F-511-3, F-511-4, and F-511-5 may vary in format depending on the time of printing.

5-2. Preparing the Aircraft for Weighing

A. Clean the aircraft.

NOTE

The operator's manual is required to be carried in the aircraft I/A/W FAA Regulations. Consult the owner/operator about including the operator's manual as part of the aircraft empty weight.

B. Remove the loose equipment from the cockpit (maps, pubs, charts, flashlights, etc.).

C. Defuel the aircraft (para. 4-5).

D. Service the engine oil reservoir full (para. 4-7).

NOTE

The main rotor blades do not need to be removed if the maximum capacity of the weighing devices (scales or load cells) will not be exceeded while weighing the aircraft.

E. Remove the main rotor blades (para. 9-34).

F. Inventory the aircraft against Form F-511-3, Form F-511-4 and Form F-511-5 or other similar forms.

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5-3. Weighing the Aircraft with Mechanical Scales

NOTE

TH-28, S/N 3007 & subsequent; 480, S/N 5003 & subsequent; and all 480B's can be weighed using electrical scales (load cells). Contact Enstrom Helicopter Corporation for more information.

NOTE

The hangar doors should be closed and, if practical, the hangar heating/ ventilation system should be turned off while weighing the aircraft.

NOTE

The two main scales must have a 1000 pound capacity and the third scale must have a 100 pound capacity.

A. Hoist or jack the aircraft (para. 4-68 or 4-69) to a height that will allow the scales to fit under the skid tubes.

B. Place a pipe nipple in the center of the left and right main scales. Place the scales under the skid tubes so that the pipe nipples will contact the skid tubes at the weighing location on the skid tubes. The weighing location is 24.9 inches forward of the aft end of the skid tubes (identified by a rivet (STA 143.40) in the skid tube of later S/N helicopters).

C. Place a suitable tripod onto the center of the third scale. Place the scale under the right side of the tail rotor transmission so that the end of the tripod contacts the transmission in-line with the center line of the tail rotor output shaft.

CAUTION

Use a suitable maintenance stand to remove the hoisting sling and have someone securing the end of the tailcone.

D. Remove the load from the hoist or jacks. Ensure that the hoisting sling is removed from the hub.

E. Level the aircraft (para. 4-67) by raising or lowering the tail for longitudinal leveling and raising or lowering one of the skid tubes for lateral leveling.

F. Check the positioning of the scales and reposition as required. Recheck the levelness of the aircraft and adjust as required. Repeat this step until the scales are in the correct positions and the aircraft is level.

G. Read the weights from the scales and record the results on Form F-511-1, Weight Sheet, (Figure 5-2) or other similar form. Double check the weights and recordings on the form.

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H. Remove the aircraft from the scales.

I. Weigh the tare items (pipe nipples, tripod, shoring, etc.) and record the results in the proper tare weight location on Form F-511-1 or other similar form.

5-4. Calculating Aircraft Empty Weight and Empty Weight C.G.

A. Subtract the tare weights (if applicable) from the scale weights and enter the net weights on Form F-511-1 or other similar form.

B. Enter the arms (Table 5-3) and multiply by the net weights to get the moments. Enter the moments onto the form.

C. Total the weights and the moments and enter the results onto the form.

D. Using the formula at the bottom of the form, calculate the c.g. and enter onto the form.

E. Transfer the total weight, c.g. (arm), and moment to Form F-511-2 or other similar form.

NOTE

The following step is only to be performed if the main rotor blades were removed while weighing the aircraft.

F. Total the weights of the main rotor blades (the weight for each blade is located on the label on the top skin of the blade at the root end or on the blade information sheet). Enter the total weight and the arm (Table 5-4) in the "Plus: Missing STD. Equipment" blocks. Calculate the moment and enter that information.

G. Locate the information for the type of engine oil used (Table 5-1) and enter the information in the "Less: Engine Oil" blocks.

H. Locate the information for the type of fuel used (Table 5-2) and enter the information in the "Plus: Unusable Fuel" blocks.

NOTE

Pay particular attention to the algebraic signs when computing the weights, moments, and c.g.

NOTE

The weight, c.g., and moment obtained in steps I, J, and K are the aircraft empty weight, empty weight c.g., and empty weight moment.

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I. Add the weights of the main rotor blades and the unusable fuel to the aircraft weight and then subtract the weight of the engine oil. This is the aircraft empty weight. Enter the weight into the "weight empty std. helicopter - actual" weight block.

J. Add the moments of the main rotor blades and the unusable fuel to the aircraft moment and then subtract the moment of the engine oil. This is the aircraft empty weight moment. Enter the moment into the "weight empty std. helicopter - actual" moment block.

K. Calculate the aircraft empty weight c.g. dividing the empty weight moment by the empty weight. Enter the c.g. into the "weight empty std. helicopter - actual" arm block.

L. Enter the weight, arm, and moment for the engine oil into the "Plus: Engine Oil" blocks. Recalculate the weight, c.g. and moment and enter the information into the "Total Basic Weight" blocks. This information is called the "basic aircraft weight, c.g., and moment".

5-5. Recalculating the Aircraft Empty Weight and Empty Weight C.G. after a Configuration Change or Repair/Alteration

NOTE

If the weight or arm of the equipment installation/removal or of the aircraft repair/alteration cannot be determined the aircraft **must** be re-weighed.

NOTE

In the following instructions of recalculating the aircraft empty weight and c.g., Form F-511-5 will be used. The procedures for using a form other than Form F-511-5 will most likely be very similar.

NOTE

When recalculating the aircraft empty weight and c.g., the numbers used will be the "basic aircraft weight, c.g., and moment" numbers.

A. If there has been no previous change to the aircraft configuration, enter the "Total Basic Weight" information on Form F-511-2 or other similar form onto Form F-511-5 above the block titled "Running Basic Total" or other similar form.

B. Enter the item number, date, and mark correct block concerning installation/removal (in/out).

C. Enter a brief description of the installation, removal, repair, or alteration.

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NOTE

Pay particular attention to the algebraic signs when computing the weights, moments, and c.g.

D. Enter the weight of the change and the arm (the arm may be determined by using Figure 5-1 and measuring from a known datum point) into the correct blocks (Weight Added + / Weight Removed -).

E. Multiply the weight of the change by the arm and enter the information into the moment block. Ensure the correct algebraic sign is used.

F. Add or subtract the weight and moment of the change to or from the basic aircraft weight and enter the information into the "Running Basic Total" blocks.

G. Divide the moment by the weight and enter the information into the "Arm" block. This is the new or running "Basic Aircraft Weight".

H. To find the actual aircraft empty weight and c.g., subtract the engine oil information found on Form F-511-2 and recalculate the empty weight c.g.

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Table 5-1. Weight and Balance Data - Engine Oil
(Engine Oil Reservoir Full - 12.0 Pints (US)/6 Quarts (US))

Type Oil	Weight	Arm	Moment
MIL-PRF-7808	11.25 lb	153"	1721.3
MIL-PRF-23699	12.6 lb	153"	1927.8

NOTES

Refer to Enstrom Type Certificate Data Sheet for unusable fuel data for the TH-28 and 480 aircraft.

Fuel weight is based on the weight of Jet A fuel. The weight will vary for other fuel types.

Table 5-2. Weight and Balance Data - Unusable Fuel

Fuel System Type	Weight (lb)	Arm (in)	Moment (in-lb)
Standard (P/N 4122052)	11.4	143.4	1634.8
Aerazur Fuel Bladder (P/N 4122009)	2.0	143.4	286.8
CRFS (P/N 4122100-1)	5.0	143.4	717.0
Equipment Option: External Fuel Filter (P/N 4220035)	1.3	132.8	172.6

Table 5-3. Weighing Location Arms
(Mechanical Scales)

Weighing Location	Arm
Landing Gear, Left and Right	143.4"
Tail Rotor Transmission	369.7"

Table 5-4. Standard Equipment Locations

Item	Arm
Main Rotor Blades Installed on the Main Rotor Hub	143.4"

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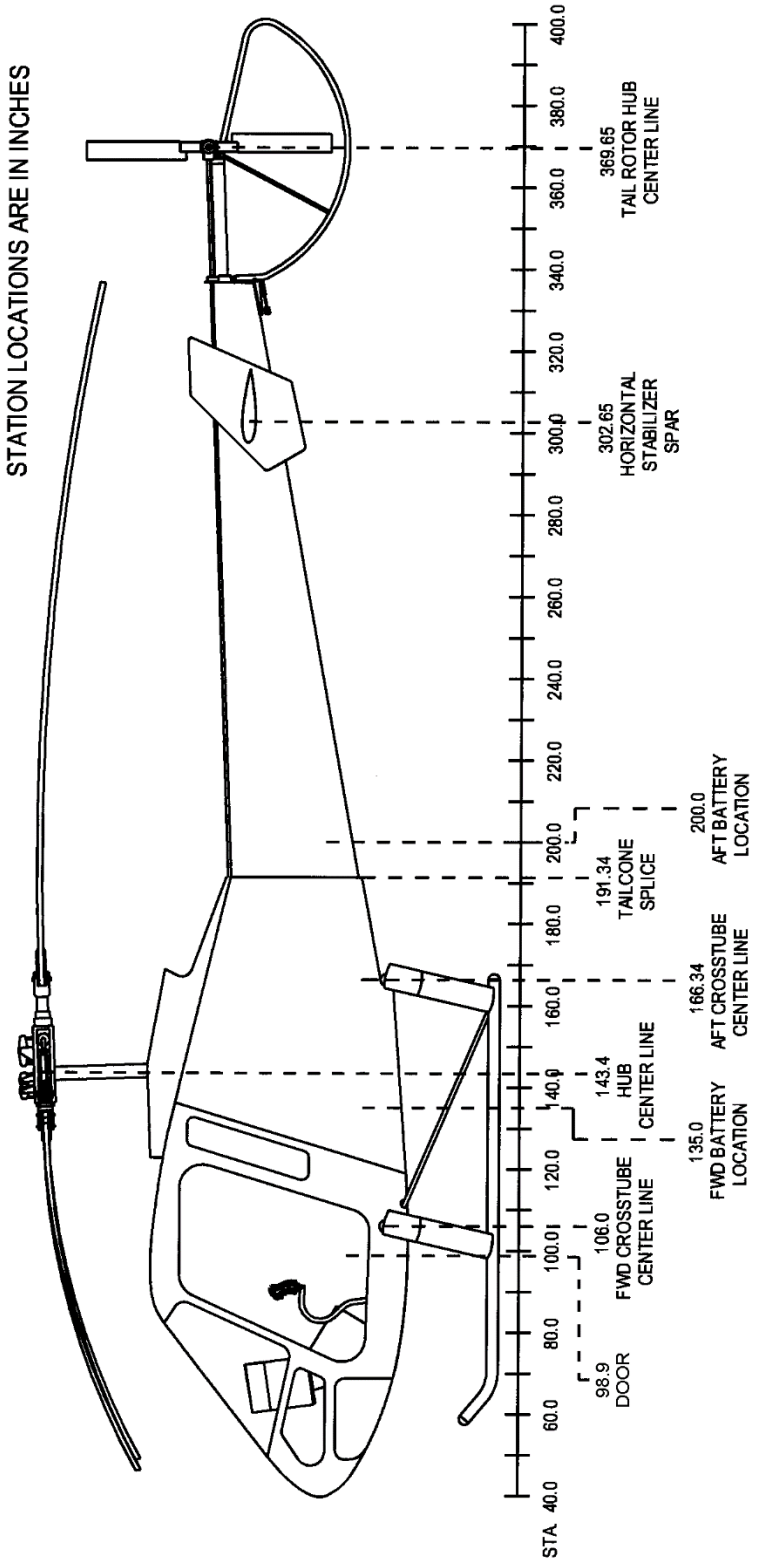


Figure 5-1. Aircraft Station Diagram

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WEIGHT SHEET

MODEL _____ SERIAL NO. _____ REG. NO. _____ Date _____

WEIGHT POINT	SCALE-LBS.	TARE	NET. WT.	ARM	MOMENT IN. LBS.
LEFT GEAR			(W_L)	143.4	
RIGHT GEAR			(W_R)	143.4	
TAIL			(W_T)	369.7	
TOTAL	XXX	X		X	

LATERAL MOMENT					
LEFT GEAR				-48.0	
RIGHT GEAR				48.0	
TOTAL					

$$LCG = \frac{W_T\ (369.7)+(W_L+W_R)\ (143.4)}{W_T+W_L+W_R} = \text{----------}$$

= ----------IN.

Date_____ WEIGHED BY _____

F511-1

Figure 5-2. Form F-511-1

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NOTE

Refer to Table 5-2 and Enstrom Type Certificate Data Sheet for unusable fuel data for the TH-28 and 480/B aircraft.

MODEL: 480B SERIAL NO.: REG. NO.: DATE:				
AIRCRAFT WEIGHT AND BALANCE COMPUTATION				
		WEIGHT LBS.	ARM IN.	MOMENT IN-LB.
WEIGHT (AS WEIGHTED)				
PLUS: MISSING STD. EQUIPMENT - net			X	
LESS: OPT & SURPLUS WT. (next page)			X	
LESS: ENGINE OIL				
PLUS: UNUSABLE FUEL (per TCDS)				
WEIGHT				
	ACTUAL			
PLUS: ENGINE OIL			X	
PLUS: OPTIONAL EQUIPMENT (next page)			X	
ITEMIZED MISSING STD. EQUIP:		WEIGHT LBS.	ARM IN.	MOMENT IN-LB.
Notes: A/C weighed/calculated C.G. using the following data: **Oil:** MIL-L-7808 is 7.74 lbs/gal, MIL-L-23699 is 8.4 lbs/gal. **Fuel Wt:** Jet A: 6.7 lbs/gal A/C weighed as a 3 place with dual controls, battery in forward location and operator's manual on shelf behind pilot's seat.				
TOTAL BASIC WEIGHT AND C.G.				

Figure 5-3. Form F-511-2

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ENSTROM TH-28 and 480 EQUIPMENT LIST

SERIAL NO.:

REG. NO.: DATE:

NO.	ITEM	ITEM WT.	ARM STD. PANEL	ARM OPT. PANEL
INSTRUMENTS – REQUIRED (STD EQUIPMENT)				
	Airspeed Indicator	.7	70.7	70.6
	Altimeter	1.10	69.9	69.8
	Clock	.5	72.0	*
	Compass	.75	68.5	68.5
	O.A.T.	.13	86.5	86.5
	Dual Tachometer	1.6	69.1	70.0
	Torque Indicator	1.0	69.9	70.8
	N1 Indicator	1.8	70.0	70.0
	T.O.T. Indicator	1.0	70.9	70.9
	Fuel Qty Indicator	1.0	70.1	71.4
	Transmission Oil Temp.	1.0	69.4	69.8
	Engine Oil Temp./Pressure	1.0	69.9	70.2
	AMP/Volt	1.0	70.3	70.6
NO.	OPTIONAL EQUIPMENT	WT.	ARM	MOMENT IN-LB
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
	TOTAL		**X**	

* Varies per inst.

TH-28, 480: All Serial Numbers
Sheet 1 of 2

Figure 5-4. Form F-511-3

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MODEL: 480B	SERIAL NO.:	REG. NO.:	DATE:

AIRCRAFT STANDARD AND OPTIONAL EQUIPMENT LIST

INSTRUMENTS - STANDARD EQUIPMENT	WT.	ARM	MOMENT IN-LB
Airspeed Indicator	.7	70.6	49.2
Altimeter	1.10	69.8	76.8
Clock (Not Required)	.5	71.6	35.8
Compass	.75	68.5	51.4
O.A.T.	.13	86.5	11.2
Dual Tachometer	1.6	70.0	112.0
Torque Indicator	1.0	70.8	70.8
N1 Indicator	1.8	70.0	126.0
T.O.T. Indicator	1.0	70.9	70.9
Fuel Qty Indicator	1.0	71.4	71.4
Transmission Oil Temp.	1.0	69.8	69.8
Engine Oil Temp./Pressure	1.0	70.2	70.2
AMP/Volt	1.0	70.6	70.6

NO.	OPTIONAL EQUIPMENT	WT.	ARM	MOMENT IN-LB
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
	TOTAL		**X**	

480B: All Serial Numbers
Sheet 2 of 2

Figure 5-4. Form F-511-3

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NOTE

Form F-511-4 is the continuation page of Form F-511-3.

No.	OPTIONAL EQUIPMENT	WT.	ARM	MOMENT IN/LB
18				
19				
20				
	TOTAL		**X**	

Figure 5-5. Form F-511-4

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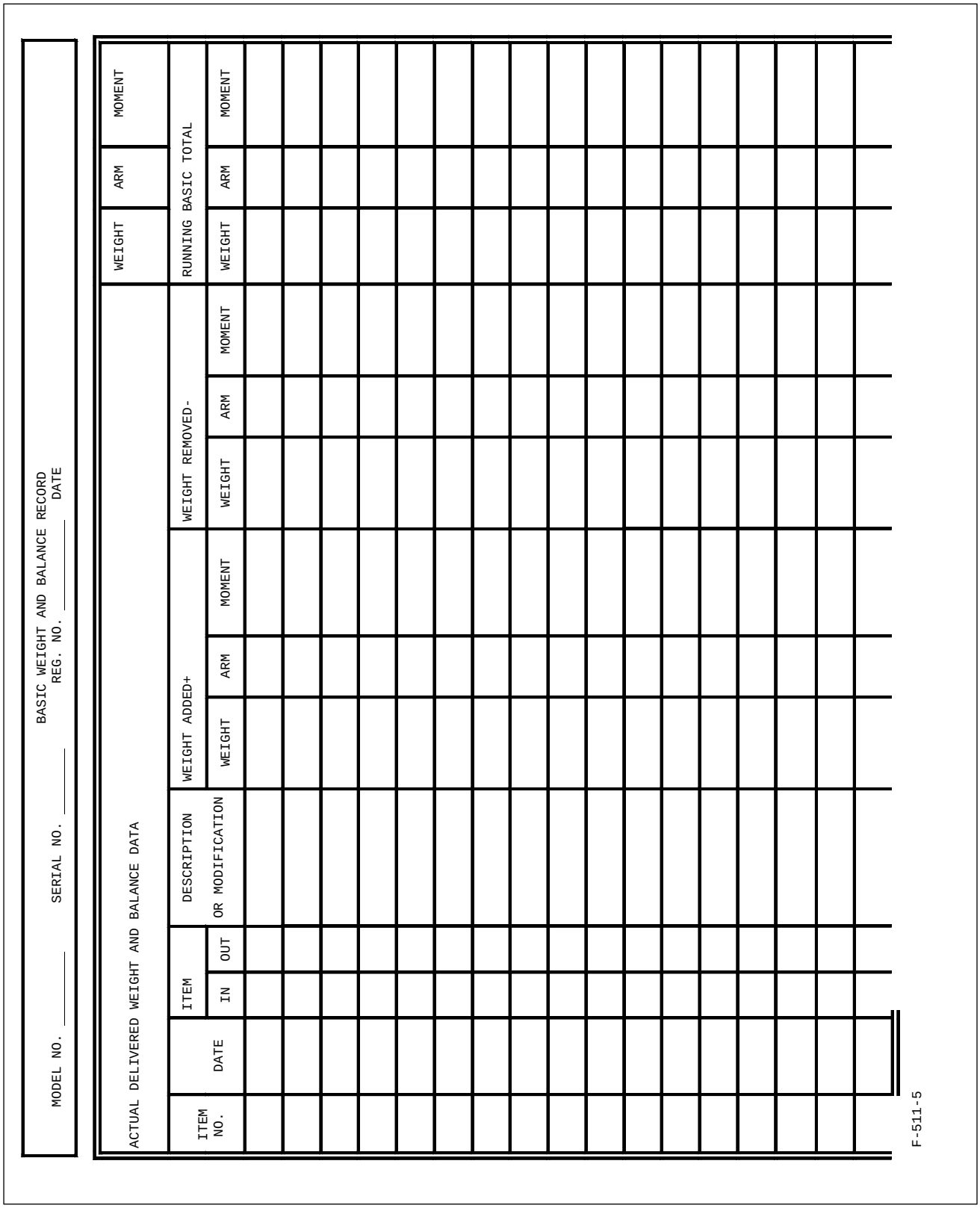


Figure 5-6. Form F-511-5

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SECTION 6

ELECTRICAL SYSTEM

6-1. Troubleshooting

NOTE

Use the following paragraphs to perform checks as necessary to isolate problems in the electrical systems. Tripped circuit breakers, blown fuses, and burned out lamps are usually easily detected and corrected and are not included. Broken wiring is always a probable cause of electrical system malfunction or failure and has not been included. Use the system descriptions and schematic diagrams to aid in the troubleshooting process.

NOTE

Schematic diagrams for the electrical system are located at the end of this section.

NOTE

Aircraft prior to S/N 5134 have a 110 ampere system. Aircraft S/N 5134 and subsequent have a 150 ampere system.

6-2. Battery System – Troubleshooting

A. Volt/Ammeter indicates zero volts with the VOLT/AMP circuit breaker closed and the BATT switch (SW10) in the ON position.

(1) Check that the battery is installed and connected to the electrical system.

Install a serviceable battery and connect to the aircraft electrical system.

(2) Check that battery voltage is present on both sides of the VOLT/AMP circuit breaker.

If voltage is present on both sides of the circuit breaker and on pin C (J42) or pins G and Y (J162) in the volt/ammeter electrical connector (See Dia. 6-8), replace the volt/ammeter. If voltage is only present on the bus side, replace the circuit breaker.

(3) Check that the current limiter (F1) is serviceable.

Replace the current limiter if unserviceable.

(4) Check that the BATT switch (SW10) completes the ground circuit when ON.

Replace the BATT switch if defective.

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(5) 110 Amp System: Determine if the battery relay (RL2) is actuated by checking for battery voltage on terminal 3 of the battery relay (RL2). If the relay is not actuated, check that the ground potential is present at terminal 1 and check for actuating voltage on terminals 1 and 2.

(6) 150 Amp System: Determine if the battery relay (RL38) is actuated by checking for battery voltage on terminal 2 of the battery relay (RL38). If the relay is not actuated, check that the ground potential is present at pin P231/2 and check for actuating voltage on pin P231/1.

Replace the battery relay if actuating voltage is present at terminals 1 and 2 (110 amp) or pin P231/1 (150 amp) and the relay is not actuated.

B. Battery will not hold charge.

(1) TH-28/480: Determine if the N2/NR switch (SW20) is in the BATT BUS position.

Place the N2/NR switch (SW20) in the MAIN BUS position.

(2) 480B: Determine if the N1-N2-NR-TOT switch (SW45/SW53) is in the BATT position.

Place the N1-N2-NR-TOT switch (SW45/SW53) in the BUS position.

(2) Determine if battery usage is too great.

Use an external power source whenever possible.

(3) Check for too low of a charging rate.

Adjust the voltage regulator portion of the GCU.

(4) Perform a visual inspection for damage to the cells.

Replace the battery if cell damage is found.

(5) Determine if the battery cells are unbalanced.

Refer to the manufacture's maintenance manual for the battery installed in the aircraft for proper servicing of the battery.

C. Battery life is short.

(1) TH-28/480: Determine if the N2/NR switch (SW20) is in the BATT BUS position.

TH-28: Place the N2/NR switch (SW20) in the MAIN BUS position.

(2) 480B: Determine if the N1-N2-NR-TOT switch (SW45/SW53) is in the BATT position.

Place the N1-N2-NR-TOT switch (SW45/SW53) in the BUS position.

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(2) Determine if the electrolyte level is below the top of the cell plates.

Refer to the manufacture's maintenance manual for the battery installed in the aircraft for proper servicing of the battery.

D. Excessive loss of electrolyte.

(1) Determine if the charging rate is too high. If the loss is in individual cells only, the cell is faulty.

Reduce the charging rate (adjust the voltage regulator) and replace the battery.

(2) Inspect for a cracked battery case.

Replace the battery if the case is cracked.

E. Battery terminals corroded.

(1) Check for excessive charging or discharging rate.

Clean the terminals and adjust the charging rate or load.

F. Polarity is reversed.

(1) Determine if the battery connections are reversed.

Reverse the wiring connections if necessary.

6-3. External Power System – Troubleshooting (480 Option)

NOTE

The battery does not have to be connected to the aircraft electrical system to apply external power to the electrical system.

A. Volt/Ammeter indicates zero volts or battery voltage with the VOLT/AMP circuit breaker closed, external power applied, and the BATT switch (SW10) in the ON position.

(1) Inspect for a loose connection between the external power plug and the external power receptacle (P50).

Reconnect the external power plug if loose.

(2) Check for reversed polarity in the external power plug.

Reconnect at the attachment points on the APU if reversed.

(3) Check for low voltage from the external power supply.

Increase the output voltage of the external power supply.

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NOTE

If the battery is not connected to the aircraft electrical system, terminal 4 of the external power relay (RL5) will show zero volts if the relay is not actuated.

(4) Determine if the external power relay (RL5) is actuated by checking for battery voltage on terminal 4 of the battery relay (RL5). If the relay is not actuated, check that the ground potential is present at terminal 1 and check for actuating voltage on terminals 1 & 2.

Replace the diode (D1) if the ground potential is not present at terminal 1. Replace the external power relay if actuating voltage is present at terminals 1 & 2 and the relay is not actuated. If the external power relay is actuated and external power voltage is present at terminal 4 of the battery relay (RL2) and the volt/ammeter indicates zero volts, proceed to paragraph 6-2,A.

6-4. Starter/Generator System – Troubleshooting

NOTE

Aircraft S/N 5136 and subsequent are equipped with dual collective engine start and idle stop controls. The start switch is located on both the pilot and copilot collective sticks.

A. The starter/generator (M6, 110 amp system) (M11, 150 amp system) fails to operate when the START RLY circuit breaker is closed, the BATT switch (SW10) is ON, the STARTER IGNITION KEYLOCK (SW25) is ON, and the starter switch (SW9 or SW87) is depressed.

(1) Ensure that electrical power is present and determine if the START RLY circuit breaker is defective.

Replace the circuit breaker if defective.

(2) 110 Amp System: Check for ground potential at terminal 1 of the starter relay (RL3).

(3) 150 Amp System: Check for ground potential at pin P232/2 of the starter relay (RL3).

If ground potential is not present at terminal 1 (110 amp) or pin P232/2 (150 amp), determine the reason and repair.

NOTE

If the starter/generator operates with one of the starter switches but not the other, replace the starter switch if defective.

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(3) 110 Amp System: With the starter switch (SW9 or SW87) depressed, check for starter relay (RL3) actuating voltage at terminals 1 and 2 of the starter relay (RL3).

(4) 150 Amp System: With the starter switch (SW9 or SW87) depressed, check for starter relay (RL39) actuating voltage at pins P232/1 and P232/2 of the starter relay (RL39).

Replace the starter switch (SW9 or SW87) or the start enable relay (RL18 on 480B, S/N 5077, 5087 and subsequent) if defective.

(4) 110 Amp System: With the starter switch (SW9 or SW87) depressed, check for main terminal strip voltage at terminal 3 of the starter relay (RL3).

(5) 150 Amp System: With the starter switch (SW9 or SW87) depressed, check for voltage at terminal 13 of the starter relay (RL39).

Replace the starter relay (RL3 or RL39) if defective.

(6) Determine if the starter/generator shaft is broken.

Replace the starter/generator (M6 or M11) if defective.

(7) Check for excessively worn starter/generator brushes.

Replace the brushes as required.

B. The starter/generator (M6 or M11) fails to produce sufficient rpm during start.

(1) Check for excessively worn starter/generator brushes.

Replace the brushes as required.

(2) Check for low battery voltage.

Service the battery or use an external power source.

C. The starter/generator (M6 or M11) rotates when the BATT switch (SW10) is turned ON.

(1) Check for a defective starter switch (SW9 or SW87).

Replace the starter switch (SW9 or SW87) if defective.

(2) Check for a defective start enable relay (RL18) (480B, S/N 5077, 5087 and subsequent)

Replace the start enable relay (RL18) if defective.

(3) Check for a defective starter relay (RL3, RL39).

Replace the starter relay (RL3 or RL39) if defective.

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D. The engine ignitor fails to operate when the IGN EXCITE circuit breaker is closed and the starter ignition lock (SW25) is ON and the BATT switch (SW10) is ON and the starter switch (SW9 or SW87) is depressed.

(1) Ensure that the proper voltage is present on the main electrical bus (150 amp system) or the main terminal strip (110 amp system). Determine if the IGN EXCITE circuit breaker or the starter ignition lock (SW25) are defective.

Replace the circuit breaker or the ignition lock if defective.

(2) Check the ignition exciter for proper operation. Refer to the Rolls-Royce 250-C20 Operators and Maintenance Manual for maintenance procedures.

Replace the ignition exciter if defective.

(3) Check the ignition ignitor for proper operation. Refer to the Rolls-Royce 250-C20 Operators and Maintenance Manual for maintenance procedures.

Replace the ignition ignitor if defective.

E. The DC GEN segment of the caution panel is not illuminated prior to engine start with the CAUT PNL circuit breaker closed and the BATT switch (SW10) ON.

(1) Thales Avionics/Auxilec Starter/Generator System: Disconnect the electrical connector (J47) from the GCU (Thales Avionics/Auxilec, P/N VR1528-11B). Jumper pin S to ground and check that the DC GEN segment illuminates.

Replace the GCU if the DC GEN segment illuminates with pin S of electrical connector (J47) jumpered to ground.

(2) APC Starter/Generator System (110 Amp System): Check for continuity between terminals 4 and 5, 4 and 6, and 5 and 6 of the GEN OFF LIGHT RELAY (RL19).

(3) APC Starter/Generator System (150 Amp System): Check for continuity between terminals B and 2, B and 7, and 7 and 2 of the GEN OFF LIGHT RELAY (RL19).

Replace the RELAY or repair the jumper between terminals 4 and 6 (110 amp) or terminals B and 7 (150 amp) as required.

F. The DC GEN segment of the caution panel does not extinguish after engine start and the MAIN GEN circuit breaker is closed and the GENERATOR CONTROL switch (CB/SW3, 110 amp system) (SW62, 150 amp system) is turned ON.

(1) Thales Avionics/Auxilec Starter/Generator System: With the engine off, disconnect the electrical connector (J47) from the GCU and check if the DC GEN segment extinguishes.

If the DC GEN segment does not extinguish when the electrical connector (J47) is disconnected, replace the caution panel.

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(2) APC Starter/Generator System (110 amp system): Check for generator voltage at terminals 1 and 7 of the GEN OFF LIGHT RELAY.

Replace the RELAY if generator voltage is present at terminal 1 but not at terminal 7.

(3) APC Starter/Generator System (150 amp system): Check for generator voltage at terminals A and 5 of the GEN OFF LIGHT RELAY.

Replace the RELAY if generator voltage is present at terminal A but not at terminal 5.

(4) APC Starter/Generator System: Check for generator voltage at terminals 2 and 3 of the GENERATOR CONTROL SWITCH (CB/SW3 or SW62).

Replace the GENERATOR CONTROL SWITCH if generator voltage is present at terminal 2 but not at terminal 3.

(5) 110 Amp System: Determine if generator voltage is present terminals 2 and 4 of the GENERATOR RELAY (RL4).

Replace the GCU if generator voltage is present at terminal 4 and not at terminal 2.

(6) 150 Amp System: Determine if generator voltage is present terminals P233/1 and 2 of the GENERATOR RELAY (RL40).

Replace the GCU if generator voltage is present at terminal 2 and not at terminal P233/1.

(7) Determine if the MAIN GEN circuit breaker is defective.

Replace the circuit breaker if defective.

(8) Determine if the GENERATOR CONTROL switch (CB/SW3 or SW62) is defective.

Replace the GENERATOR CONTROL switch (CB/SW3 or SW62) if defective.

(9) 110 Amp System: Disconnect the electrical connector (J47 or J147) from the GCU. Jumper terminal 2 of the GENERATOR RELAY (RL4) to terminal 4 of the BATTERY RELAY (RL2) and determine if the GENERATOR RELAY (RL4) actuates.

(10) 150 Amp System: Disconnect the electrical connector (J191) from the GCU. Jumper pin P233/1 of the GENERATOR RELAY (RL40) to terminal 1 of the BATTERY RELAY (RL38) and determine if the GENERATOR RELAY (RL40) actuates.

Replace the generator relay (RL4 or RL40) if defective.

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(11) 110 Amp System: Determine if generator voltage is present at terminal 3 of the GENERATOR RELAY (RL4). If voltage is present, compare to the voltage at terminal 4 of the generator relay (RL4).

If battery voltage is present at terminal 3 of the generator relay (RL4), replace the GCU. If voltage is present at terminal 3 and the voltage is higher than the voltage at terminal 4 and voltage for the actuating coil is not present at terminal 2 of the generator relay (RL4), replace the GCU.

(12) 150 Amp System: Determine if generator voltage is present at terminal 1 of the GENERATOR RELAY (RL40). If voltage is present, compare to the voltage at terminal 2 of the generator relay (RL40).

If battery voltage is present at terminal 1 of the generator relay (RL40), replace the GCU. If voltage is present at terminal 1 and the voltage is higher than the voltage at terminal 2 and voltage for the actuating coil is not present at pin P233/1 of the generator relay (RL40), replace the GCU.

G. The Volt/Amp gauge indicates battery voltage and no load when the MAIN GEN circuit breaker is closed, the GENERATOR CONTROL switch (CB/SW3 or SW62) is turned ON, and the DC GEN segment of the caution panel is not illuminated.

(1) 110 Amp System: Determine if generator voltage is present at terminal 3 of the GENERATOR RELAY (RL4).

If battery voltage is present at terminal 3 of the generator relay, generator voltage is present at terminal 4 of the generator relay, and voltage for the actuating coil for the generator relay is present at terminal 1 of the generator relay; replace the generator relay.

(2) 150 Amp System: Determine if generator voltage is present at terminal 1 of the GENERATOR RELAY (RL40).

If battery voltage is present at terminal 1 of the generator relay, generator voltage is present at terminal 2 of the generator relay, and voltage for the actuating coil for the generator relay is present at pin P233/1 of the generator relay; replace the generator relay.

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6-5. Internal Lighting – Troubleshooting

A. Complete group of instrument lights fail to illuminate or cannot be adjusted using the potentiometer.

(1) Determine if the associated circuit breaker is defective.

Replace the circuit breaker if defective.

(2) Determine if the associated potentiometer is defective by disconnecting the electrical connector and connecting an ohmmeter between terminals 1 and 3 and determining if the resistance reading changes when the potentiometer is operated.

Replace the potentiometer if defective.

(3) Determine if the associated dimmer assembly is defective by checking for a variable voltage reading when checking the corresponding input terminal of the harmonizing card (H1) and operating the associated potentiometer.

Replace the dimmer assembly if defective.

B. One lamp in a group is dim, will not illuminate, or is intermittent.

(1) Check for proper circuit ground contact.

Clean the ground contact.

C. The cockpit/map light fails to operate.

(1) Determine if the rheostat in the light is defective.

Replace the rheostat if defective.

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6-6. External Lighting – Troubleshooting

A. The landing light fails to illuminate with the LDG LT and LDG LT RLY/ACTR circuit breakers closed and the landing light switch (SW7) ON.

B. Aircraft S/N 5136 and subsequent: The landing light fails to illuminate with the LDG LT and LDG LT/ACTR circuit breakers closed and the landing light switch (SW7 or SW88 or SW107 or SW108) ON.

C. Aircraft S/N 5157, 5183 and subsequent: The landing light fails to illuminate with the LDG LT and LDG LT/ACTR circuit breakers closed and the landing light switch (SW107 or SW108) in PULSE position (if equipped).

(1) Determine if the LDG LT circuit breaker or the LDG LT/ACTR circuit breaker is defective.

Replace the circuit breaker if defective.

(2) Determine if the landing light switch is defective.

Replace the switch if defective.

(3) Determine if voltage is present at terminal 1 of the landing light relay (RL1). If actuating voltage is present at terminal 1, check for voltage at terminal 2 of the landing light relay (RL1).

Replace the landing light relay (RL1) if defective.

D. (S/N 5121 only) The landing light fails to illuminate with the LDG LT and LDG LT PLSR circuit breakers closed and the landing light switch (SW81) in ON or PULSE position.

(1) Determine if the LDG LT circuit breaker or the LDG LT PLSR circuit breaker is defective.

Replace the circuit breaker if defective.

(2) Determine if the landing light switch is defective.

Replace the switch if defective.

(3) Determine if voltage is present at terminal 1 and A1 of the pulse control unit and if actuating ground is present at terminals 3 and 8 of the pulse control unit.

Replace the pulse control unit if defective.

E. The landing light fails to extend or retract when the landing light switch (SW7 or SW88) is ON or (SW107 or SW108) is in PULSE position (if equipped), and either of the extend/retract switches (SW8 or SW13) are closed.

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NOTE

If the landing light will extend and retract with one of the switches but not the other, replace the switch if defective.

(1) Determine if fuse (F12) is blown or the LDG LT/ACTR circuit breaker (CB120) is defective.

Replace the fuse or circuit breaker if defective.

(2) Determine if 12 Vdc is at terminal 13 of terminal strip T5.

Replace the voltage regulator (VC1) if 12 Vdc is not present at terminal 13 of terminal strip T5 and 28 Vdc is present at terminal 11 of terminal strip T5.

(3) Determine if the landing light motor (M5) is defective.

Replace the landing light motor (M5) if defective.

D. The anticollision lights fail to operate with the STROBE LTS switch (CB/SW4) in the ON position.

(1) Check to determine if the STROBE LTS switch (CB/SW4) is defective.

Replace the switch if defective.

(2) Check for proper ground contact at the power supply (SLPS3) case ground.

Properly ground the circuit.

(3) Check for a defective power supply (SLPS3).

Replace the power supply (SLPS3) if defective.

E. The LED anticollision lights fail to operate with the BCN LTS switch (CB/SW13) in the ON position.

(1) Check to determine if the BCN LTS switch (CB/SW13) is defective.

Replace the switch if defective.

(2) Check for proper ground contact at the pylon or terminal strip (T9).

Properly ground the circuit.

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F. The position lights fail to illuminate with the NAV LTS switch (CB/SW5) in the ON position.

(1) Check for a defective NAV LTS switch (CB/SW5).

Replace the switch if defective.

(2) Check for proper ground contact at the power supply (SLPS3) case ground.

Properly ground the circuit.

6-7. Caution and Warning Systems – Troubleshooting

A. Use the systems descriptions, functional tests, schematic diagrams, and standard electronic troubleshooting procedures to trace a malfunctioning circuit or loop and repair as necessary.

6-8. Engine Power Governor Trim System – Troubleshooting

A. The linear actuator fails to operate with the N2 TRIM ACTR circuit breaker closed and either of the GOVN INCR/DECR switch (SW11 or SW12) is closed.

NOTE

If the linear actuator can be operated by one switch and not the other, replace the switch if defective.

(1) Determine if the N2 TRIM ACTR circuit breaker is defective.

Replace the circuit breaker if defective.

(2) Determine if the linear actuator (M7) is defective.

6-9. Cyclic Trim System – Troubleshooting

A. Both trim actuators fail to operate when the TRIM circuit breaker is closed and either of the trim switch (SW31 or SW 32) is closed.

NOTE

If the trim system can be operated with one of the switches but not the other, replace the switch if defective.

(1) Determine if the TRIM circuit breaker is defective.

Replace the circuit breaker if defective.

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B. Both of the trim switches will not operate one of the trim actuators.

(1) Remove the trim switch units (TSU1 and TSU2) and reinstall the units in the other's location. Test the system by checking the same axis that did not work.

Replace the trim switch unit (TSU1 or TSU2) if the trim actuator that previously worked does not work with the trim switch unit connected to it. If the trim actuator does work, test the other axis of the system. If the trim actuator does not work, proceed to the next step.

(2) Determine if the microswitch assembly on the trim actuator is functioning properly.

Replace the trim actuator assembly if defective.

(3) Determine if the trim actuator motor is defective.

Replace the trim actuator assembly if defective.

6-9.1. Engine Idle Stop System – Troubleshooting

A. The idle stop pin fails to retract when the IDLE STOP circuit breaker is closed and either of the idle stop switches (SW89 or SW90) is closed.

(1) Determine if the collective wire harness is disconnected.

Connect the collective wire harness.

NOTE

If the idle stop can be operated with one of the switches but not the other, replace the switch if defective.

(2) Determine if the IDLE STOP circuit breaker is defective.

Replace the circuit breaker if defective.

(3) Determine if the idle stop relay (RL41) on the idle stop mechanism is functioning properly.

Replace the relay if defective.

(4) Determine if the solenoid (SOL2) is defective.

Replace the solenoid if defective.

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6-10. Miscellaneous Electrical Components

6-11. Description – Miscellaneous Electrical Components (See Figure 6-1)

The miscellaneous electrical components consists of resistors, diodes, leads and wiring, panel lights, connectors, relays, potentiometers, shunts and terminal strips, switches, terminal boards, current limiters, fuses, solenoids, and LED illuminated components (Figure 6-3).

6-12. Removal – Miscellaneous Electrical Components

WARNING

Before removing or adjusting any electrical component, ensure all electrical power is off and the battery is disconnected.

A. Remove the attaching hardware, clamps, connectors, leads, or wiring.

B. Identify the connectors, leads, or wiring.

C. Remove the component.

6-13. Inspection – Miscellaneous Electrical Components

A. Inspect the potentiometers for security, corrosion, cracks, and correct resistance.

B. Inspect the switches for weak detents, security, corrosion, faulty operation, and continuity in the ON position and infinity in the OFF position.

C. Inspect the plugs, connectors and receptacles for security, contact corrosion, damaged contacts, broken wires, faulty contacts, insert cracks, and faulty insulation.

D. Inspect the leads and wiring for loose terminals, chafing, corrosion or deteriorated condition, faulty or damaged insulation, excessive mechanical stress, broken strands, damaged shielding, shorted shielding, routing and mounting conditions.

(1) Inspect the pylon grounding tabs for corrosion and presence of paint under the mounting hardware.

E. Inspect the shunts and terminal strips for corrosion, security, deep scratches, physical damage, deformity, and discoloration (indicating excessive overload).

F. Inspect the relays for loose connections, damaged or broken terminals, damage to the case, and evidence of corrosion, pits, or discoloration (indicating arcing due to loose connections, internal shorting, or excessive overload).

G. Inspect the terminal boards for crack, corrosion, and security.

H. Inspect the panel lights for faulty bulbs, security, and corrosion.

I. Inspect the resistors for loose connections, security of mounting, and apparent damage. Inspect for correct resistance value using an ohmmeter.

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J. Inspect the diodes for loose connections and broken leads. Check suspected faulty diode front to back conductivity ratio with an ohmmeter.

K. Inspect the current limiter for loose connections, security of mounting, and apparent damage. Inspect the current limiter for continuity with an ohmmeter.

L. Remove the fuses from the holders to visually inspect for a blown fuse or check the continuity of the fuses using a multimeter (480 only).

M. Inspect the solenoids for security, corrosion, cracks, damage, and mechanical stress.

N. Inspect the LED switches, lights, or panels for security and failed circuits.

6-14. Repair – Miscellaneous Electrical Components

A. Tighten loose terminal connectors, mounting hardware, and electrical component attachments.

B. Replace miscellaneous electrical components that fail to meet the inspection requirements.

C. Clean corrosion from the connectors and receptacles with contact cleaner.

D. Remove corrosion and paint, if present, under the mounting hardware at the pylon grounding tabs.

6-15. Installation – Miscellaneous Electrical Components

A. Install the electrical component and secure with the attaching hardware, clamps, or cable ties.

B. Connect the identified terminals and/or connectors.

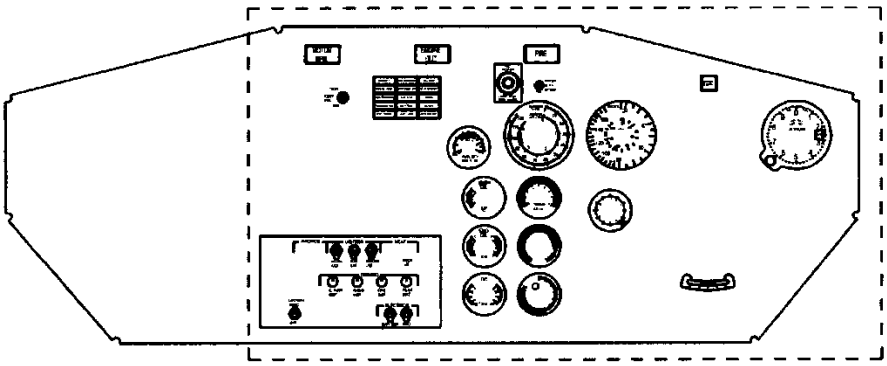
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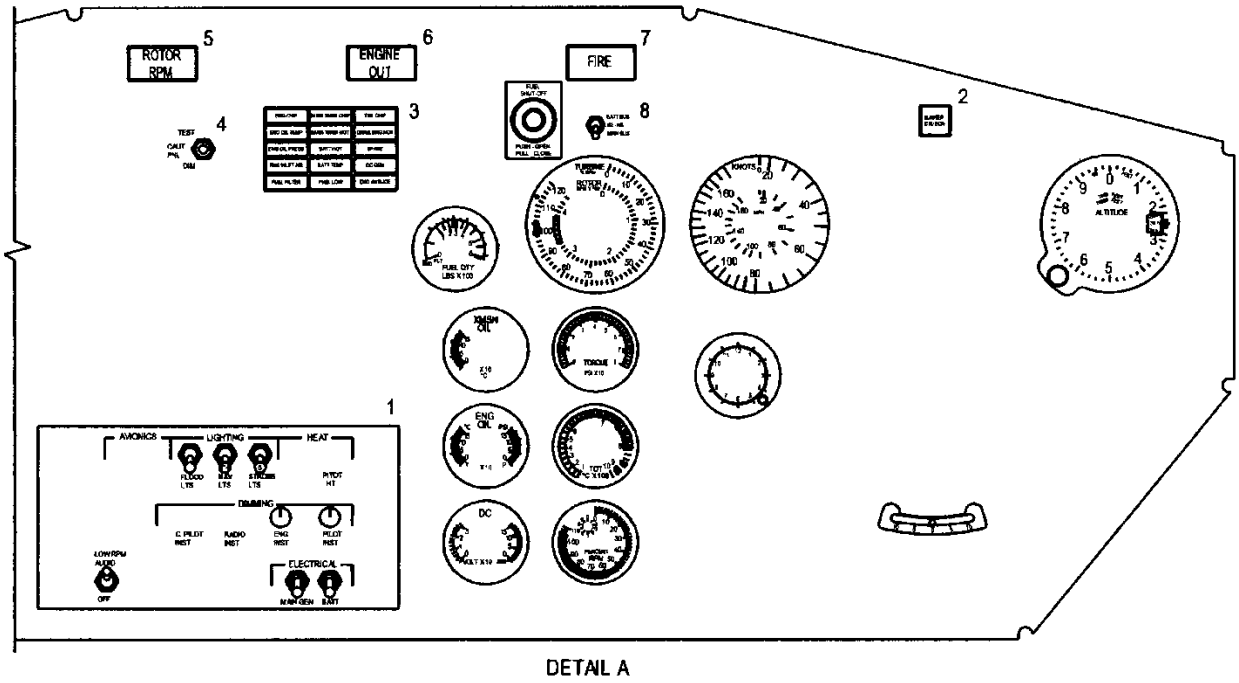
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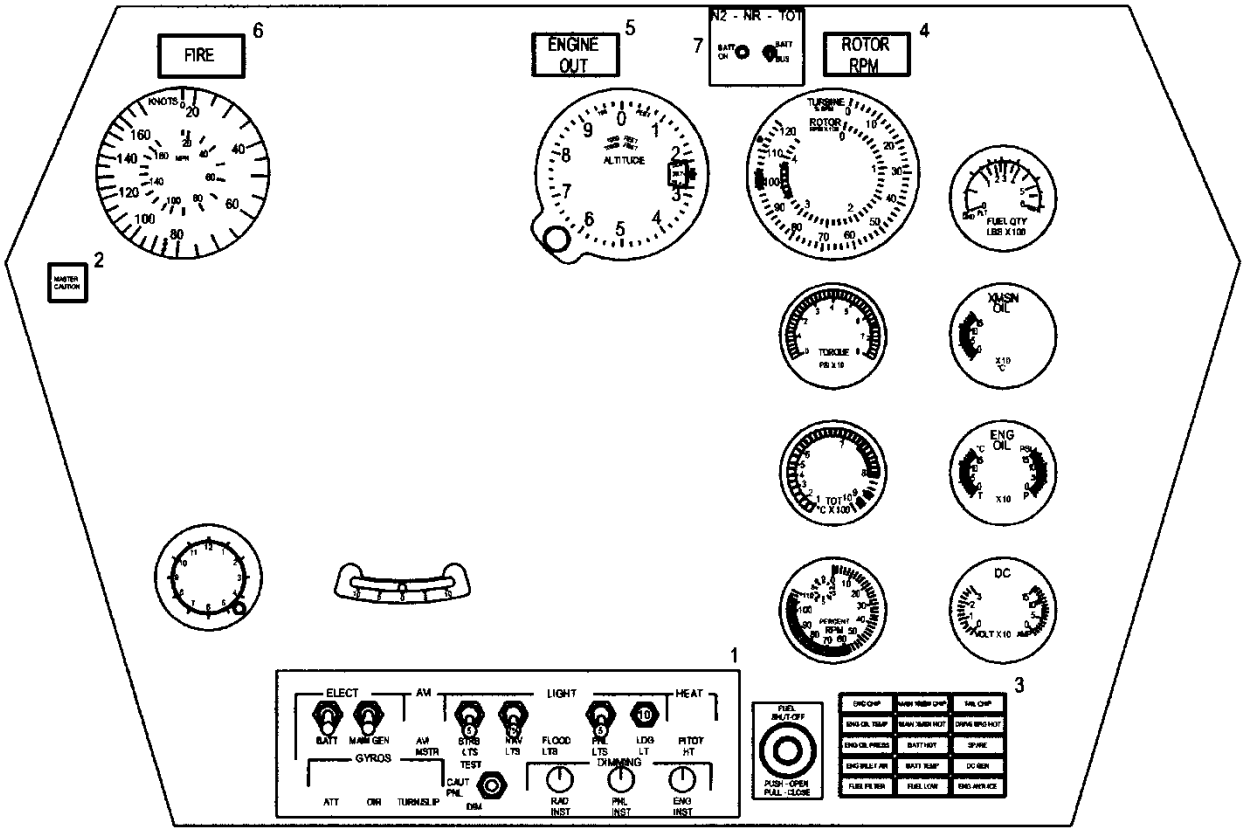


1. Switch Panel
2. Master Caution Annunciator/Switch
3. Caution/Warning Panel
4. Caution/Warning Panel Test Switch
5. Low Rotor RPM Warning Indicator
6. Engine Out Warning Indicator
7. Fire Indicator
8. N_2/N_R Battery Bus Switch

TH-28 Standard Panel

Figure 6-1.1. Switch and Indicator Locations

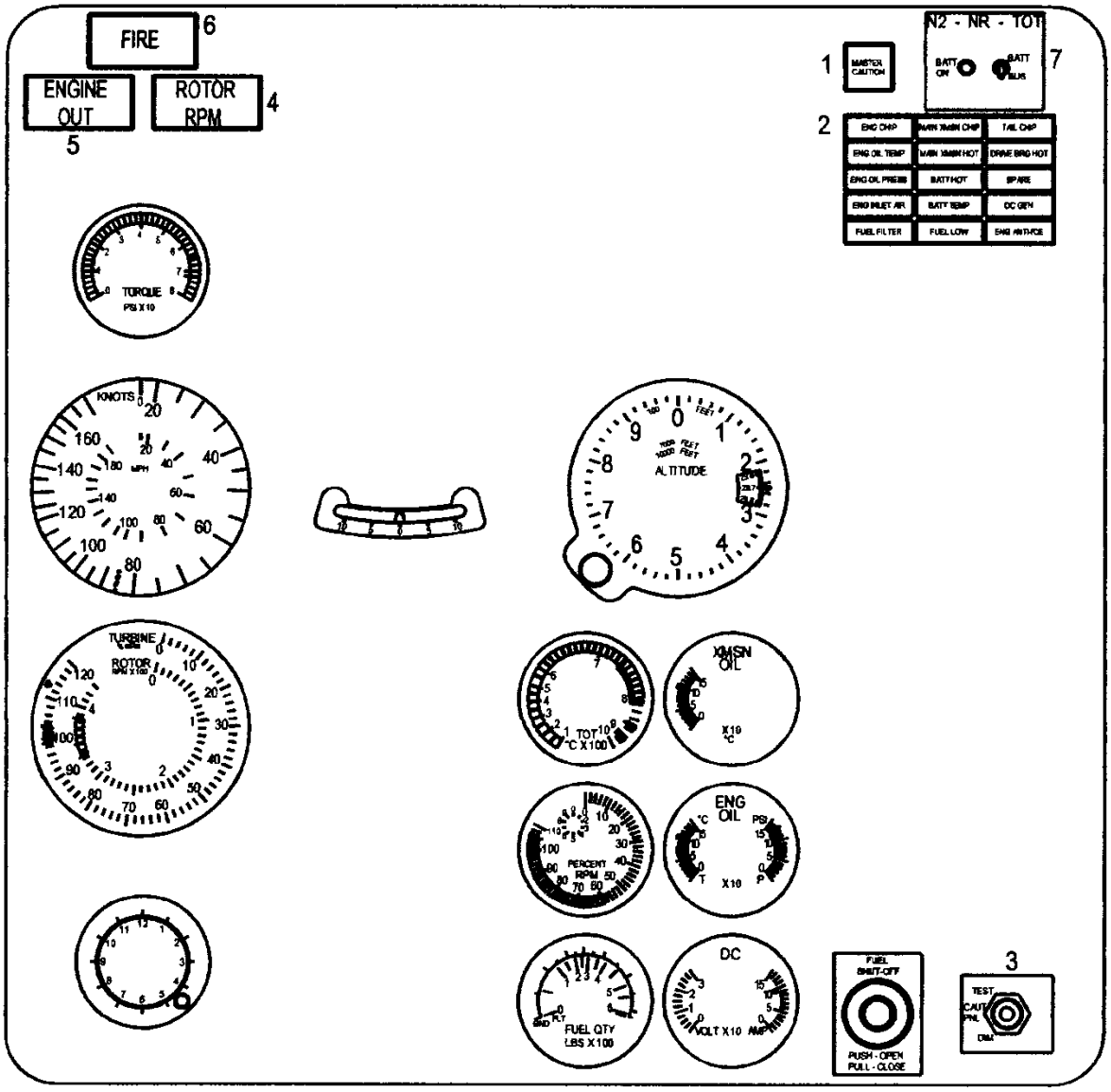
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1. Switch Panel
2. Master Caution Annunciator/Switch
3. Caution/Warning Panel
4. Low Rotor RPM Warning Indicator
5. Engine Out Warning Indicator
6. Fire Indicator
7. N_2/N_R Battery Bus Switch

480 Standard Panel

Figure 6-1.2. Switch and Indicator Locations



NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES.

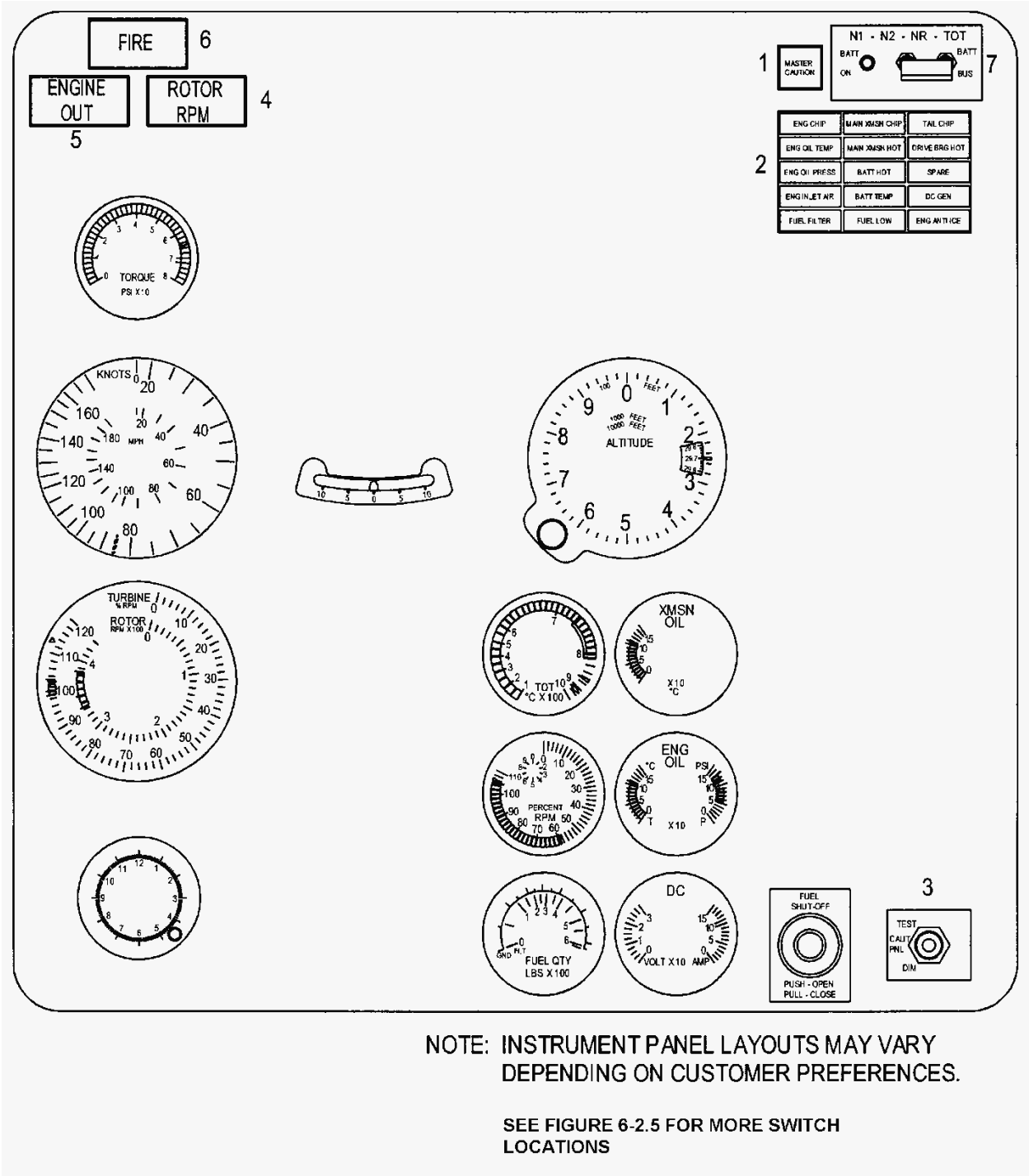
SEE FIGURE 6-2.3 AND FIGURE 6-2.4 FOR MORE SWITCH LOCATIONS.

1. Master Caution Annunciator/Switch
2. Caution/Warning Panel
3. Caution/Warning Panel Test Switch
4. Low Rotor RPM Warning Indicator
5. Engine Out Warning Indicator
6. Fire Indicator
7. N_2/N_R Battery Bus Switch

480 Optional/480B (Early Configuration) Standard Panel

Figure 6-1.3. Switch and Indicator Locations

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NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES.

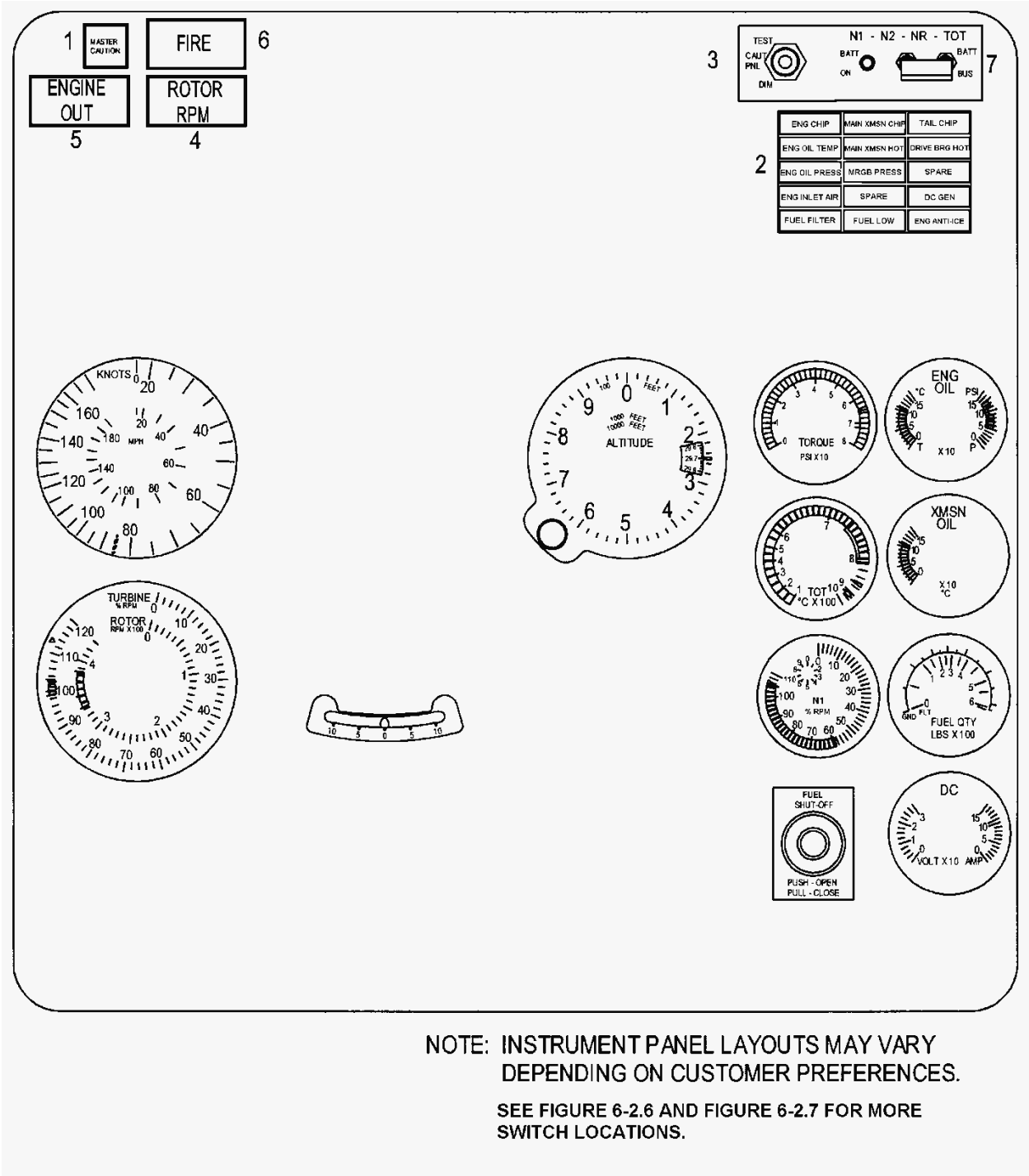
SEE FIGURE 6-2.5 FOR MORE SWITCH LOCATIONS

1. Master Caution Annunciator/Switch
2. Caution/Warning Panel
3. Caution/Warning Panel Test Switch
4. Low Rotor RPM Warning Indicator
5. Engine Out Warning Indicator
6. Fire Indicator
7. $N_1/N_2/N_R$/TOT Battery Bus Switch

480B Standard Panel
Serial Numbers: 5046, 5048 through 5049

Figure 6-1.4. Switch and Indicator Locations

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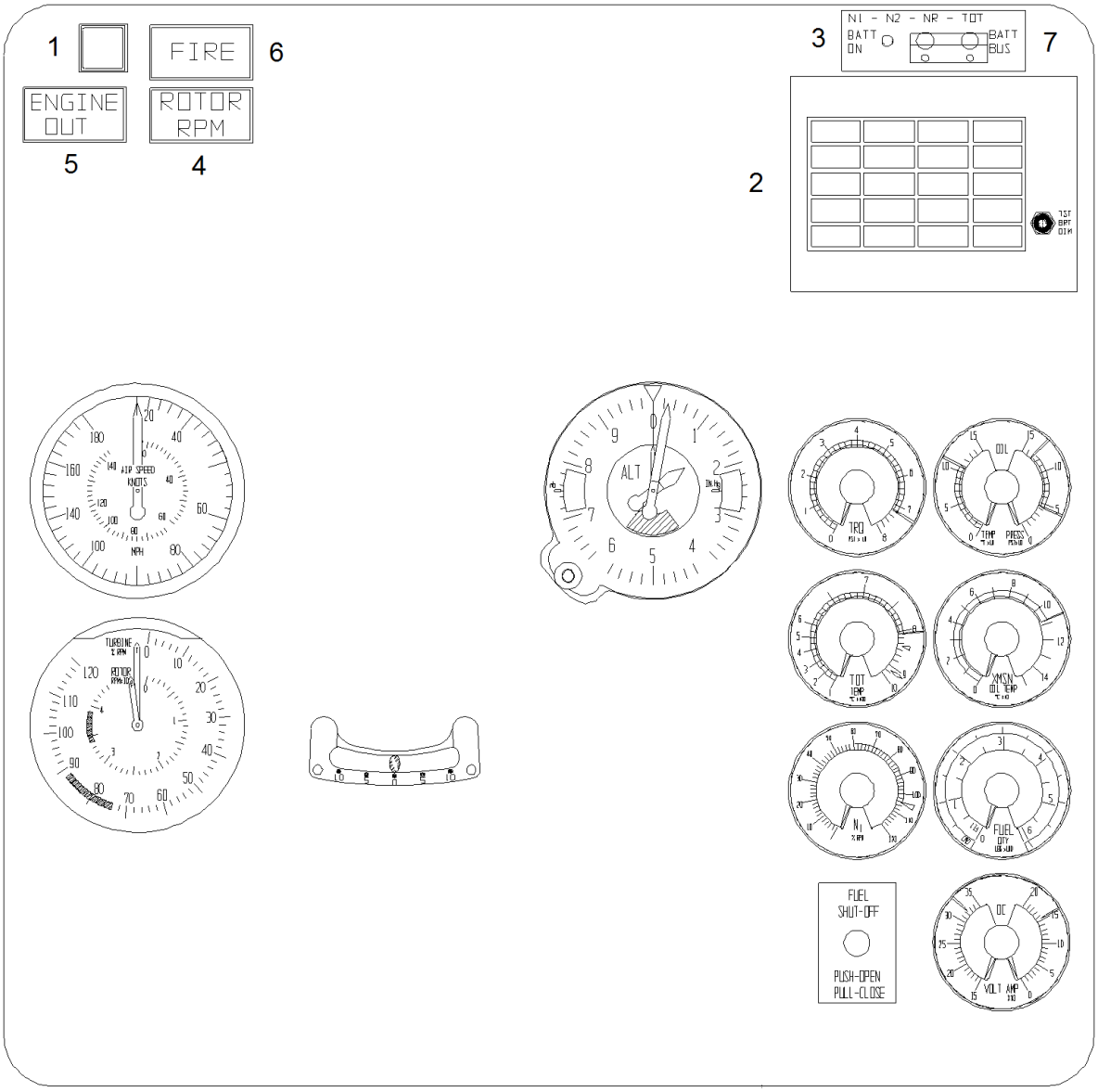
NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES.

SEE FIGURE 6-2.6 AND FIGURE 6-2.7 FOR MORE SWITCH LOCATIONS.

1. Master Caution Annunciator/Switch
2. Caution/Warning Panel
3. Caution/Warning Panel Test Switch
4. Rotor RPM Warning Indicator
5. Engine Out Warning Indicator
6. Fire Indicator
7. $N_1/N_2/N_R$/TOT Battery Bus Switch

480B Standard Panel
Serial Numbers: 5050 through 5135

Figure 6-1.5. Switch and Indicator Locations



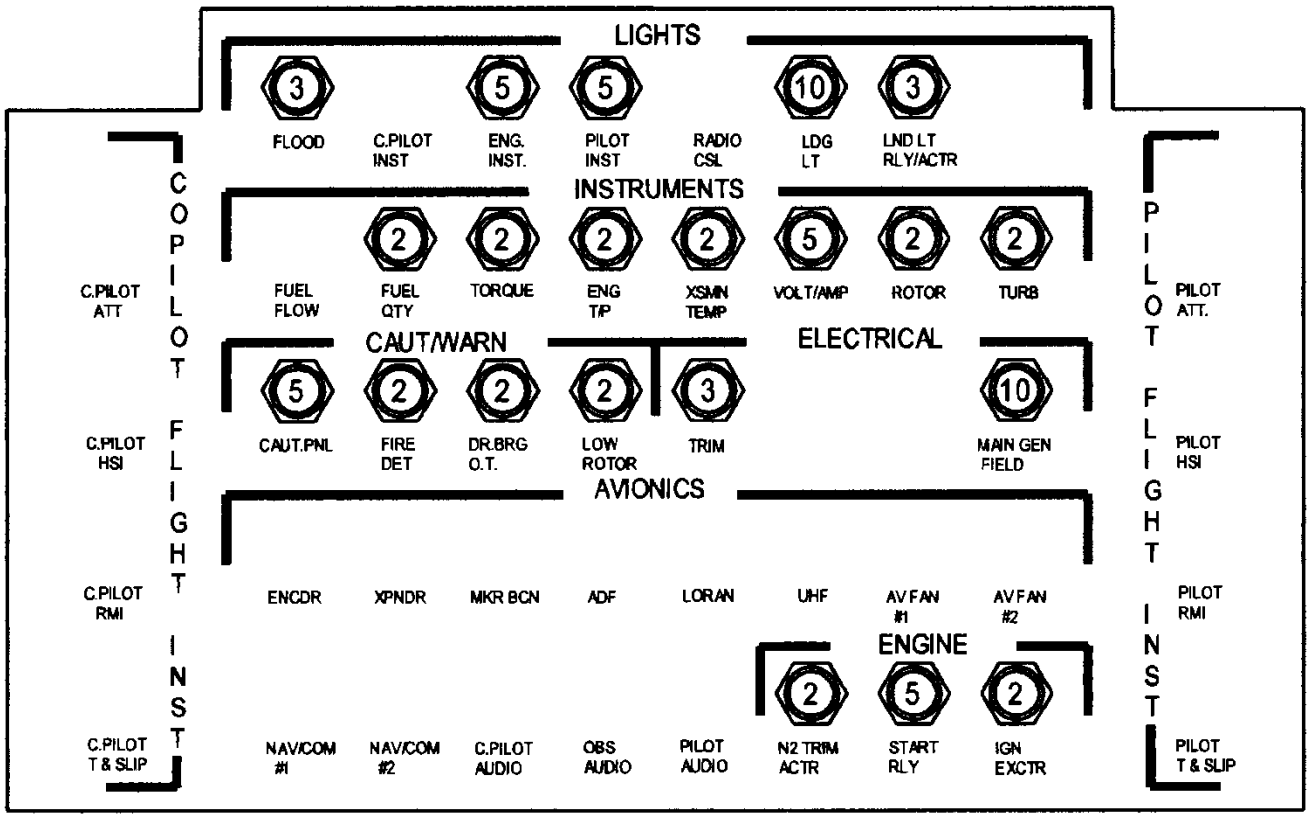
NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES

SEE FIGURE 6-2.7 FOR MORE SWITCH LOCATIONS

1. Master Caution Annunciator/Switch
2. Caution/Warning Panel
3. Caution/Warning Panel Test Switch
4. Rotor RPM Warning Indicator
5. Engine Out Warning Indicator
6. Fire Indicator
7. $N_1/N_2/N_R$/TOT Battery Bus Switch

480B Standard Panel
Serial Numbers: 5136 and Subsequent

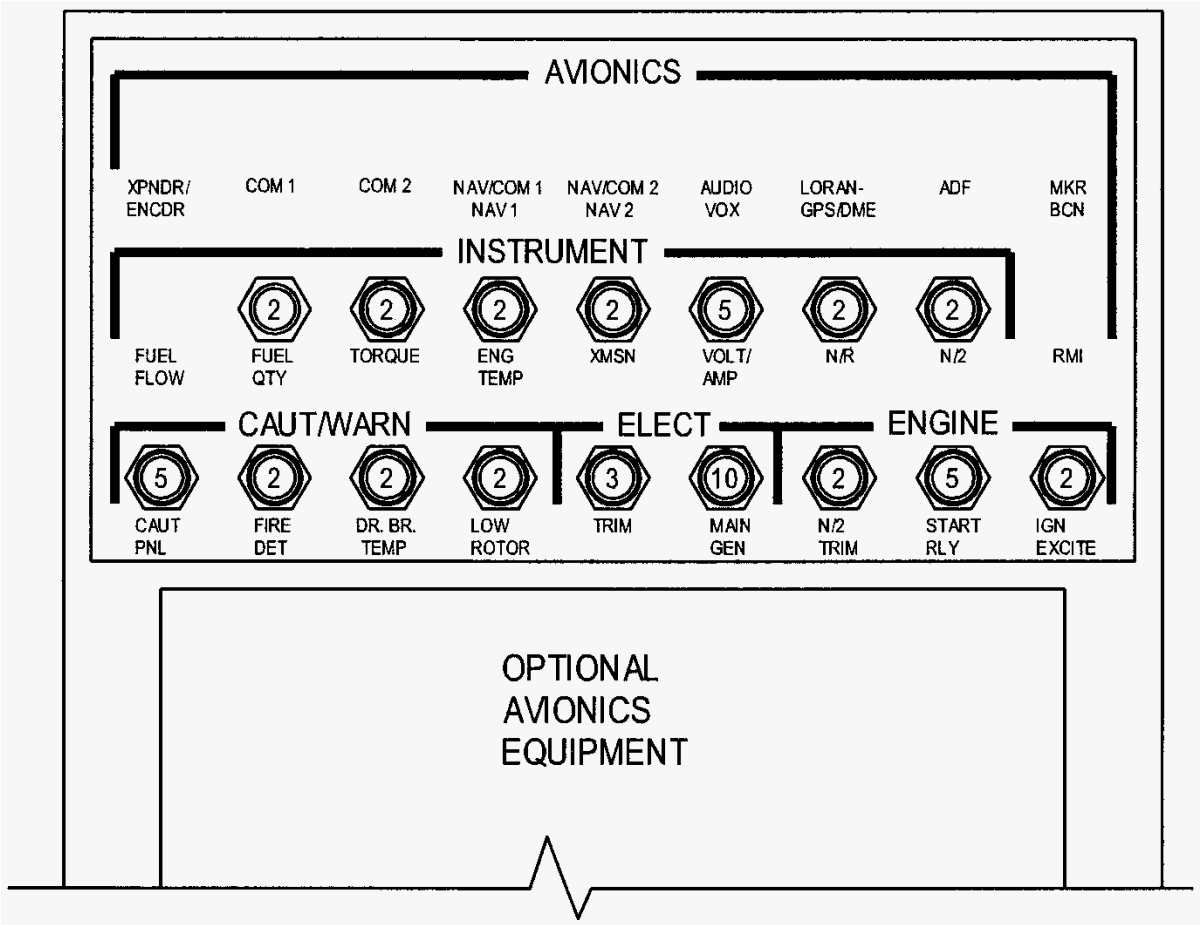
Figure 6-1.6. Switch and Indicator Locations



TH-28 Standard Panel

Figure 6-2.1. Circuit Breaker Panels

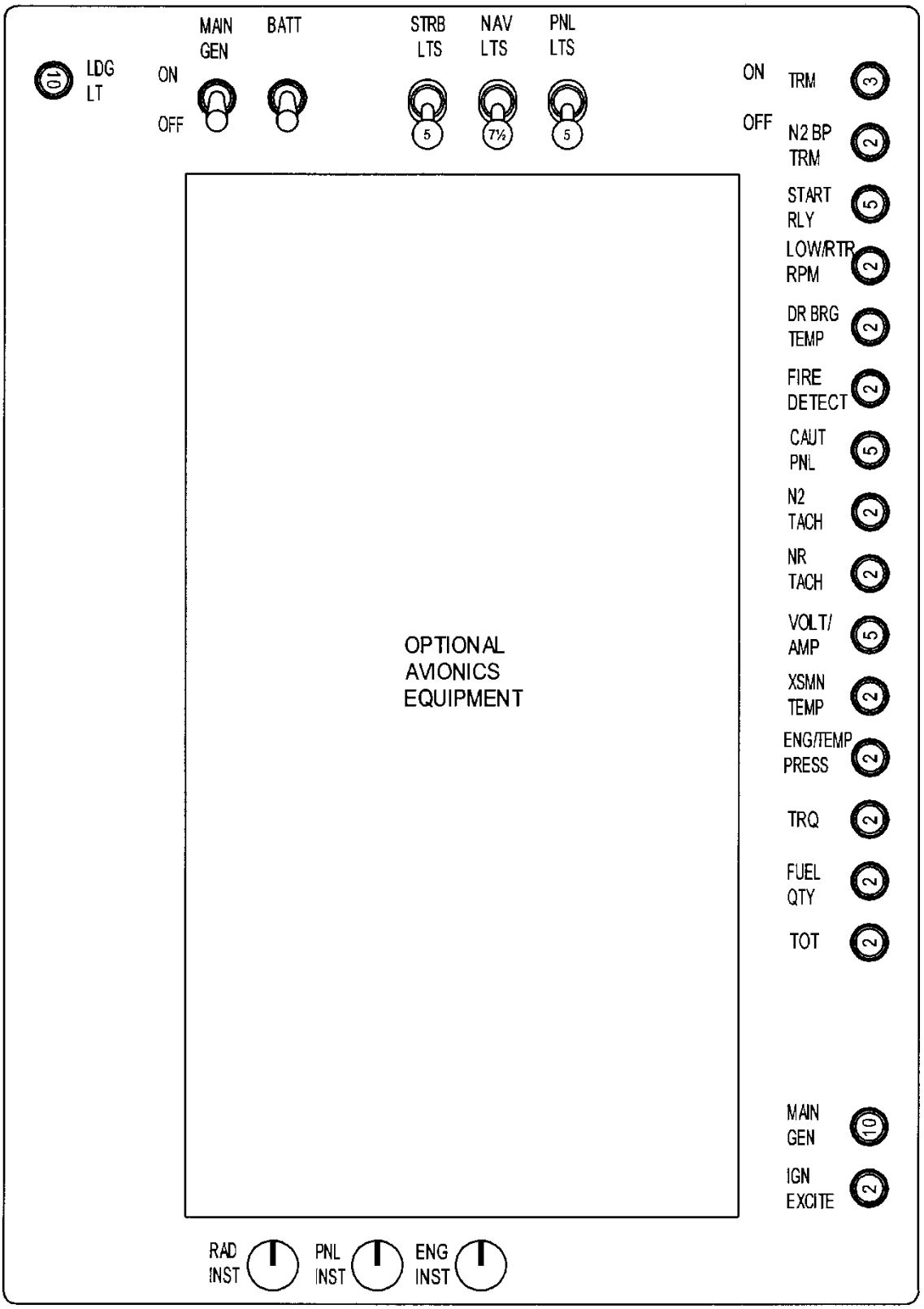
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480 Standard Panel

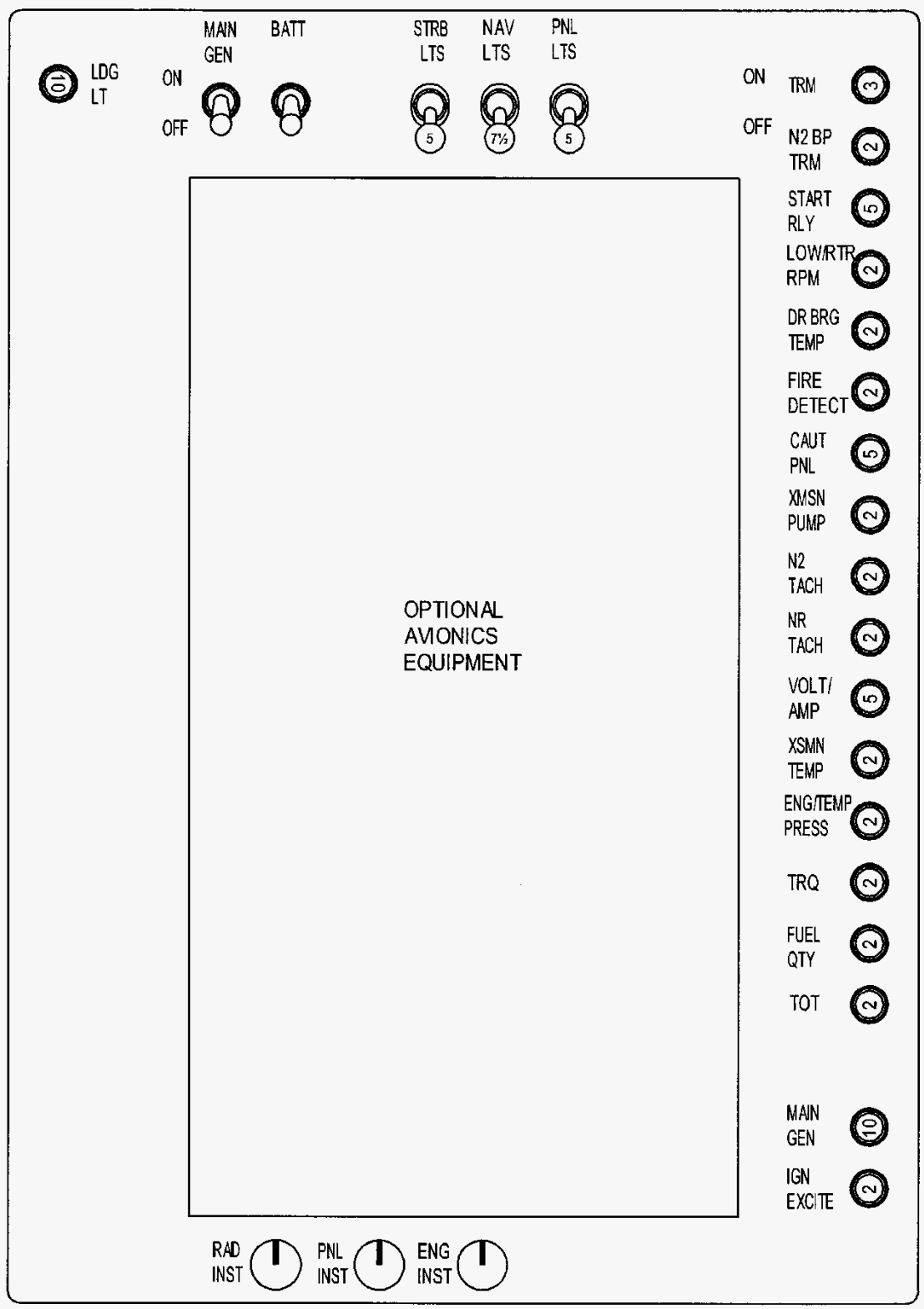
Figure 6-2.2. Circuit Breaker Panels

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480 Optional Panel

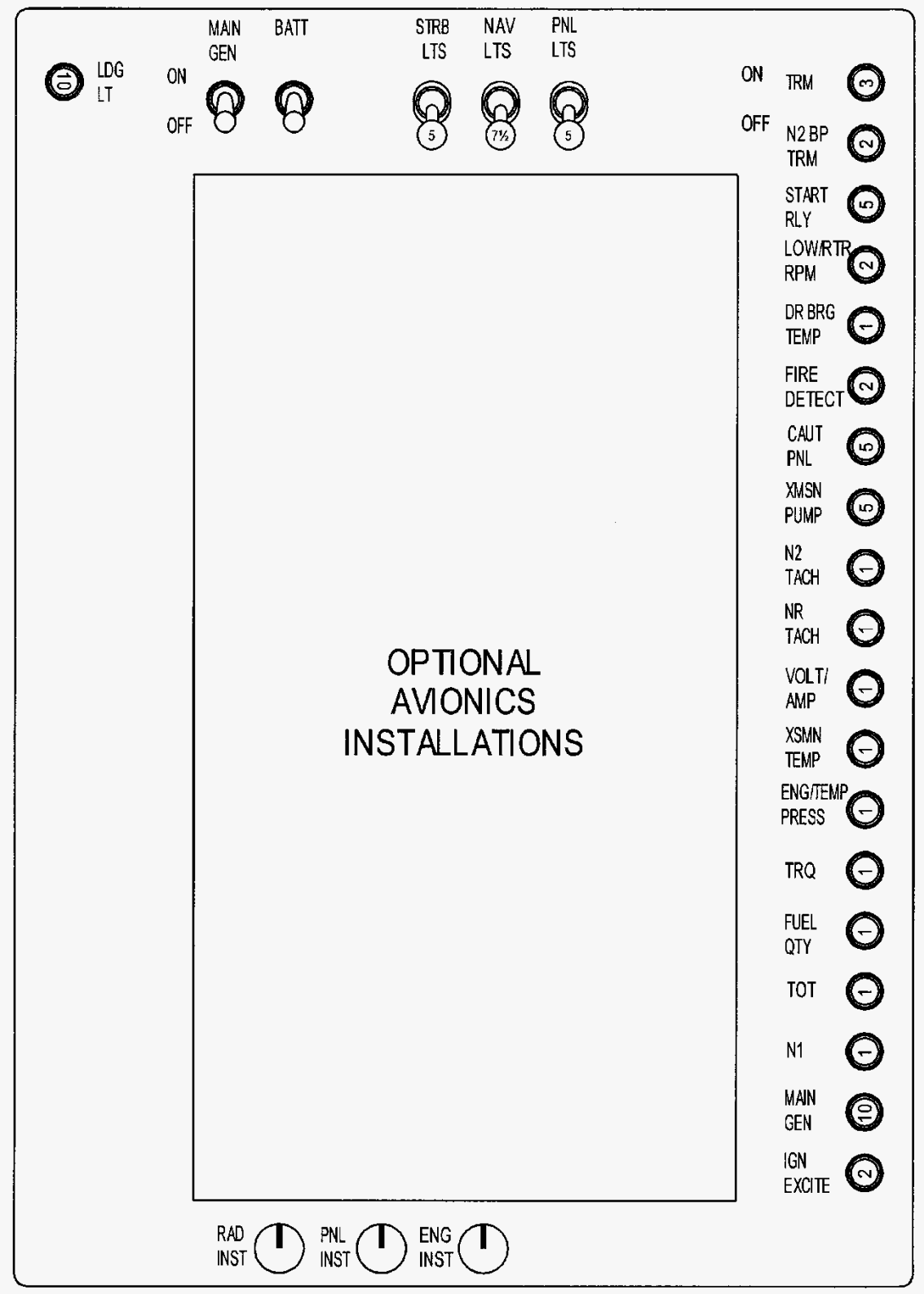
Figure 6-2.3. Circuit Breaker Panels



480B Standard Panel (Early Configuration)

Figure 6-2.4. Circuit Breaker Panels

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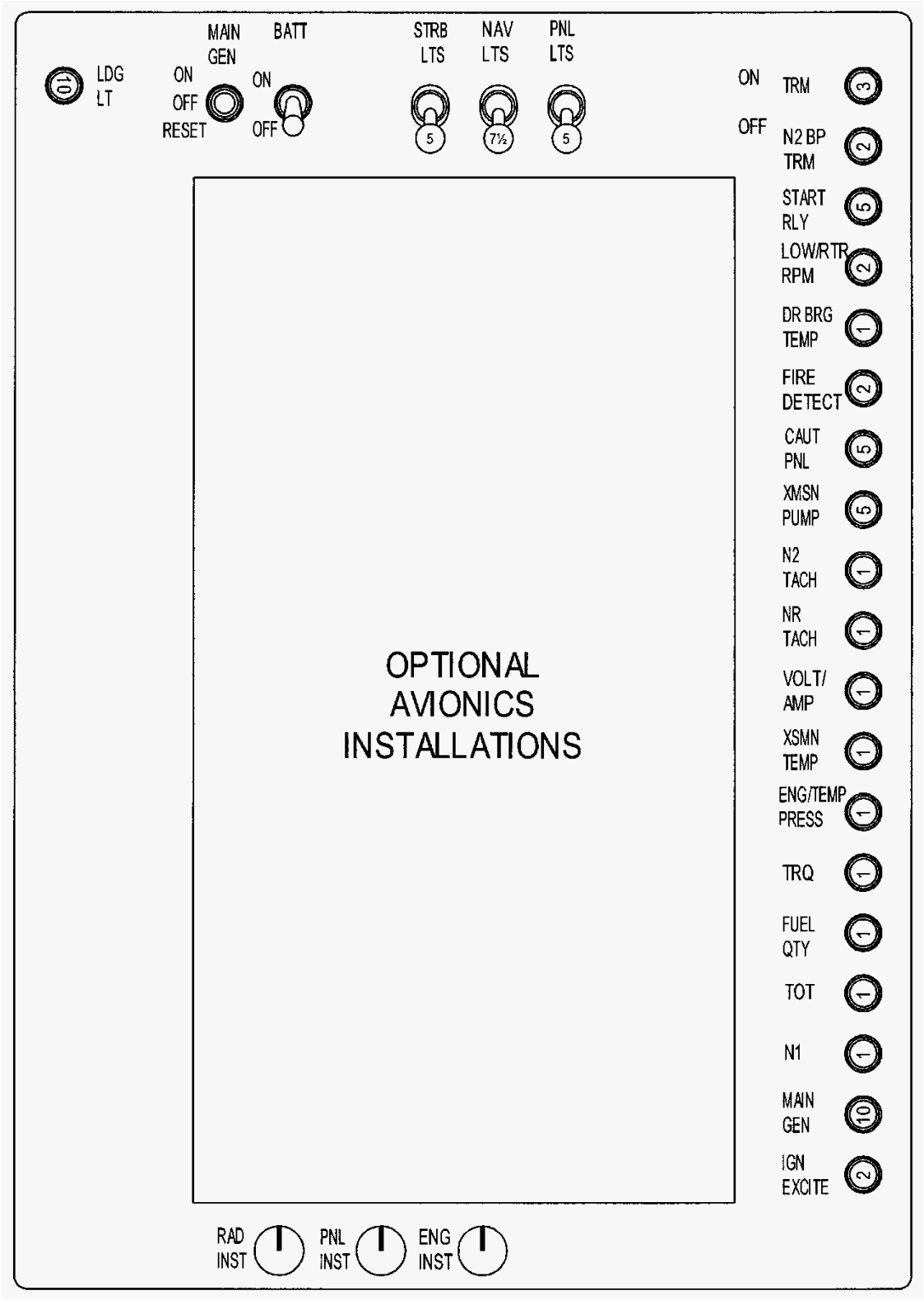


480B Standard Panel
Serial Numbers: 5046, 5048-5076, 5078-5084

Figure 6-2.5. Circuit Breaker Panels

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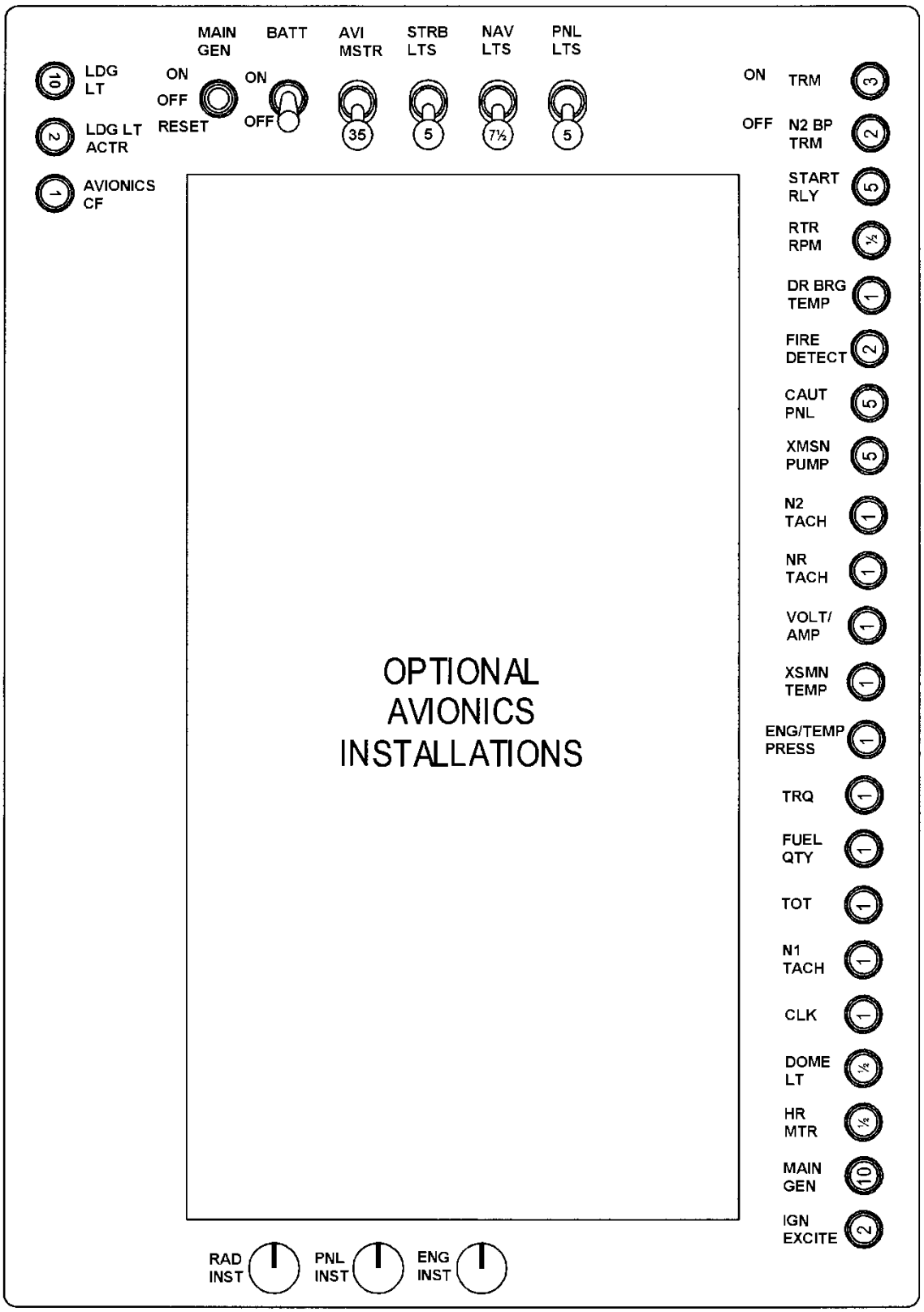


480B Standard Panel
Serial Numbers: 5077, 5085-5133

Figure 6-2.6. Circuit Breaker Panels

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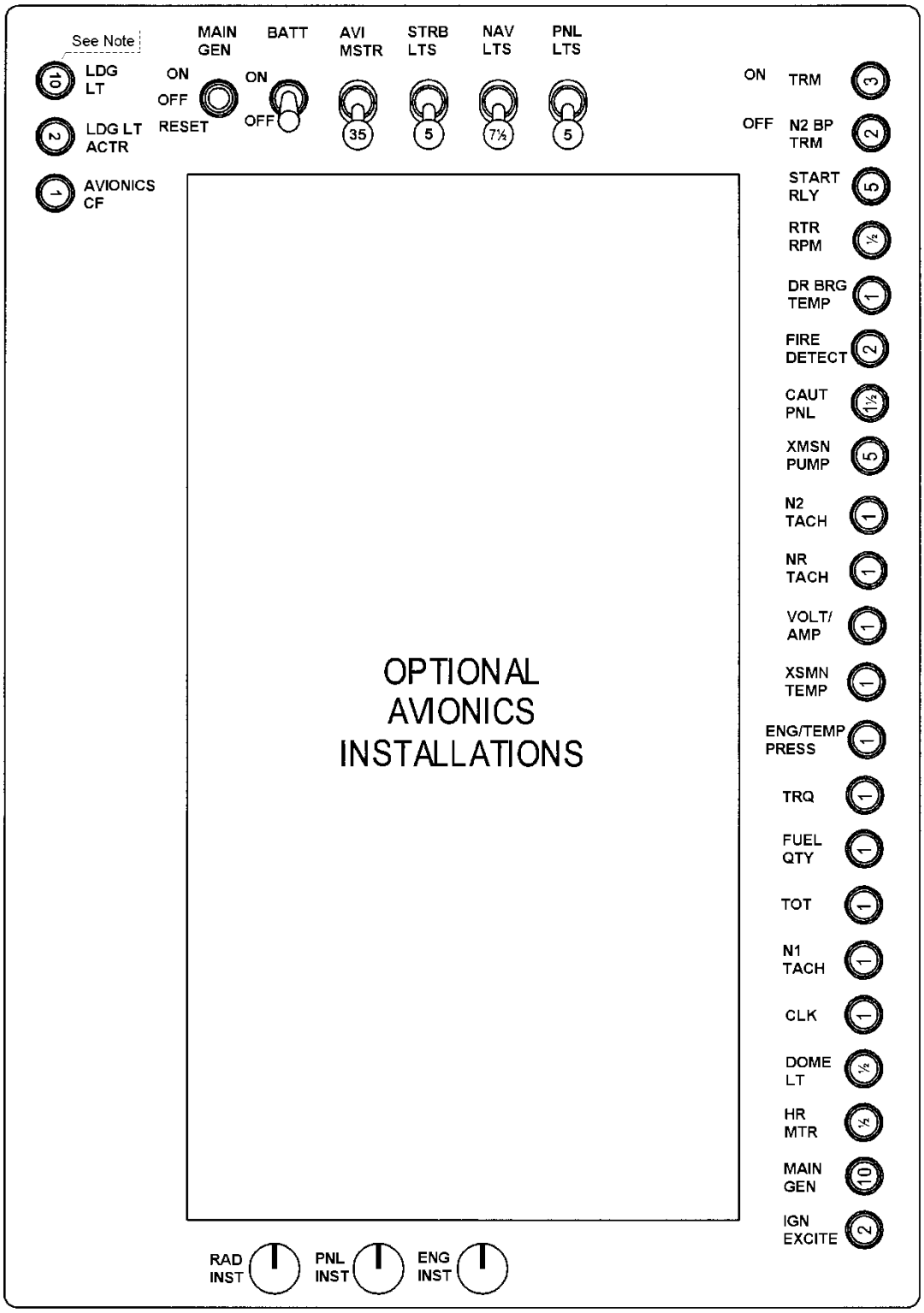
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480B Standard Panel
Serial Numbers: 5134 and 5135

Figure 6-2.7. Circuit Breaker Panels

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480B Standard Panel
Serial Numbers: 5136 and Subsequent

NOTE: The 10 amp LDG LT circuit breaker pertains to the incandescent landing light. The LED landing light options, D48 and D50, have 1.5 and 5 amp circuit breakers, respectively.

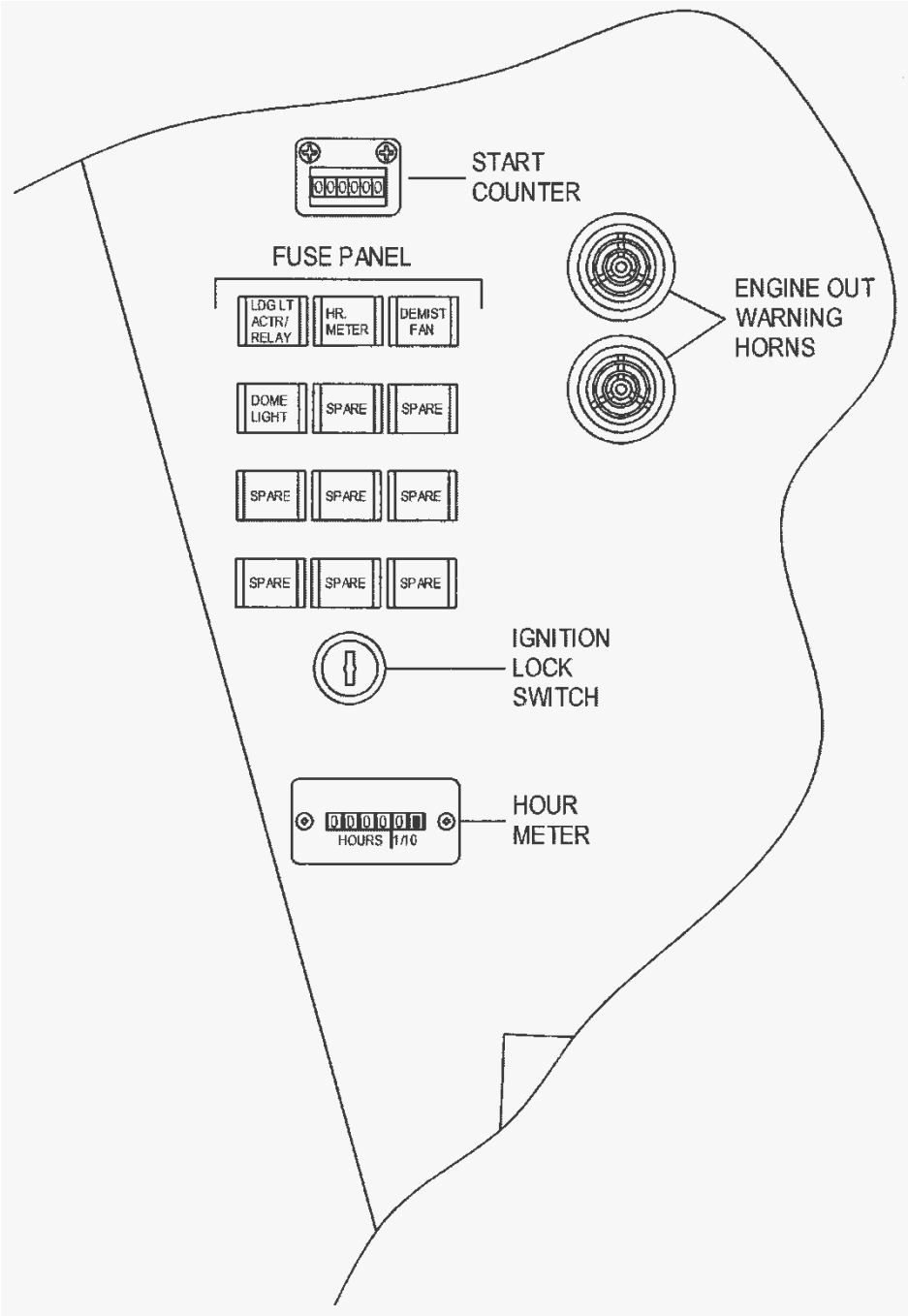
Figure 6-2.8. Circuit Breaker Panels

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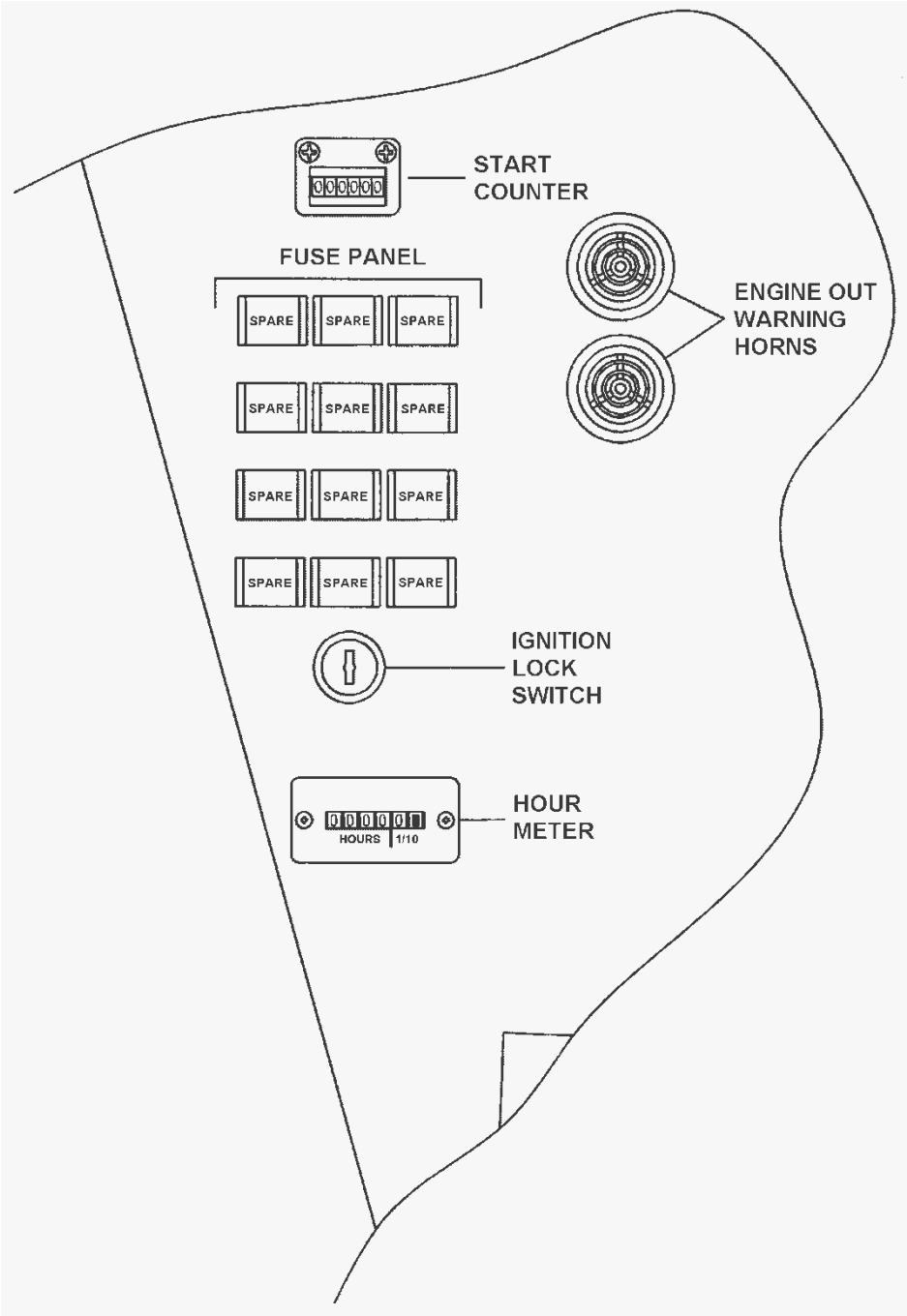
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480/B Standard Panel
Serial Numbers: 5133 and Earlier
Sheet 1 of 2

Figure 6-3. Fuse Panel

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480B Option
Serial Numbers: 5134 and Subsequent
Sheet 2 of 2

Figure 6-3. Fuse Panel

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6-16. Circuit Breakers

6-17. Description – Circuit Breakers

All circuits of the electrical system, except the main electrical bus which is protected with a current limiter, are protected by push-to-reset or switch type circuit breakers. On aircraft (prior to S/N 5134) with the 110 amp electrical system, the map light, hour meter, and the landing light actuator are protected by fuses (Figure 6-3). The push-to-reset circuit breakers are located in a panel on the lower radio console and on the electrical switch section of the instrument panel (Figure 6-2). The switch type circuit breakers are located in the electrical switch section of the instrument panel.

6-18. Removal – Circuit Breakers

WARNING

Before removing or adjusting any electrical component, ensure all electrical power is off and the battery is disconnected.

A. Ensure all electrical power is off and the battery is disconnected.

B. Remove the hardware securing the breaker or switch panel to gain access to the back of the panel.

C. Disconnect the wiring from the appropriate circuit breaker and cover the wire ends with electrical tape.

D. Remove the mounting hardware and remove the circuit breaker from the panel assembly.

6-19. Inspection – Circuit Breakers

A. Inspect the circuit breakers for reset retention, activation for circuit ON and power OFF, faulty operation, corrosion, and security.

6-20. Repair – Circuit Breakers

A. Repair is limited to tightening or properly installing any loose or improperly installed mounting hardware and connectors.

B. Replace circuit breaker if any other inspection requirements are not met.

6-21. Installation – Circuit Breakers

A. Position the circuit breaker into the panel assembly and install the mounting hardware.

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B. Remove the cover from the wire ends and connect the wires to the circuit breaker.

C. Install the panel assembly.

6-22. Electrical Power Distribution System

6-23. Description – Electrical Power Distribution System

The electrical power distribution system provides all the electrical power required for operation of the electrical equipment installed in the aircraft and consists of the starter/ generator, battery, external power, and main electrical bus. Primary electrical power is supplied by the engine driven 28 Vdc, 150 ampere starter/generator. In the event of a starter/generator failure, power is supplied by a 24 volt, 18 ampere/hour lead acid battery. The aircraft may also be equipped with an optional 24 volt, 17 ampere/hour NiCad battery. The electrical power is distributed to the aircraft electrical systems via the main electrical bus. The main electrical bus is protected by a 150 ampere bus current limiter (F1). In the event of a complete electrical system failure, emergency electrical power, controlled by the N1-N2-NR-TOT switch, can be supplied to the gas producer tachometer (N_1), dual tachometer (N_2/N_R), and TOT indicator.

On aircraft prior to S/N 5134, electrical power is distributed to the aircraft electrical systems via the main terminal strip (T1), which is protected by a current limiter (F1). Electrical power is limited to 110 amperes due to the bus architecture.

6-24. Battery System

6-25. Description – Battery System

The battery system consists of the battery, battery relay (RL 2 or RL38), and the battery switch (SW10). The battery system is activated by placing the battery switch (SW10) in the ON position. The battery relay is energized and battery power is transferred to the main bus. The dual volt/ammeter monitors the battery voltage.

6-26. Battery

6-27. Description – Battery

The battery is located on the right side of the pylon assembly. Access to the battery is via the right side engine access panel. The battery installation includes vent tubes, battery tie downs, battery cable, an electrical connector (J49), and an electrical connector (J89, NiCad battery only) for the battery temperature portion of the caution/warning panel. On 480/480B aircraft, the battery can be installed in the baggage compartment as an alternate location for weight and balance purposes. The primary purpose for the battery is to start the engine at remote sites where external power is not available.

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6-28. Removal – Battery

WARNING

The electrolyte used in nickel-cadmium batteries contains potassium hydroxide (KHO), which is a caustic chemical agent. Serious and deep burns of body tissue will result if the electrolyte comes in contact with the eyes or any part of the body. Use rubber gloves, rubber apron, and protective eye covering when handling the battery. If accidental contact with the electrolyte is made, use ONLY clean water and immediately flush the contaminated areas. Continue flushing with large quantities of clean water. Seek medical attention immediately. Before removing or installing the battery insure that the battery switch is OFF and the battery has cooled down if overheated. Removal or installation of the battery connector while the battery is under load may result in an explosion, electrical arching, and possible severe burns to personnel.

WARNING

CO_2 is an acceptable fire extinguishing agent once a fire has developed. In no case should CO_2 be directed into a battery compartment to effect cooling or displace explosive gases. The static electricity generated by the discharge of the extinguishers could explode the hydrogen/oxygen gases trapped in the battery compartment.

CAUTION

Take every possible step to keep the nickel-cadmium battery as far away as possible from the lead-acid type battery. Do not use the same tools and materials (screwdrivers, wrenches, gloves, apron, etc.) for both types of batteries. Anything associated with the lead-acid battery, even the air, must never come in contact with the nickel-cadmium battery or its electrolyte. Even a trace of sulphuric acid fumes from a lead-acid battery may result in damage to the nickel-cadmium battery. If sulphuric acid has been advertently mixed with the electrolyte in the battery, the upper areas or the cells will appear greenish in color. In such cases, the battery must be replaced.

CAUTION

Small amounts of gases are vented from a battery during normal operation. Ensure that the vent tubes are not restricted or disabled.

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A. Ensure that the battery switch (SW10) is OFF and external power is not applied.

B. Open or remove the right side engine access panel and disconnect the battery cable from the battery.

C. Disconnect the vent tubes from the battery case.

D. Disconnect the electrical connector (J49) from the battery case.

E. NiCad Battery Only: Disconnect the electrical connector (J89, temperature warning) from the battery case.

F. Open the clamp securing the battery in its mount and remove the battery from the aircraft.

6-29. Inspection – Battery

A. Inspect the battery I/A/W the manufacturer's instructions.

B. Inspect the vent tubes for condition, security, and clear of obstructions.

C. Inspect the battery mount and retaining strap for corrosion, damage, and security.

D. Inspect the electrical connectors I/A/W paragraph 6-13.

6-30. Repair – Battery

A. Repair or replace the battery I/A/W the manufacturer's instructions.

B. Clear obstructions from the vent tubes and replace the tubes if damage cannot be repaired.

C. Replace the retaining strap if economically damaged beyond repair.

D. Repair the battery mount I/A/W AC 43.13-1B.

E. Repair the electrical connectors I/A/W paragraph 6-14.

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6-31. Installation – Battery

WARNING

The electrolyte used in nickel-cadmium batteries contains potassium hydroxide (KHO), which is a caustic chemical agent. Serious and deep burns of body tissue will result if the electrolyte comes in contact with the eyes or any part of the body. Use rubber gloves, rubber apron, and protective eye covering when handling the battery. If accidental contact with the electrolyte is made, use ONLY clean water and immediately flush the contaminated areas. Continue flushing with large quantities of clean water. Seek medical attention immediately. Before removing or installing the battery insure that the battery switch is OFF and the battery has cooled down if overheated. Removal or installation of the battery connector while the battery is under load may result in an explosion, electrical arching, and possible severe burns to personnel.

CAUTION

Take every possible step to keep the nickel-cadmium battery as far away as possible from the lead-acid type battery. Do not use the same tools and materials (screwdrivers, wrenches, gloves, apron, etc.) for both types of batteries. Anything associated with the lead-acid battery, even the air, must never come in contact with the nickel-cadmium battery or its electrolyte. Even a trace of sulphuric acid fumes from a lead-acid battery may result in damage to the nickel-cadmium battery. If sulphuric acid has been advertently mixed with the electrolyte in the battery, the upper areas or the cells will appear greenish in color. In such cases, the battery must be replaced.

CAUTION

Small amounts of gases are vented from a battery during normal operation. Ensure that the vent tubes are not restricted or disabled.

A. Position the battery onto its mount and secure the battery with the retaining strap.

B. Connect the electrical connector (J49) to the battery case.

C. NiCad Battery Only: Connect the electrical connector (J89, temperature warning) to the battery case.

D. Connect the vent tubes to the battery case.

E. Connect the battery cable to the battery.

F. Install or close the right side engine access panel.

G. If a replacement battery was installed, check the voltage regulator setting and adjust as required (para. 6-68).

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6-32. Battery Relay

6-33. Description – Battery Relay

The battery relay (RL2 or RL38), located on the aft side of the cockpit bulkhead in the right side of the engine compartment, is an electrically operated switch between the battery and the main electrical bus. It is controlled by a switch (SW10) which opens or closes the circuit to the actuating coil of the relay. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-34. External Power System (480 Option)

6-35. Description – External Power System

NOTE

The battery connector (J49) does not have to be connected to the battery to apply external power to the aircraft.

External power may be connected to the aircraft electrical systems through an external auxiliary power receptacle (P50) located on the aft side of the cockpit bulkhead in the right side of the engine compartment. No special action or switching is required to connect the external power. If the external power connections are of the correct polarity, the external power relay (RL5), located on the right side of the keel assembly, closes automatically and connects the ground power unit to the battery relay (RL2) and the battery terminal strip (T11). Positioning the battery switch (SW10) to ON, energizes the battery relay (RL2) and connects the external power to the main electrical terminal strip (T1). The dual volt/ammeter monitors the external power voltage when applied.

6-36. Auxiliary Power Receptacle

6-37. General Description – Auxiliary Power Receptacle

The auxiliary power receptacle (P50), located on the aft side of the cockpit bulkhead and accessed via the right side engine access panel, provides connection for an external power source to the aircraft.

6-38. Removal – Auxiliary Power Receptacle

A. Ensure that all electrical power is off.

B. Open the right side engine access panel.

C. Disconnect the electrical wires from the receptacle. Identify the wires and protect the ends with electrical tape.

D. Remove the hardware securing the external power receptacle to the mounting bracket.

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6-39. Inspection – Auxiliary Power Receptacle

A. Inspect the auxiliary power receptacle I/A/W paragraph 6-13.

6-40. Repair – Auxiliary Power Receptacle

A. Repair the auxiliary power receptacle I/A/W paragraph 6-14.

6-41. Installation – Auxiliary Power Receptacle

A. Install the receptacle into the mounting bracket and secure the mounting hardware.

B. Connect the electrical wires to the proper terminals on the receptacle.

C. Close the right side engine access panel.

6-42. Reverse Polarity Relay

6-43. General Description – Reverse Polarity Relay

The reverse polarity relay (RL37), located on the aft side of the cockpit bulkhead in the right side of the engine compartment, connects an external source of power through the auxiliary power receptacle (P50) to the battery relay (RL38) and the main electrical bus. A diode (D1), mounted forward of terminal strip T5 in the keel assembly, serves to complete the ground return for the holding coil and prevents reverse polarity to the aircraft electrical system. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-44. Starter/Generator Systems

6-45. Description – Starter/Generator Systems

The starter/generator systems consist of the starter/generator (M6 or M11), starter relay (RL3 or RL39), ignition exciter, start counter, starter ignition lock (SW25), start switch (SW9 or SW87), generator control unit (GCU), generator relay (RL4 or RL40), generator control switch (CB/SW3 or SW62), and generator shunt. The APC Starter/Generator System also has a start enable relay (RL18) and a generator off light relay (RL19).

The starter system is used to start the aircraft powerplant. Using either battery power or external power and with the battery switch (SW10) turned ON to supply electrical power to the main electrical bus (150 amp system) or terminal strip (110 amp system), the starter system is engaged by pressing the start switch (SW9) located on the pilot's collective stick control head or the start switch (SW87) located on the copilot collective stick (480B option). For aircraft equipped with the Thales Avionics/Auxilec Starter/Generator System, when the start switch is engaged, the start relay (RL3) coil is energized and electrical power is supplied to the starter side of the starter/generator (M6) and electrical power is supplied to the ignition exciter and the start counter. For aircraft equipped with the APC Starter/Generator System, when the start switch (SW9 or SW87) is engaged, the start enable relay (RL18) coil is energized, sending electrical power to energize the start relay (RL39) coil. Electrical power is then supplied to the starter side of the starter/generator (M11), the ignition exciter, and the start counter. The starter

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ignition lock (SW25) is key operated and must be ON for power to be applied to the starter/generator, ignition exciter, and the start counter whether the aircraft has the Thales Avionics/Auxilec or the APC Starter/Generator System. The starter/generator (M6 or M11) cannot be engaged with the starter ignition lock (SW25) in the OFF position.

The generator system is used to supply 28 Vdc electrical power to the main electrical bus or terminal strip and to recharge the battery after a battery powered start. The generator system is controlled by the generator control unit (GCU). The Thales Avionics/Auxilec GCU performs the following functions: voltage regulation, overvoltage protection, reverse current protection, overcurrent protection, generator failure indication for the caution panel, and generator field excitation. The APC GCU performs the following functions: voltage regulation, line contactor control, differential voltage sensing, reverse current protection, overvoltage protection, undervoltage protection, overload protection, anti-cycle control, open ground protection, self-test, remote reset, and remote trip. The voltage regulator portion of the GCU can be adjusted. When the generator control switch (CB/SW3 or SW62) is placed in the ON position, the GCU connects the starter/generator (M6 or M11) to the electrical bus via the generator relay (RL4 or RL40) and on aircraft equipped with the APC Starter/Generator System, the generator off light relay (RL19) is energized if the system is operating properly. When the starter/generator (M6 or M11) is on-line, the dual volt/ammeter monitors generator current output via the generator shunt.

6-46. Starter/Generator

6-47. Description – Starter Generator

The starter/generator (M11), mounted on the right, forward side of the engine accessory gearbox, drives the engine compressor during the start cycle. In the generator mode, the starter/generator is a 28 Vdc, 150 amp output maximum limit generator.

On aircraft prior to S/N 5134, the starter/generator (M6) output maximum limit is 110 amps due to the bus architecture.

6-48. Removal – Starter Generator

A. Refer to paragraph 13-119 for removal procedures.

6-49. Inspection – Starter Generator

A. Refer to paragraph 13-120 for removal procedures.

6-50. Repair – Starter Generator

A. Refer to paragraph 13-121 for removal procedures.

6-51. Installation – Starter Generator

A. Refer to paragraph 13-122 for removal procedures.

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6-52. Start Relay

6-53. Description – Start Relay

The starter relay, located either below the cockpit floor in the right side of the keel assembly (RL3) or on the aft side of the cockpit bulkhead in the right side of the engine compartment (RL39), connects electrical power to the starter portion of the starter/generator. The relay is energized when the start switch (SW9 or SW87) is depressed and electrical power is applied to the electrical bus. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-53.1 Starter Enable Relay

6-53.2 Description – Starter Enable Relay

The starter enable relay (RL18), located either below the cockpit floor in the right side of the keel assembly or on the aft side of the cockpit bulkhead in the right side of the engine compartment, connects electrical power to the coil of the starter relay. The relay is energized when the start switch (SW9 or SW87) is depressed and electrical power is applied to the electrical bus. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-54. Ignition Exciter

6-55. Description – Ignition Exciter

The ignition exciter, furnished with and attached to the engine, provides continuous ignition arch during the engine start cycle. Refer to the Rolls-Royce 250-C20 Operators and Maintenance Manual for maintenance procedures.

6-56. Start Counter

6-57. Description – Start Counter

The start counter, furnished with and attached to the engine, is used to keep track of the number of start cycles on the engine for retirement life purposes. Refer to the Rolls-Royce 250-C20 Operators and Maintenance Manual for maintenance procedures. On 480B, S/N 5048 and subsequent, the start counter is located on the left side of the center pedestal, above the fuse panel (Refer to Figure 6-3). Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-58. Starter Ignition Lock

6-59. Description – Starter Ignition Lock

The starter ignition lock (SW25), located on the right side of the pedestal (left side of the pedestal for 480/B), is key operated. The lock is used to prevent inadvertent start of the aircraft engine and as an anti-theft device. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

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6-60. Start Switch

6-61. Description – Start Switch

NOTE

Aircraft S/N 5136 and subsequent are equipped with dual collective engine start and idle stop controls. The start switch is located on both of the pilot and copilot collective sticks.

The start switch (SW9), located on the pilot's collective control stick, or the start switch (SW87) located on the copilot's collective control stick, is used to energize the starter relay during the engine start cycle. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-62. Generator Control Unit (GCU)

6-63. Description – Generator Control Unit (GCU)

The GCU is located on the bottom right hand side of the oil cooler/blower shelf or on the right side of the keel assembly in later production aircraft. At flight idle RPM and above, the voltage regulator portion of the GCU maintains the correct generator output voltage by varying the generator field current. When the Thales Avionics/Auxilec GCU senses an overvoltage condition, the GCU causes current to flow in the trip coil of the generator control switch (CB/SW3), which trips the switch to the OFF position. This removes the current from the generator field and power from the generator relay (RL4) actuating coil disconnecting the starter/generator (M6) from the main electrical bus. The reverse current portion of the Thales Avionics/Auxilec GCU de-energizes the generator relay when the generator output voltage falls below the battery voltage. The overcurrent protection circuitry will cause current to flow in the trip coil of the generator control switch when the generator maximum output current rating is continuously exceeded for 10 seconds ± 2 seconds. The circuitry in the Thales Avionic/Auxilec GCU will illuminate the generator caution light (DC GEN) in the caution panel any time the generator voltage is less than the battery voltage, the generator switch is OFF, or the generator is not connected to the main electrical bus. The GCU will also flash the generator field circuitry if required. When APC GCU senses an overvoltage condition, an internal latching relay opens in the GCU, which removes power from the generator field and the actuating coil of the generator relay. When the power is removed from the generator field, the actuating coil of the generator off light relay (RL19) de-energizes and connects the ground potential to the caution segment circuit, which illuminates the DC GEN segment in the caution panel. The generator control switch must be manually positioned to the RESET position momentarily to reset the GCU. The reverse current portion of the APC GCU de-energizes the generator relay when the generator output voltage falls below the battery voltage.

6-64. Removal – Generator Control Unit

A. Ensure electrical power is turned off and disconnect the battery.

B. Remove the right side aft cowling and the aft bottom cowling or the right side keel access panel.

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C. Disconnect the electrical connector from the GCU.

D. Remove the hardware securing the GCU to the bottom of the shelf or the mounting bracket on the keel and remove the GCU.

6-65. Inspection – Generator Control Unit

A. Inspect the GCU I/A/W the manufacturer's instructions.

6-66. Repair – Generator Control Unit

A. Repair the GCU I/A/W the manufacturer's instructions.

6-67. Installation – Generator Control Unit

A. Position the GCU onto the bottom of the oil cooler/blower shelf or the mounting bracket on the keel and install the mounting hardware.

B. Connect the electrical connector to the GCU and safety wire with .020 lockwire.

C. Reconnect the battery and install the right aft side cowling and the aft bottom cowling or the keel access panel.

6-68. Adjustment – Generator Control Unit (Voltage Regulator)

WARNING

The following steps are to be performed by authorized personnel.

A. Run up the aircraft I/A/W the operator's manual (RFM). If available, use an external power source to start the aircraft.

B. Bring the generator system on line and turn on all of the communications, navigation, and instrument systems.

NOTE

Use a voltmeter with a DC voltage scale accuracy of 1 percent.

C. Connect the positive probe of a voltmeter to one of the terminals on the generator shunt. Connect the negative probe to any convenient aircraft ground.

D. Read and record the voltage.

(1) The voltage setting for the NICAD batteries should be 28.2 ±.3 Vdc

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NOTE

Some battery manufacturers may specify a different voltage setting for operations in certain temperature environments. Consult the battery manufacturer's manual for additional guidance.

(2) The setting for a Gill G-641 lead acid battery should be as follows:

Operating Temperature (°F)	Minimum	Nominal	Maximum
120	27.1	27.5	27.8
90	27.6	28.0	28.3
60	28.1	28.5	28.8
30	28.6	29.0	29.3
< 0	29.1	29.5	29.8

(3) The setting for a 7641-20 VRLA battery should be 28.6 Vdc.

E. If required, remove the rubber plug (Thales Avionics/Auxlec) or open the access cover (APC) from the front side of the GCU and adjust the voltage regulator.

F. Turn off the communications, navigation, and instrument systems. Read and record the voltage. The voltage should be the same as was set in step D or E. If the voltage varies more than ± 0.5 Vdc between a load and no load condition, replace the GCU.

6-69. Generator Relay

6-70. Description – Generator Relay

The generator relay (RL4 or RL40), located on the right side of the cockpit bulkhead in the engine compartment, connects generator power to the electrical bus and is controlled by the GCU. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-71. Generator Switch

6-72. Description – Generator Switch

The generator switch (CB/SW3) installed in the Thales Avionics/Auxilec Starter/Generator System is a magnetic circuit breaker with a shunt trip element. The generator control switch (SW62) installed in the APC Starter/Generator System is a 2 pole, 3 position switch. The generator control switch (CB/SW3 or SW62) controls the power to the GCU. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-72.1 Generator Off Light Relay

6-72.2 Description – Generator Off Light Relay

The generator off light relay (RL19), located below the cockpit floor in the right side of the keel assembly, next to terminal strip T5, removes the ground potential from the caution segment

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circuit of the generator system when the system is operating properly. The relay is energized when the generator switch (SW62) is turned ON and electrical power is applied to the relay's actuating coil. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-73. Generator Shunt

6-74. Description – Generator Shunt

The generator shunt, located on the right side of the cockpit bulkhead in the engine compartment, shares a proportional current flow with the ammeter. The proportional current flow is used to drive the ammeter portion of the dual volt/ammeter. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

NOTE

Aircraft prior to S/N 5134 have a 110 ampere system. Aircraft S/N 5134 and subsequent have a 150 ampere system.

6-74.1 Bus (150 Amp Electrical System)

6-74.2 Description – Bus

The electrical bus distributes the electrical power to the electrically powered systems. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-75. Main Electrical Terminal Strip (110 Amp System)

6-76. Description – Main Electrical Terminal Strip

The main electrical terminal strip (T1) distributes the electrical power to the electrically powered systems with the exception of the hour meter. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-77. Current Limiter

6-78. Description – Current Limiter

On aircraft prior to S/N 5134, the current limiter (F1), located on the right side of the cockpit bulkhead in the engine compartment, is a 100 ampere fusible link and protects the main electrical terminal strip (T1) from overloads. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

On aircraft S/N 5134 and subsequent, the current limiter (F1), located on the right side of the cockpit bulkhead in the engine compartment, is a 150 ampere fusible link and protects the electrical bus from overloads. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

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6-79. Battery Bus

6-80. Description – Battery Bus

Aircraft prior to S/N 5134: In the event of the main electrical terminal strip (T1) failure, the battery terminal strip (T11, TH-28 only) provides emergency power to the N_2/N_R tachometer and if installed to the "active" TOT and N_1 indicating systems. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

Aircraft S/N 5134 and subsequent: In the event of the electrical bus failure, emergency power, controlled by the N1-N2-NR-TOT switch, can be supplied to the gas producer tachometer (N_1), dual tachometer (N_2/N_R), and TOT indicator. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-81. N_2/N_R Switch

NOTE

If the N_2/N_R switch (SW20) is inadvertently left in the BATT position, the battery can be completely discharged.

6-82. Description – N_2/N_R Switch

The N_2/N_R switch (SW20), located in the instrument panel (See Figure 6-1), is used to connect emergency battery power to the dual tachometer and if installed the "active" TOT and N_1 indicating systems in the event of a main electrical terminal strip (T1) failure. The switch is normally in the NORMAL or BUS position. To apply emergency power, place the switch in the BATT position. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-82.1. N1-N2-NR-TOT Switch

NOTE

If the N1-N2-NR-TOT switch (SW45/SW53) is inadvertently left in the BATT position, the battery can be completely discharged.

6-82.2. Description – N1-N2-NR-TOT Switch

The N1-N2-NR-TOT switch (SW45/SW53) is located at the top right side of the instrument panel. It controls the emergency electrical power circuits that provide power to the gas producer (N1) tachometer, the dual (N2/NR) tachometer, and the TOT indicator in case of a complete electrical system failure. Emergency power is supplied directly from the battery to the indicators by moving the switch from the BUS position to the BATT position. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

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6-83. Lighting Provisions

6-84. Description – Lighting Provisions

The lighting provisions include all the equipment necessary for the illumination of the instruments, switches, circuit breakers, and interior and exterior of the aircraft for night operations.

6-85. Interior Lighting Systems

6-86. Description – Interior Lighting Systems

The internal lighting systems consist of the instrument lights, instrument panel flood lights, and cockpit/map lights.

6-87. Instrument Lights

6-88. Description – Instrument Lights

The panel lighting is divided into three groups: engine instruments (this group includes the circuit breaker and electrical switch panels), avionic/radio equipment, and flight instruments. Each group consists of a potentiometer, dimmer assembly, balance card, lamps, wiring, and circuit breaker. The potentiometers, located in the electrical switch panel (See Figure 6-1), adjust the output voltage of the dimmer assemblies, thus varying the intensity of the lighting. The balance cards (harmonizing cards) use fixed resistors to equalize the light intensity of each lamp in a lighting group (TH-28 Option). The dimmer assemblies, located outboard on the keel assembly beneath the cabin floor, are solid state units and continuously powered when the PNL LTS switch is on. Four different types of lighting are utilized for the instrument lights. Post type or illuminated panel lighting is used for the circuit breaker and switch panels and for any instrument that does not have an internal lighting source. Most of the flight instruments use a light tray assembly for instrument lighting. The instruments must be removed to replace the light tray assembly or the lamps installed in them. Most of the navigation and engine instruments, radios, and avionics have internal lighting. These components must be returned to an authorized repair facility to have unserviceable internal lighting repaired. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-89. Instrument Panel Flood Lights (480/B Option)

6-90. General Description – Instrument Panel Flood Lights

Three blue-white instrument panel flood lights, located on the bottom side of the instrument panel glare shield, furnish secondary illumination for the instrument panel should the instrument lighting in any or all of the groups fail. These lights are activated and controlled by a three position switch (SW6) labeled FLOOD. With the switch (SW6) in the up position, the flood lights are activated at the maximum intensity. With the switch (SW6) in the down position, the lights are activated at the factory preset dim condition. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

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6-91. Cockpit/Map Lights

6-92. General Description – Cockpit/Map Lights

A hand held cockpit/map light (the TH-28 has three cockpit/map lights) is provided for the crew. The light is stowed in a bayonet type holder and is within easy reach of the crew while in flight. The cockpit/map light has a red filter that may be positioned over the normal white light, and a rheostat at the back of the light unit to control the intensity of the light. The light is also equipped with a momentary push button type rheostat override switch located on the top of the rheostat that will activate the light to full bright as long as the switch is depressed. The light beam can be controlled from a spotlight beam to a floodlight beam. This provides a secondary source of illumination for each primary crewmember if the instrument lighting fails on one side of the instrument panel. The cockpit/map light is protected by the PLT INST circuit breaker. The cockpit/map light in a 480 is fuse protected.

6-93. Removal – Cockpit/Map Lights

A. Disconnect the battery and ensure all electrical power is removed from the aircraft.

B. Remove the circuit breaker panel.

C. Disconnect the light wiring.

D. Remove the mounting hardware and remove the light assembly.

6-94. Inspection – Cockpit/Map Lights

A. Inspect the light for corroded lamp socket terminals, shorted or broken wires, cracked lens, burned out lamp bulbs, and improper bonding to ground.

6-95. Repair – Cockpit/Map Lights

A. Light assemblies may be repaired by replacing damaged or defective component parts. If the light case is damaged beyond repair, the complete unit must be replaced.

6-96. Installation – Cockpit/Map Lights

A. Install the light assembly with the mounting hardware and connect the wiring.

B. Reinstall the circuit breaker panel and check the light for proper operation.

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6-97. Exterior Lighting Systems

6-98. Description – Exterior Lighting Systems

The exterior lighting systems consist of the landing light, anticollision lights, and position lights.

6-99. Landing Light

6-100. Description – Landing Light

A moveable landing light is located in the lower nose section of the aircraft. Two landing light lamp types are available; incandescent (LA28) or LED (D48 or D50). The landing light is activated by a switch (SW7) located on the pilot's collective control stick. On aircraft with dual collective engine start and idle stop controls (S/N 5136 and subsequent), the landing light is activated by a switch (SW7) on the pilot's collective control stick or by a switch (SW88) on the co-pilot's collective control stick. The landing light switch controls the landing light relay (RL1), which connects the power used to illuminate the lamp, and connects the power used to operate the landing light positioning motor (M5) located in the nose section of the cabin. The landing light relay (RL1) is located in the aft portion of the keel assembly under the cockpit floor. The position of the landing light is controlled by a switch (SW8 or SW13) located on both the pilot's and co-pilot's collective control sticks. The switch is a momentary switch spring loaded to the center (OFF) position and has a serrated top. When the switch is pressed forward (UP), the landing light positioning motor will move the landing light beam upward until the switch is released or the motor comes to its internal stop. When the switch is pressed aft (DOWN), the landing light positioning motor will move the landing light beam downward until the switch is released or the motor comes to its internal stop. A voltage regulator (VC1), located next to the landing light relay, is used to provide the 12 Vdc required to operate the positioning motor and is non-adjustable.

6-100.1. Description – Pulse Landing Light

(S/N 5121 only) A moveable halogen pulse landing lamp (LA28) is activated by a switch (SW81) located on the pilot's collective control stick. The landing light switch (SW81) provides switched power from the fuse (F12) to the voltage regulator (VC1). The switch (SW81) also provides switched ground to the pulse control unit to select either constant or pulsed illumination of the landing light as well as to the instrument panel to select which LED indicator illuminates. The fuse (F12) is the bus source for the LED indicators (D10 and D33) in daylight mode. The circuit breaker (CB/SW8) controls the day/night relay (RL17) to switch power to the LED indicators (D10 and D33) from fuse (F12) to the panel instruments dimmer control for night mode. The day/night relay (RL17) is located on the back side of the pedestal console behind the fuse panel.

(S/N 5173 and subsequent) The LED landing lamp option (D50 only) includes a pulse feature, if configured. The landing light is activated by a switch (SW107) located on the pilot's collective control stick or by a switch (SW108) on the co-pilot's collective control stick.

For aircraft equipped with the G1000H Integrated Flight Deck, the switch controls the landing light relay (RL1) which connects the power to the lamp for constant illumination and provides switched ground to the G1000H display to annunciate landing light operation. The switch also controls the pulse landing light annunciation relay (RL42) which connects the power to the lamp for pulsed illumination and provides switched ground to the G1000H display to change the annunciation from landing light on to landing light pulse operation.

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6-101. Landing Light Lamp

NOTE

Repair procedures are not available for either the incandescent or LED landing light.

6-102. Removal – Landing Light Lamp

A. Ensure all electrical power is off.

B. Remove the landing light lamp retaining ring.

C. Disconnect the wiring from the lamp and remove the lamp.

6-103. Installation – Landing Light Lamp

A. Install the lamp in the reverse order of the removal procedure.

6-104. Landing Light Switches

A. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-105. Landing Light Relay

A. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-106. Landing Light Motor

6-107. Removal – Landing Light Motor

A. Ensure all electrical power is off.

B. Remove the landing light lamp (para. 6-102).

C. Remove the link between the motor and the lamp retainer.

D. Disconnect the electrical connector from the motor.

E. Remove the hardware securing the motor to the mounting bracket and remove the motor.

6-108. Inspection – Landing Light Motor

A. Inspect the motor for damage, broken wires, security of mounting, and proper operation.

6-109. Repair – Landing Light Motor

A. Repair damaged wiring or electrical connector.

B. Tighten loose mounting hardware.

C. Replace the motor if it is not operating properly.

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6-110. Installation – Landing Light Motor

A. Install the motor onto the mounting bracket.

B. Connect the electrical connector.

C. Install the link between the motor and the lamp retainer.

D. Install the landing light lamp (para. 6-103).

6-111. Landing Light Motor Voltage Regulator

6-112. Removal – Light Motor Voltage Regulator

A. Ensure all electrical power is off.

B. Remove the right side keel access panel.

C. Disconnect the wiring from the terminal strip.

D. Remove the hardware securing the regulator to the bracket and remove the regulator.

6-113. Inspection – Light Motor Voltage Regulator

A. Inspect the regulator for damage, broken wires, security, and proper operation.

6-114. Repair – Light Motor Voltage Regulator

A. Repair damaged wiring.

B. Tighten loose mounting hardware.

C. Replace the voltage regulator if damaged or not operating properly.

6-115. Installation – Light Motor Voltage Regulator

A. Install the voltage regulator onto the bracket.

B. Connect the wiring to the terminal strip.

C. Install the keel access panel.

6-115.1. Pulse Control Unit (S/N 5121 only, Refer to Paragraphs 6-100.1)

6-115.2. Description – Pulse Control Unit

The pulse control unit, located in the keel assembly under the cockpit floor, pulses the landing light 45 times per minute. It also allows the landing light to be on for constant illumination depending on the position of the landing light switch (SW81). The pulse control unit power is provided via the (LDG LT PLSR) circuit breaker (CB116) (1 Amp).

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6-115.3. Removal – Pulse Control Unit

A. Ensure all electrical power is off. Pull the (LDG LT PLSR) circuit breaker (CB116) out. Disable the circuit breaker by installing a cable tie or other similar device around the circuit breaker stem.

B. Remove the left side keel access panel.

C. Disconnect the wiring from the pulse control unit.

D. Remove the hardware securing the pulse control unit to the bracket assembly.

6-115.4. Inspection – Pulse Control Unit

A. Inspect the pulse control unit for damage, broken wires, security of mounting, and proper operation.

6-115.5. Repair – Pulse Control Unit

A. Repair damaged wiring.

B. Tighten loose mounting hardware.

C. Replace the pulse control unit if it is not operating properly.

6-115.6. Installation – Pulse Control Unit

A. Install the pulse control unit onto the mounting bracket.

B. Connect the electrical wiring.

C. Install the keel access panel.

D. Remove the cable tie or other similar device from the (LDG LT PLSR) circuit breaker stem and push the stem in to set the circuit breaker.

6-116. Anticollision Lights

6-117. Description – Anticollision Lights

The anticollision lights (LA47 and LA48) are high intensity flashing strobe lights located on the end of both horizontal stabilizers. The system consists of a switch/circuit breaker (CB/SW4), 2 light assemblies, and a power supply (SLPS3).

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6-118. Anticollision Lights Switch/Circuit Breaker

6-119. Description –Anticollision Lights Switch/Circuit Breaker

The anticollision light switch/circuit breaker (CB/SW4), located in the electrical switch panel on the instrument panel (See Figure 6-1), connects the aircraft electrical power to the anticollision light power supply (SLPS3) and protects the system from overload. Refer to paragraphs 6-18 through 6-21 for maintenance procedures.

6-120. Anticollision/Position Light Assembly

6-121. Description – Anticollision/Position Light Assembly

The anticollision/position light assembly contains the lamps and lenses for the anticollision (LA47 and LA48) and position lights (LA43, LA44, LA45, and LA46). Depending on which side the assembly is installed, the assembly will either have a red (LA44) or green (LA46) lens for the forward position light.

WARNING

The anticollision light power supply (SLPS3) is a high voltage device. Wait 5 minutes after turning off the power before starting work on the system.

6-122. Removal – Anticollision/Position Light Assembly

NOTE

The removal/installation procedures are the same for both light assemblies except as noted.

A. Ensure all electrical power is off.

CAUTION

The lenses may fall off of the assembly when the lens retainer is removed.

B. Remove the screws securing the lens retainer to the assembly.

C. Remove the lenses from the light assembly.

D. Remove the hardware securing the light assembly to the horizontal stabilizer.

E. Pull the assembly away from the stabilizer and disconnect the electrical connectors J82 and P82 and cut the splices SPL58 and SPL59, or disconnect the electrical connectors J81 and P81 and cut the splices SPL60 and SPL61.

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6-123. Inspection – Anticollision/Position Light Assembly

A. Inspect the light assembly for defective lamps, damaged lenses, security, and proper color lens in the forward position light (red on the left, green on the right), damaged wiring or electrical connectors.

6-124. Repair – Anticollision/Position Light Assembly

A. Replace burned out or defective lamps.

B. Replace damaged lenses or install the correct color lens in the forward position light.

C. Repair damaged wiring or electrical connectors.

D. Tighten loose mounting hardware.

6-125. Installation – Anticollision/Position Light Assembly

NOTE

The removal/installation procedures are the same for both light assemblies except as noted.

A. Connect the electrical connectors to the light assemblies (J82 and P82 and resplice SPL58, SPL59, SPL60, and SPL61).

CAUTION

Use caution when installing the mounting hardware so that the electrical wiring in the light assembly is not pinched and shorted to ground.

B. Position the assembly onto the horizontal stabilizer and install the mounting hardware.

NOTE

Ensure the red lens is installed on the left forward position light and the green lens is installed on the right forward position light.

C. Install the lenses.

D. Install the lens retainer.

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6-125.1 LED Position and Strobe Light Assembly

6-125.2. Description – LED Position and Strobe Light Assembly

The LED position and strobe light assembly contains the LEDs and lenses for the position lights (D38, D39, D40, and D41) and the strobe lamp for the anticollision (LA47 and LA48) light. Depending on which side the assembly is installed, the assembly will either have three forward red and two aft white LEDs (D40 and D41) or three forward green and two aft white LEDs (D40 and D41).

WARNING

The anticollision light power supply (SLPS3) is a high voltage device. Wait 5 minutes after turning off the power before starting work on the system.

6-125.3. Removal – LED Position and Strobe Light Assembly

NOTE

The removal/installation procedures are the same for both light assemblies except as noted.

A. Ensure all electrical power is off.

CAUTION

The lenses may fall off of the assembly when the lens retainer is removed.

B. Remove the screws securing the lens retainer to the assembly.

C. Remove the forward and aft lenses from the light assembly.

D. Remove the hardware securing the light assembly to the horizontal stabilizer.

E. Pull the assembly away from the stabilizer and disconnect the electrical connectors J82, P82, J238, and P238 (left light assembly), or disconnect the electrical connectors J81, P81, J237, and P237 (right light assembly).

6-125.4. Inspection – LED Position and Strobe Light Assembly

A. Inspect the light assembly for defective LEDs or strobe lamp, damaged lenses, security, and proper color LED position lights (red on the left, green on the right), damaged wiring or electrical connectors.

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6-125.5. Repair – LED Position and Strobe Light Assembly

A. Replace the unit if any one LED fails.

B. Replace burned out or defective strobe lamps.

C. Replace damaged lenses.

D. Repair damaged wiring or electrical connectors.

E. Tighten loose mounting hardware.

6-125.6. Installation – LED Position and Strobe Light Assembly

NOTE

Ensure the red LED assembly is installed on the left position and the green LED assembly is installed on the right position. A red dot on the LED circuit board indicates the red LED assembly. A green dot on the LED circuit board indicates the green LED assembly.

A. Connect the electrical connectors to the light assemblies (J82, P82, J238, and P238 or J81, P81, J237, and P237).

CAUTION

Use caution when installing the mounting hardware so that the electrical wiring in the light assembly is not pinched and shorted to ground.

B. Position the assembly onto the horizontal stabilizer and install the mounting hardware.

NOTE

Ensure the red LED assembly is installed on the left position and the green LED assembly is installed on the right position. A red dot on the LED circuit board indicates the red LED assembly. A green dot on the LED circuit board indicates the green LED assembly.

C. Install the forward and aft lenses.

D. Install the lens retainer.

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6-126. Anticollision Light Power Supply

6-127. Description – Anticollision Light Power Supply

The anticollision light power supply (SLPS3), located in the tailcone, provides the power and switching to make the anticollision lights (LA47 and LA48) alternately double flash with a 650 candlepower intensity.

WARNING

The strobe anticollision light power supply (SLPS3) is a high voltage device. Wait 5 minutes after turning off the power before starting work on the system.

6-128. Removal – Anticollision Light Power Supply

A. Remove the aft tailcone/horizontal stabilizer access panel from both sides of the tailcone.

6-129. Inspection – Anticollision Light Power Supply

A. Inspect the power supply for damage, broken electrical connectors, security of installation, and proper operation.

6-130. Repair – Anticollision Light Power Supply

A. Replace the power supply if defective or the electrical connectors are broken.

B. Tighten loose mounting hardware.

6-131. Installation – Anticollision Light Power Supply

A. Install the power supply onto the mounting bracket and install the mounting hardware and install the electrical shields.

B. Connect the power input (P95) and output (P93 and P94) electrical connectors.

C. Install the tailcone/horizontal stabilizer access panels.

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6-131.1. LED Anticollision Lights

6-131.2. Description – LED Anticollision Lights

The anticollision LED beacon lights (D34 and D35) are located centerline above the cabin behind the main rotor mast and under the helicopter on the center belly panel. The system consists of a switch/circuit breaker (CB/SW13) and 2 light assemblies.

6-131.3. Description – LED Anticollision Lights Switch/Circuit Breaker

The anticollision light switch/circuit breaker (CB/SW13), located in the electrical switch panel on the instrument panel (See Figure 6-1), protects the system from overload. Refer to paragraphs 6-18 through 6-21 for maintenance procedures.

6-131.4. Removal – LED Anticollision Lights

NOTE

The removal/installation procedures are the same for both light assemblies except as noted.

A. Ensure all electrical power is off.

B. Remove the screws securing the light assembly to the aircraft surface.

C. Pull the assembly away and disconnect the electrical connectors (P225 and P227).

6-131.5. Inspection – LED Anticollision Lights

A. Inspect the light assembly for defective lamps, security, and damaged wiring or electrical connectors.

6-131.6. Repair – LED Anticollision Lights

A. Replace the unit if any one LED fails.

B. Repair damaged wiring or electrical connectors.

C. Tighten loose mounting hardware.

6-131.7. Installation – LED Anticollision Lights

NOTE

The removal/installation procedures are the same for both light assemblies except as noted.

A. Connect the electrical connectors to the light assemblies (P225 and P227).

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CAUTION

Use caution when installing the mounting hardware so that the electrical wiring in the light assembly is not pinched and shorted to ground.

B. Position the assembly and install the mounting hardware.

6-132. Position Lights

6-133. Description – Position Lights

The position light system consists of a switch/circuit breaker (CB/SW5) and two (2) light assemblies.

6-134. Position Light Switch/Circuit Breaker

6-135. Description – Position Light Switch/Circuit Breaker

The position light switch/circuit breaker (CB/SW5), located in the electrical switch panel on the instrument panel (See Figure 6-1), connects power to the position lights (LA43, LA44, LA45, and LA46 or D38, D39, D40, and D41) and protects the system from overload. Refer to paragraph 6-18 through 6-21 for maintenance procedures.

6-136. Anticollision/Position Light Assembly

A. Refer to paragraphs 6-122 through 6-125 for maintenance procedures.

6-136.1. LED Position and Strobe Light Assembly

A. Refer to paragraphs 6-125.1 through 6-125.6 for maintenance procedures.

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6-137. Caution and Warning System

6-138. Description – Caution and Warning System

NOTE

Aircraft S/N 5136 and subsequent are equipped with a 20 segment caution panel to accommodate additional inputs and allow for NVIS compatibility through LED lighting.

NOTE

For aircraft equipped with the G1000H Integrated Flight Deck, refer to Enstrom TH-28/480 Series Maintenance Manual Supplement 8 for information regarding the caution and warning system.

A. The caution system for aircraft S/N 5135 and earlier consists of a caution panel, two annunciator/switches (one on the 480), a test/dim switch (SW14), and 14 input circuits. The warning system consists of three individual warning lights (LA1, LA2, and LA3) and their associated input circuits (See Figure 6-1).

B. For aircraft S/N 5136 and subsequent, the caution system consists of a caution panel unit with an integrated test/dim switch, two annunciator/switches, and 23 input circuits. The warning system consists of three individual warning lights (LA1, LA2, and LA3 or D43, D44, and D45) and their associated input circuits (See Figure 6-1.6).

C. The caution system is used to provide a visual indication that a fault condition has occurred. The caution panel, located in the instrument panel, has individual worded segments, which when illuminated identify specific fault conditions (Refer to Figure 6-4 and Table 6-1). When a fault occurs, the associated segment on the caution panel illuminates and flashes at a 2 Hz rate, and the MASTER CAUTION annunciator/switches, located on the left and right side of the instrument panel, will illuminate and flash at the same rate. When the fault is acknowledged by pressing one of the MASTER CAUTION annunciator/switches, the MASTER CAUTION light will extinguish and the fault on the caution panel will reset to a steady (on) condition. As each fault condition occurs, it is indicated by the same sequence of events as described above. Only a new fault will flash until it is acknowledged. The MASTER CAUTION annunciator/switches will only be illuminated by faults associated with the caution panel; the warning system will not activate the MASTER CAUTION annunciator/switches.

NOTE

If the optional airframe fuel filter is installed, the SPARE segment on the caution panel will be connected to the impending bypass switch incorporated in the filter assembly. The segment for the impending bypass will be labeled A/F FILTER.

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NOTE

The BATT HOT and BATT TEMP segments are utilized for optional Ni-Cad battery installation. For the standard lead acid battery installation, these segments will be labeled SPARE.

NOTE

Aircraft S/N 5135 and earlier: The ENG ANTI-ICE segment of the caution panel will not flash or cause the MASTER CAUTION annunciator/switch to illuminate or flash. On early production aircraft, the engine anti-ice segment is labeled ENG DEICE.

NOTE

Aircraft S/N 5136 and subsequent: The ENG ANTI-ICE, LDG LIGHT ON, LDG LIGHT PULSE, and CARGO HOOK ARMED segments of the caution panel will not flash or cause the MASTER CAUTION annunciator/switch to illuminate or flash.

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ENG CHIP	MAIN XMSN CHIP	TAIL CHIP
ENG OIL TEMP	MAIN XMSN HOT	DRIVE BRG HOT
ENG OIL PRESS	BATT HOT	SPARE
ENG INLET AIR	BATT TEMP	DC GEN
FUEL FILTER	FUEL LOW	ENG ANTI-ICE

TH-28/480 Standard Configuration

ENG CHIP	MAIN XMSN CHIP	TAIL CHIP
ENG OIL TEMP	MAIN XMSN HOT	DRIVE BRG HOT
ENG OIL PRESS	MRGB PRESS	SPARE
ENG INLET AIR	SPARE	DC GEN
FUEL FILTER	FUEL LOW	ENG ANTI-ICE

480: S/N 4042 and Subsequent
480B: Prior to S/N 5136

ENG CHIP	MAIN XMSN CHIP	TAIL CHIP	FUEL FILTER
ENG OIL TEMP	MAIN XMSN HOT	DRIVE BEARING HOT	A/F FUEL FILTER
ENG OIL PRESS	MAIN XMSN PRESS	BATT TEMP	FUEL LOW
ENG INLET AIR	DC GEN	BATT HOT	SPARE
ENG ANTI-ICE	LDG LIGHT ON	LDG LIGHT PULSE	CARGO HOOK ARMED

Note: The wording layout of an individual segment may vary from that shown above.

480B: S/N 5136 and Subsequent

Figure 6-4. Caution Panel

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Table 6-1. Caution Panel Segments

SEGMENT	COLOR	DESCRIPTION OF FAULT
ENG CHIP	**AMBER**	Engine scavenge oil has ferrous metal fragments
MAIN XMSN CHIP	**AMBER**	Main transmission chip detector has detected ferrous metal fragments
TAIL CHIP	**AMBER**	Tail rotor transmission chip detector has detected ferrous metal fragments
FUEL FILTER	**AMBER**	Pressure drop in the fuel filter exceeds 1.3 psi and filter bypass is impending
ENG OIL TEMP	**AMBER**	Engine oil temperature is above 107°C
MAIN XMSN HOT	**AMBER**	Main transmission oil temperature is above 107°C
DRIVE BRG HOT	**AMBER**	Either the forward or aft lower pulley bearings are above 120°C
A/F FUEL FILTER	**AMBER**	Airframe fuel filter bypass is impending
ENG OIL PRESS	**AMBER**	Engine N_1 RPM is above 78.5% and engine oil pressure is below 90 psi. (P/N ECD4078 caution panel: Engine N_1 RPM is above 78.5% and anytime engine oil pressure is below 50 psi or above 130 psi)
MAIN XMSN PRESS	**AMBER**	Pump inlet pressure is less than 4.4-5.9 psi/30.2-40.7 kPa of vacuum
BATT TEMP	**AMBER**	Battery temperature is at or above 63°C
FUEL LOW	**AMBER**	Fewer than 5 gallons/19 liters remaining
ENG INLET AIR	**AMBER**	Engine inlet particle separator partially blocked
DC GEN	**AMBER**	DC generator system failure
BATT HOT	**RED**	Battery temperature is at or above 71°C
SPARE	**AMBER**	Spare segment
ENG ANTI-ICE	**GREEN**	Engine anti-ice is activated
LDG LIGHT ON	**GREEN**	Landing light is activated
LDG LIGHT PULSE	**GREEN**	Pulse landing light is activated
CARGO HOOK ARMED	**GREEN**	Cargo hook electric release is armed

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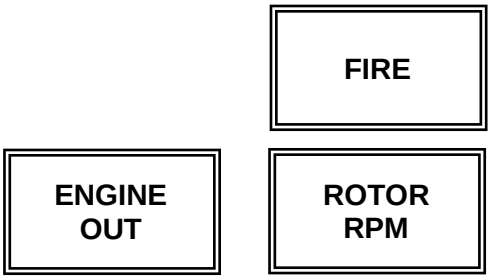


Figure 6-5. Warning Lights

Table 6-2. Warning Lights

LIGHTS	COLOR	DESCRIPTION OF FAULT
ROTOR RPM	**RED**	Low Rotor RPM Warning System: Main rotor RPM below 334 RPM. Hi/Lo Rotor RPM Warning System: Main rotor RPM below 334 RPM or above 385 RPM.
ENGINE OUT	**RED**	Engine N_1 below 58%
FIRE	**RED**	The fire detection system has detected either a fire or an extreme overheat condition in either the upper or lower engine compartment.

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NOTE

480, S/N 5042 and subsequent, and the 480B, S/N 5135 and earlier, are equipped with an oil filtration/cooling system on the main rotor transmission. This system incorporates a pressure switch which is connected to the caution panel. On aircraft S/N 5135 and earlier, the segment associated with the switch is labeled MRGB PRESS and is currently located in the BATT HOT location of the caution panel. Aircraft prior to S/N 5136 equipped with the filtration/cooling system must be equipped with the lead acid battery.

D. The warning system consists of three independent red warning lights (LA1, LA2, and LA3 or D43, D44, and D45) located at the top of the instrument panel (refer to Figure 6-5 and Table 6-2). When each light is activated, it comes on steady and full bright with no dimming capability. The warning lights are for conditions that require immediate action to correct.

6-139. Caution System

6-140. Functional Test - Caution System

NOTE

Aircraft S/N 5135 and earlier have a 15-segment illuminated caution panel. The TEST/CAUT PNL/DIM switch (SW14) is interfaced with the aircraft wiring harness. Aircraft S/N 5136 and subsequent have a 20-segment LED illuminated caution panel with the TST/BRT/DIM switch interfaced within the caution panel unit.

NOTE

For aircraft equipped with the G1000H Integrated Flight Deck, refer to Enstrom TH-28/480 Series Maintenance Manual Supplement 8 for caution system function tests.

NOTE

The MAIN XMSN PRESS, LDG LIGHT ON, LDG LIGHT PULSE, CARGO HOOK ARMED segments apply to aircraft S/N 5136 and subsequent.

NOTE

The following procedures cover the functional tests of all the caution system circuits. Open all circuit breakers. The MASTER CAUTION annunciator/switches should illuminate each time a caution panel segment illuminates and shall be reset each time in preparation for another fault indication.

A. Caution Panel:

(1) Apply external power to aircraft and turn the BATT switch (SW10) on.

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(2) Close the CAUT PNL circuit breaker. Check that the MASTER CAUTION annunciator/switches are flashing at a 2 Hz rate and the following segment lights in the caution panel are illuminated and flashing: ENG CHIP, MAIN XMSN CHIP, TAIL CHIP, ENG OIL PRESS, MAIN XSMN PRESS (MRGB PRESS, S/N 5135 and earlier), DC GEN, and FUEL LOW.

NOTE

The ENG CHIP, MAIN XMSN CHIP, and TAIL CHIP segments should only be illuminated for approximately 5 seconds and then extinguish due to programmed continuity sensors (PCS1, PCS2, and PCS3) in each detector circuit.

NOTE

The FUEL LOW segment should only illuminate if there is approximately 5-8 gallons or less of fuel in the aircraft fuel cells.

(3) Reset the MASTER CAUTION annunciator/switches by pressing in on the annunciator/switch. Check that the MASTER CAUTION annunciator/switches extinguish and the illuminated caution panel segments are in a steady bright condition.

(4) S/N 5135 and earlier: Place the TEST/CAUT PNL/DIM switch (SW14) in the TEST position. Check that the MASTER CAUTION annunciator/switch is illuminated and flashing and that all the caution panel segment lights are illuminated and with the exception of the ENG OIL PRESS, DC GEN, ENG ANTI-ICE, and possibly the FUEL LOW, all the segments are flashing. Release the switch and reset the MASTER CAUTION annunciator/switches.

(5) S/N 5136 and subsequent: Place the TST/BRT/DIM switch in the TST position. Check that the MASTER CAUTION annunciator/switch is illuminated and flashing and that all the caution panel segment lights are illuminated and with the exception of the ENG OIL PRESS, DC GEN, ENG ANTI-ICE, LDG LIGHT ON, LDG LIGHT PULSE, CARGO HOOK ARMED, and possibly the FUEL LOW, all the segments are flashing. Release the switch and reset the MASTER CAUTION annunciator/switches.

(6) S/N 5135 and earlier: Place the TEST/CAUT PNL/DIM switch (SW14) in the DIM position. Check that the ENG OIL PRESS, DC GEN, and possibly the FUEL LOW segments are in a steady dim condition. Jumper the tail rotor transmission chip detector to ground. Check that the MASTER CAUTION annunciator/switches and the TAIL CHIP segment are illuminated in a flashing bright condition and that the ENG OIL PRESS, DC GEN, and possibly the FUEL LOW segments are in a steady dim condition. Reset the MASTER CAUTION annunciator/ switches and check that the ENG OIL PRESS, DC GEN, TAIL CHIP, and possibly the FUEL LOW segments are in a steady dim condition. Place the TEST/CAUT PNL/DIM switch in the center position and check that the segment lights return to a steady bright condition. Remove the jumper from the tail rotor transmission.

(7) S/N 5136 and subsequent: Place the TST/BRT/DIM switch in the DIM position. Check that the ENG OIL PRESS, DC GEN, and possibly the FUEL LOW segments are in a steady dim condition. Jumper the tail rotor transmission chip detector to ground. Check that the MASTER CAUTION annunciator/switches and the TAIL CHIP segment are illuminated in a

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flashing bright condition and that the ENG OIL PRESS, DC GEN, and possibly the FUEL LOW segments are in a steady dim condition. Reset the MASTER CAUTION annunciator/switches and check that the ENG OIL PRESS, DC GEN, TAIL CHIP, and possibly the FUEL LOW segments are in a steady dim condition. Place the TST/BRT/DIM switch in the BRT position and check that the segment lights return to a steady bright condition. Remove the jumper from the tail rotor transmission.

B. Engine, Main and Tail Rotor Transmission Chip Detector Lights:

(1) Because of the programmed continuity sensors (PCS1, PCS2, and PCS3) installed in the chip detector wiring, this portion on the caution panel circuitry is tested every time the BATT switch (SW10) is turned on. Also, for aircraft so equipped (S/N 5135 and prior and S/N 5256 and subsequent (if equipped with the legacy instrument panel)), the caution panel circuitry is tested when the caution panel test/dim switch is placed and held in the test position for 3 seconds or longer. If the segment lights do not illuminate when the BATT switch (SW10) is turned on or the caution panel test/dim switch is placed in the test position, there is a problem with the detector wiring. If the segments do not extinguish after approximately 5 seconds, there is a problem with that circuit's continuity sensor or the chip detector.

C. Engine Oil Temperature Light:

(1) Disconnect the electrical connector (J16 or J161) from the engine oil pressure/ temperature gauge and jumper pin A or pin J, as applicable, to ground. Check that the ENG OIL TEMP segment is illuminated.

(2) Remove the jumper and check that the ENG OIL TEMP segment is extinguished. Reconnect the electrical connector.

D. Main Rotor Transmission Oil Temperature Light:

(1) Disconnect the electrical connector (J14 or J164) from the transmission oil temperature gauge and jumper pin A to ground. Check that the MAIN XMSN HOT segment is illuminated.

(2) Remove the jumper and check that the MAIN XMSN HOT segment is extinguished. Reconnect the electrical connector.

E. Lower Pulley Bearing Temperature Light:

(1) Disconnect the electrical connector (J64 or J166) from the bearing temperature warning unit and jumper pin J to ground. Check that the DRIVE BRG HOT segment is illuminated.

(2) Remove the jumper and check that the DRIVE BRG HOT segment is extinguished. Reconnect the electrical connector.

F. Engine Oil Pressure Light:

(1) Close the ENG/TEMP PRESS circuit breaker. Connect a pressure source to the engine oil pressure transducer and apply pressure. The ENG OIL PRESS segment should extinguish at 50 psig increasing pressure and illuminate at 50 psig decreasing pressure.

(2) Remove the pressure source from the transducer and open the ENG TEMP/PRESS circuit breaker.

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NOTE

Step G applies to an optional Ni-Cad battery installation. If the lead acid battery is installed, the connector for these segments will be tied off and not connected to the battery. The segments for these indications may also have "SPARE" segments installed.

G. Battery Temperature Lights:

(1) Disconnect the electrical connector (J89) from the battery and jumper pin A to B and pin C to D. Check that the BATT HOT and BATT TEMP segments are illuminated.

(2) Remove the jumpers and check that the BATT HOT and BATT TEMP segments are extinguished. Reconnect the electrical connector.

H. Engine Inlet Air Light:

(1) Disconnect the electrical connector (J69) from the engine inlet differential pressure switch and jumper pin B to ground. Check that the ENG INLET AIR segment is illuminated.

(2) Remove the jumper and check that the ENG INLET AIR segment is extinguished. Reconnect the electrical connector.

I. Generator Light:

(1) Disconnect the electrical connector (J47 or J191) from the GCU. Check that the DC GEN segment is extinguished.

(2) Reconnect the electrical connector and check that the DC GEN segment is illuminated.

J. Fuel Filter Differential Pressure Light:

(1) Disconnect the electrical connector (J68) from the fuel filter differential pressure switch and jumper pin B to ground. Check that the FUEL FILTER segment is illuminated.

(2) Remove the jumper and check that the FUEL FILTER segment is extinguished. Reconnect the electrical connector.

K. Low Fuel Light:

(1) If there is more than 5-8 gallons/19-30 liters of fuel in the aircraft and the FUEL LOW segment is not illuminated, disconnect the electrical connector (J67 or J134) from the fuel cell and jumper pin A or pin 1 to ground. Check that the FUEL LOW segment is illuminated.

(2) Remove the jumper and check that the FUEL LOW segment is extinguished. Reconnect the electrical connector.

(3) If there is less than 5-8 gallons/19-30 liters and the FUEL LOW segment is illuminated, disconnect the electrical connector (J67 or J134) from the fuel cell. Check that the FUEL LOW segment is extinguished.

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(4) Reconnect the electrical connector and check that the FUEL LOW segment is illuminated.

L. Engine Anti-Ice Light:

(1) Pull the ENG ANTI-ICE control on. Check that the ENG ANTI-ICE segment is illuminated.

(2) Push the ENG ANTI-ICE control off and check that the ENG ANTI-ICE segment is extinguished.

M. Air Frame Fuel Filter Impending Bypass (Optional Equipment):

(1) Press the test button on the external fuel filter assembly. Check that the A/F FILTER segment is illuminated.

(2) Release the test button. Check that the A/F FILTER segment is extinguished.

N. Main Rotor Transmission Filtration/Cooling Oil Pressure:

(1) Open the main rotor transmission oil pump (MRGB PUMP) circuit breaker and check that the MRGB PRESS (MAIN XMSN PRESS, S/N 5136 and sub.) segment illuminates.

(2) Close the main rotor transmission oil pump (MRGB PUMP) circuit breaker and check that the MRGB PRESS (MAIN XMSN PRESS, S/N 5136 and sub.) segment extinguishes.

NOTE

Steps O through Q apply to aircraft S/N 5136 and subsequent.

O. Landing Light On Light:

(1) Switch the landing light on the pilot's collective switch box to ON. Check that the LDG LIGHT ON segment is illuminated.

(2) Switch the landing light on the pilot's collective switch box to OFF. Check that the LDG LIGHT ON segment is extinguished.

(3) Switch the landing light on the co-pilot's collective switch box to ON. Check that the LDG LIGHT ON segment is illuminated.

(4) Switch the landing light on the co-pilot's collective switch box to OFF. Check that the LDG LIGHT ON segment is extinguished.

P. Landing Light Pulse Light (Optional Equipment):

(1) Switch the landing light on the pilot's collective switch box to PULSE. Check that the LDG LIGHT ON segment is illuminated.

(2) Switch the landing light on the pilot's collective switch box to OFF. Check that the LDG LIGHT ON segment is extinguished.

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(3) Switch the landing light on the co-pilot's collective switch box to PULSE. Check that the LDG LIGHT ON segment is illuminated.

(4) Switch the landing light on the co-pilot's collective switch box to OFF. Check that the LDG LIGHT ON segment is extinguished.

Q. Cargo Hook Armed Light (Optional Equipment):

(1) Switch the CARGO HOOK ARM on the lower right side of the instrument panel to ON. Check that the CARGO HOOK ARMED segment is illuminated.

(2) Switch the CARGO HOOK ARM on the lower right side of the instrument panel to OFF. Check that the CARGO HOOK ARMED segment is extinguished.

6-141. Caution Panel

6-142. Description – Caution Panel

NOTE

Aircraft S/N 5136 and subsequent have a 20-segment LED illuminated caution panel with the caution panel/test switch interfaced within the caution panel unit.

NOTE

For aircraft S/N 5157, 5183 and subsequent, the 20 segment caution panel is replaced by the G1000H Integrated Flight Deck, if equipped.

The caution panel has segments which when illuminated identify specific fault conditions. On aircraft S/N 5135 and earlier, each segment of the caution panel has two lamps so that the segment will still illuminate if a lamp fails. On aircraft S/N 5136 and subsequent, each segment is LED illuminated. The internal circuitry controls the 2 Hz flashing feature and the dimming feature when the test/dim switch is in the DIM position.

6-143. Removal – Caution Panel

A. Ensure all electrical power is off.

B. Gain access to the back of the instrument panel (para. 7-3).

C. Disconnect the electrical connectors (J59 & P60 or J242) from the caution panel.

D. Remove the hardware securing the caution panel in the instrument panel and remove the caution panel.

6-144. Inspection – Caution Panel

NOTE

Steps A and B are applicable to S/N 5135 and earlier.

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A. Inspect the caution panel for damage, burned out lamps, missing or illegible segment lenses, damaged electrical connectors or pins, and security of installation.

B. Check the caution panel for proper operation I/A/W paragraph 6-140.

NOTE

Steps C and D are applicable to S/N 5136 and subsequent.

C. Inspect the caution panel for damage, failed LED circuits, damaged display, damaged electrical connectors or pins, functioning caution panel/test switch, and security of installation.

D. Check the caution panel for proper operation I/A/W paragraph 6-140.

6-145. Repair – Caution Panel

NOTE

Steps A through E are applicable to S/N 5135 and earlier.

A. Replace burned out lamps by pushing in on the affected segment until the spring catch releases and pull the segment out of the panel. Replace the lamp and reinstall the segment.

B. Repair minor damage to the panel that does not affect the panel operation.

C. Straighten bent connector pins and repair or replace damaged electrical connectors.

D. Tighten loose mounting hardware.

E. Replace the panel if the panel fails the test in paragraph 6-140 and the defect is in the caution panel.

NOTE

Steps F through I are applicable to aircraft S/N 5136 and subsequent.

F. Repair procedures are not available for the caution panel unit. Replace the panel if any LED circuit is not functioning or the TST/BRT/DIM switch does not function.

G. Straighten bent connector pins and repair or replace damaged electrical connectors.

H. Tighten loose mounting hardware.

I. Replace the panel if the panel fails the test in paragraph 6-140 and the defect is in the caution panel.

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6-146. Installation – Caution Panel

A. Position the caution panel into place and secure with the mounting hardware.

B. Connect the electrical connectors.

C. Install the instrument panel covers.

6-147. Master Caution Annunciator/Switch

6-148. Description – Master Caution Annunciator/Switch

The master caution annunciator/switches are used to alert the pilot that a fault condition exists and to reset the flashing circuitry in the caution panel. Each annunciator/switch has 4 lamps so that failure of up to three lamps will still illuminate the annunciator/ switch. On aircraft S/N 5136 and subsequent, an optional LED annunciator/switch may be installed. Each LED annunciator/switch has four independent LED circuits. Failure of one LED circuit would not affect the remaining LED circuits.

6-149. Removal – Master Caution Annunciator/Switch

A. Ensure all electrical power is off.

B. Gain access to the back of the instrument panel (para. 7-3).

C. Disconnect the electrical connector (J72 or J73) from the annunciator/switch.

D. Grasp the annunciator/switch push to reset portion by the sides and pull the front of the annunciator/switch from the rest of the unit. Allow the front portion to hang on its hinge.

E. Using a small screwdriver, unlock the retaining latch by turning the retaining screw, located in the top center portion of the unit, counter clockwise.

F. Slide the unit from the instrument panel and remove the retaining collar from the back of the instrument panel.

6-150. Inspection – Master Caution Annunciator/Switch

A. Inspect the annunciator/switch for damage, burned out lamps or failed LED circuits, damaged electrical connector, and security of installation.

B. Check the annunciator/switch for proper operation I/A/W paragraph 6-140.

6-151. Repair – Master Caution Annunciator/Switch

A. Replace burned out lamps by grasping the annunciator/ switch push to reset portion by the sides and pulling the front of the annunciator/switch from the rest of the unit. Allow the front portion to hang on its hinge. Replace the failed lamp and reinstall the front portion of the annunciator/switch.

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B. Repair procedures are not available for failed LED circuits. Replace the switch if any LED circuit fails.

C. Repair or replace damaged electrical connectors.

D. Tighten loose mounting hardware.

E. Replace the annunciator/switch if damaged or it fails the test in paragraph 6-140 and the defect is in the annunciator/switch.

6-152. Installation – Master Caution Annunciator/Switch

A. Install the annunciator/switch into the instrument panel. Install the retaining collar onto the annunciator/switch and turn the retaining screw clockwise, engaging the retaining latch onto the collar.

B. Install the front portion of the annunciator/switch into the unit.

C. Reconnect the electrical connector.

D. Install the instrument panel covers.

6-153. Caution Panel Test/Dim Switch

6-154. Description – Caution Panel Test/Dim Switch

NOTE

Aircraft S/N 5135 and earlier: The TEST/CAUT PNL/DIM switch (SW14) is interfaced with the aircraft wiring harness. Aircraft S/N 5136 and subsequent: The TST/BRT/DIM switch is interfaced within the caution panel unit.

For aircraft S/N 5135 and earlier, the caution panel test/dim switch (SW14), located in the electrical switch panel (See Figure 6-1), is used to test the caution panel segment lights, engine out warning light, and the low rotor warning light and to set the caution panel into the dim configuration. The switch is "momentary on" in the TEST position and "constant on" in the DIM position. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

For aircraft S/N 5136 and subsequent, the caution panel test/dim switch is located in the caution panel unit (See Figure 6-1.6). The switch is "momentary on" in the TST position and "constant on" in the DIM position. Refer to paragraphs 6-143 through 6-146 for maintenance procedures

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6-155. Warning System

6-156. Functional Tests – Warning Systems

NOTE

The aircraft is equipped with either a Low Rotor RPM Warning System or a Hi/Lo Rotor RPM Warning System. Some earlier aircraft may have been modified with the Hi/Lo Rotor RPM warning system.

A. Close the CAUT PNL, FIRE DET, and RTR RPM circuit breakers and apply electrical power to the aircraft.

B. Check that the ROTOR RPM (LA3 or D44) and ENGINE OUT (LA2 or D43) warning lights are illuminated and the associated audio horns are not activated.

C. Place the caution panel test/dim switch in the TEST (TST, S/N 5136 and subsequent) position and check that the FIRE warning light (LA1 or D45) illuminates. Release the switch.

D. Release the collective friction and raise the collective controls off of the down stop. Check that the ROTOR RPM (AH1) and ENGINE OUT (AH2 and AH3) audio horns activate.

E. (TH-28 Only) Place the throttle in the flight idle position and press the LOW RPM AUDIO switch (SW21) into the OUT position. Check that the switch (SW21) is latched in the OFF position and that the low rotor audio horn (AH1) is deactivated and the engine out audio horns (AH2 and AH3) are still activated.

F. Place the collective controls against the down stop and apply collective friction. Check that the engine out audio horns (AH2 and AH3) and the hi/low rotor audio horn (AH1) are deactivated (the low rotor audio horns will already be deactivated on a TH-28).

G. (TH-28 Only) Roll the throttle toward the ON position. Check that the LOW RPM AUDIO switch (SW21) releases and cannot be latched.

WARNING

The following checks are to be performed by authorized personnel.

H. Run up the aircraft I/A/W the operator's manual. Check that the ENGINE OUT warning light (LA2 or D43) extinguishes when the N1 passes through 58%.

I. Low Rotor RPM Warning System: Increase the power to bring the NR up to 334 rpm and check that the ROTOR RPM warning light (LA3 or D44) extinguishes at 334 ±1 rpm.

J. Hi/Low Rotor RPM Warning System: Increase the power to bring the NR up to 334 rpm and check that the ROTOR RPM warning light (LA3 or D44) extinguishes at 333 ±1 rpm. If the light does not illuminate or extinguish at 333 ±1 RPM, refer to paragraph 6-160.5 for adjustment.

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WARNING

The following steps, K through O, require flying the aircraft in an autorotation. They should be conducted by an appropriately rated pilot using appropriate safety precautions.

K. Fly the aircraft to an altitude and location where an autorotation can be safely performed and recovered.

CAUTION

Rotor RPM can build very quickly in an autorotation. Use care when approaching the upper red line.

L. Enter a stabilized autorotation and allow the rotor RPM to build to the upper red line, 385 RPM.

M. Check that the ROTOR RPM (LA3 or D44) warning light illuminates and the audio horn (AH1) is activated above 385 +/- 2 RPM. Under no circumstances should the rotor RPM exceed 390.

N. Bring RPM down. Check that the ROTOR RPM (LA3 or D44) warning light extinguishes below 385 +/- 2 RPM and the audio horn deactivates.

O. If the light does not illuminate or extinguish at 385 +/- 2 RPM, refer to paragraph 6-160.5.B. for adjustment.

P. Place the caution panel test/dim switch in the TEST (TST, S/N 5136 and subsequent) position and check that the FIRE, ENGINE OUT, and ROTOR RPM warning lights (LA1, LA2, and LA3 or D43, D44, or D45) illuminate. Release the switch.

Q. Check the operation of the ROTOR RPM (LA3 or D44) and ENGINE OUT (LA2 or D43) warning lights during the shutdown procedure.

6-157. Rotor RPM Warning System

NOTE

The aircraft is equipped with either a Low Rotor RPM Warning System or a Hi/Lo Rotor RPM Warning System. Some earlier aircraft may have been modified with the Hi/Lo Rotor RPM warning system.

6-158. Description – Rotor RPM Warning System

The Hi/Lo Rotor RPM Warning System consists of a warning light (LA3 or D44), a magnetic pickup, the Hi/Lo Rotor RPM Switch, a microswitch (SW18), a test switch (SW14, S/N 5135 and earlier), and an audio horn (AH1). The magnetic pickup, located next to the NR magnetic pickup, senses the main rotor transmission ring gear teeth passage and sends a signal to the Hi/Lo Rotor RPM Switch. The Hi/Lo Rotor RPM Switch, located on the keel structure below the pilot's seat, interrogates

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the incoming signal and triggers the ROTOR RPM warning light (LA3 or D44) and audio horn (AH1) when the main rotor rpm is below 334 RPM or above 385 RPM. The warning light (LA3 or D44) and audio horn (AH1) will be activated anytime the N_R is below 334 RPM or above 385 RPM and the rotor warning system has electrical power applied. A microswitch (SW18), located on the collective torque tube behind the pilot's seat, deactivates the audio horn (AH1) when the collective controls are on the down stop. The caution panel test/dim switch will illuminate the warning light (LA3 or D44) for test purposes when the switch is placed in the test position.

The Low Rotor RPM Warning System consists of the same components as the Hi/Lo Rotor RPM with the exception of a speed amplifier (RL6) in place of the Hi/Lo Rotor RPM switch, an additional microswitch (SW22) (TH-28 only), and an audio silence switch (TH-28 only). The speed amplifier (RL6), located behind the instrument panel, interrogates the incoming signal and activates the ROTOR RPM warning light (LA3) and the audio horn (AH1) when the main rotor rpm is below 334 rpm and the low rotor warning system has electrical power applied. A microswitch (SW22) (TH-28 only), located on the throttle bellcrank below the copilot's seat, controls the power required to energize the magnetic latch portion of the switch.

6-159. Magnetic Pickup

6-160. Description – Magnetic Pickup

The magnetic pickup is used to generate a signal to be interrogated by the hi/lo rotor rpm switch or the speed amplifier (RL6) which activates the ROTOR RPM warning light (LA3 or D44) and audio horn (AH1). Refer to paragraphs 7-21 through 7-24 for maintenance procedures for the magnetic pick-up.

6-160.1 Hi/Lo Rotor RPM Switch

6-160.2 Description – Hi/Lo Rotor RPM Switch

The Hi/Lo Rotor RPM Switch, located on the keel below the pilot's seat, interrogates the signal from the magnetic pickup and activates the ROTOR RPM warning light (LA3 or D44) and audio horn (AH1). The wiring schematic diagram of the Hi/Lo Rotor RPM Warning System is detailed in Figure 6-15.1.

6-160.3 Removal – Hi/Lo Rotor RPM Switch

A. Ensure all electrical power is off.

B. Remove the lower (keel) access panels IAW paragraph 8-14 of the Enstrom TH-28/480 Series Maintenance Manual to gain access to the keel structure below the pilot's seat.

C. Unplug the electrical connector from the P/N ECD4079 Hi/Lo Rotor RPM Switch.

D. Remove the four screws mounting the Hi/Lo Rotor RPM Switch to the keel.

E. Remove the Hi/Lo Rotor RPM Switch.

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6-160.4 Inspection – Hi/Lo Rotor RPM Switch

A. Inspect the Hi/Lo Rotor RPM Switch for damage, security of installation, and proper operation.

6-160.5 Repair – Hi/Lo Rotor RPM Switch

A. Replace the Hi/Lo Rotor RPM switch if damaged or the unit fails to activate the light and horn or the unit cannot be set to activate at rotor speeds below 334 RPM and above 385 RPM.

B. The Hi/Lo Rotor RPM Switch has been adjusted at the factory to activate at rotor speeds below 334 RPM or above 385 RPM. The unit should not need readjustment, but if it does, the operator may adjust the LO or HI potentiometers located on the top of the unit. Turn the LO adjustment counter clockwise to reduce the low-end (i.e. 334 RPM) activating rpm and clockwise to increase the low-end (i.e. 334 RPM) activating rpm. Turn the HI adjustment counter clockwise to reduce the high-end (i.e. 385 RPM) activating rpm and clockwise to increase the high-end (i.e. 385 RPM) activating rpm.

6-160.6 Installation – Hi/Lo Rotor RPM Switch

A. Install the Hi/Lo Rotor RPM Switch onto the keel structure by securing the unit to the keel with four screws.

B. Plug the electrical connector into the P/N ECD4079 Hi/Lo Rotor RPM Switch.

C. Replace the lower (keel) access panels IAW paragraph 8-17 of the Enstrom TH-28/480 Series Maintenance Manual.

D. Perform Functional Tests (para. 6-156) for the ROTOR RPM visual and audio signals.

6-161. Rotor RPM Speed Amplifier – Low Rotor RPM System

6-162. Description – Rotor RPM Speed Amplifier

The rotor rpm speed amplifier (RL6), located behind the instrument panel, interrogates the signal from the magnetic pickup and activates the low rotor warning light (LA3 or D44) and audio horn (AH1).

6-163. Removal – Rotor RPM Speed Amplifier

A. Ensure all electrical power is off.

B. Gain access to the back of the instrument panel (para. 7-3).

C. Pull the speed amplifier from the mounting bracket.

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6-164. Inspection – Rotor RPM Speed Amplifier

A. Inspect the speed amplifier for damage, security of installation, and proper operation.

6-165. Repair – Rotor RPM Speed Amplifier

A. Replace the mounting bracket if damaged.

B. Replace the speed amplifier if damaged or the unit fails to activate the light and horn or the unit cannot be set to activate at 334 ±1 rpm NR.

C. Adjust the unit to activate the light and horn at 334 ±1 rpm NR by adjusting the potentiometer located at the top of the speed amplifier. Turn the adjustment counter clockwise to reduce the activating rpm and turn the adjustment clockwise to increase the activating rpm.

6-166. Installation – Rotor RPM Speed Amplifier

A. Install the speed amplifier into the mounting bracket.

B. Install the instrument panel covers.

6-167. Rotor RPM Warning Light

6-168. Description – Rotor RPM Warning Light

The low rotor warning light (LA3 or D44) is used to inform the crew that the NR is below 334 rpm or above 385 rpm (Hi/Lo Rotor RPM warning system only). The LA3 unit contains 2 lamps so that it will illuminate if one of the lamps fail. The optional LED (D44) unit contains 4 independent LED circuits so that it will illuminate if one of the circuits fail. There is no means of dimming the warning light.

6-169. Removal – Rotor RPM Warning Light

A. Ensure all electrical power is off.

B. Gain access to the back of the instrument panel (para. 7-3).

C. Disconnect the wiring from the light unit or disconnect the electrical connector (LED).

D. Standard Light: Remove the front from the light unit. Remove the 2 screws securing the light unit in the instrument panel. Remove the light unit and the retaining strip from the backside of the instrument panel.

E. LED Light (Option): Grasp the unit by the sides and pull the front of the light from the rest of the unit. Allow the front portion to hang on its hinge. Using a small screwdriver, unlock the retaining latch by turning the retaining screw. Slide the unit from the instrument panel and remove the retaining collar from the back of the instrument panel.

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6-170. Inspection – Rotor RPM Warning Light

A. Inspect the warning light for damage, burned out lamps or failed LED circuits, and security of installation.

6-171. Repair – Rotor RPM Warning Light

A. Replace a damaged light unit.

B. Replace the unit if any LED circuit does not function.

C. Replace burned out lamps (LA3) by removing the front of the light unit and removing the faulty lamp.

D. Tighten loose mounting hardware.

6-172. Installation – Rotor RPM Warning Light

A. Install the light unit into the instrument panel. Place the retaining strip into place and install the mounting hardware.

B. Connect the electrical wiring.

C. Install the front of the light unit.

D. Install the instrument panel covers.

6-173. Rotor RPM Audio Horn

6-174. Description – Rotor RPM Audio Horn

The low rotor audio horn (AH1), located in the side of the center pedestal, is used to warn the crew that the NR rpm is below 334 ±1 rpm or above 385 ±1 rpm (Hi/Lo Rotor RPM warning system only).

6-175. Removal – Rotor RPM Audio Horn

A. Disconnect the battery and ensure all electrical power is off.

B. Remove the circuit breaker panel.

C. Remove the retaining ring from the horn and remove the horn from the panel.

D. Disconnect the wires from the audio horn.

6-176. Inspection – Rotor RPM Audio Horn

A. Inspect the horn for damage and security of installation.

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6-177. Repair – Rotor RPM Audio Horn

A. Replace the horn if damaged or inoperable.

B. Tighten the retaining ring if loose.

6-178. Installation – Rotor RPM Audio Horn

A. Attach the wiring to the horn.

B. Install the horn into the panel and install the retaining ring.

C. Reinstall the circuit breaker panel.

6-179. Rotor RPM Warning Microswitches

6-180. General Description – Rotor RPM Warning Microswitches

The low rotor warning microswitch (SW18) is interfaced with the rotor RPM audio horn and rotor RPM magnetic pickup. In a low rotor RPM condition with collective stick raised (open microswitch), the rotor RPM audio warning is activated. The TH-28 is also configured with a throttle position microswitch (SW22) and audio silencer switch (SW21). (SW21 is used to turn the low rotor RPM audio horn off during conditions that the crew is aware of a low rotor RPM (operations at flight idle, practice “engine out” autorotations, etc.).

6-181. Removal – Rotor RPM Warning Microswitches

A. Ensure all electrical power is off.

B. Gain access the portion of the collective control torque tube located behind the copilot's seat (TH-28)/pilot’s seat (480/B).

C. Disconnect the wiring from the switch.

D. Remove the hardware securing the switch to the mounting bracket and remove the switch.

6-182. Inspection – Rotor RPM Warning Microswitches

A. Inspect the switch for damage, broken or damaged wiring, security of installation, proper operation and adjustment.

6-183. Repair – Rotor RPM Warning Microswitches

A. Replace the switch if damaged or does not properly operate.

B. Repair broken or damaged wiring.

C. Tighten loose mounting hardware.

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D. Adjust the switch and/or cam to close or open when collective stick is raised 2°-4° off stop. (TH-28: Also, adjust switch (SW22) so that contact occurs at throttle flight idle stop.)

6-184. Installation – Rotor RPM Warning Microswitches

NOTE

Ensure proper adjustment of all installed microswitches (ENG, RPM, HR (option), and AOG (option)) if any microswitch is replaced or adjusted.

A. Install the switch onto the mounting bracket and secure with the mounting hardware.

B. Connect the electrical wiring.

C. Adjust the switch (para. 6-183,D).

D. Install the collective control covers.

6-185. Engine Out Warning System

6-186. Description – Engine Out Warning System

The engine out warning system consists of the gas producer (N1) tachometer generator, the caution panel, a warning light (LA2 or D43), a microswitch (SW26), a test switch (SW14, S/N 5135 and earlier), and 2 audio horns (AH2 and AH3). The N1 tach generator sends a signal to both the N1 tachometer and to the caution panel. When the engine N1 rpm drops below 58%, the internal circuitry in the caution panel activates the ENGINE OUT warning light (LA2 or D43) and the audio horns (AH2 and AH3). The warning light (LA2 or D43) and audio horns (AH2 and AH3), located on the left side of the center pedestal, will activate anytime the N1 rpm is below 58% and electrical power is applied to the caution system. A microswitch (SW26), located on the collective control torque tube behind copilot's seat, deactivates the audio horns (AH2 and AH3) when the collective controls are on the down stop. The caution panel test/dim switch will illuminate the warning light (LA2 or D43) for test purposes when the N1 is above 58% and the switch is placed in the TEST (TST, S/N 5136 and subsequent) position.

6-187. Gas Producer (N1) Tachometer Generator

Refer to paragraphs 13-129 through 13-132 for maintenance procedures.

6-188. Caution Panel

Refer to paragraphs 6-143 through 6-146 for maintenance procedures.

6-189. Engine Out Warning Light

Refer to paragraphs 6-169 through 6-172 for maintenance procedures.

6-190. Engine Out Audio Horns

Refer to paragraphs 6-175 through 6-178 for maintenance procedures.

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6-191. Engine Out Microswitch

Refer to paragraphs 6-181 through 6-184 for maintenance procedures.

6-192. Fire Warning System

6-193. Description – Fire Warning System

The fire warning system consists of a fire/overheat detector, a warning light (LA1 or D45), and a test switch (SW14, S/N 5135 and earlier). The fire/overheat detector is installed in both the "hot" and "cold" sections of the engine compartment. The self test feature of the detector will not illuminate the FIRE warning light (LA1 or D45) if there is a fault with the detector and the caution panel test/dim switch (SW14, S/N 5135 and earlier) is placed in the TEST (TST, S/N 5136 and subsequent) position.

6-194. Fire/Overheat Detector

6-195. Description – Fire/Overheat Detector

The fire/overheat detector sensor tube contains helium gas under a preset pressure and a hydrogen charged core material. The application of heat to the sensor causes an increase in the internal gas pressure which in turn operates a pressure diaphragm switch activating the FIRE warning light (LA1 or D45). The pressure diaphragm switch will return to the normal position when the internal gas pressure decreases. Mechanical damage to the sensor tube will not result in a false alarm.

6-196. Removal – Fire/Overheat Detector

A. Ensure all electrical power is off.

B. Remove the engine access and bottom engine access panels.

C. Disconnect the electrical connector from the fire/overheat detector.

D. Starting at the end of the detector under the engine, remove the detector from the mounting clips and remove the detector from the aircraft.

6-197. Inspection – Fire/Overheat Detector

A. Inspect the fire/overheat detector for security of installation, damaged or broken wiring and electrical connector, and proper operation with the caution panel test/dim switch.

6-198. Repair – Fire/Overheat Detector

A. Replace damaged mounting clips.

B. Repair or replace damaged or broken wiring or electrical connectors.

C. Replace the fire/overheat detector if it fails the self test.

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6-199. Installation – Fire/Overheat Detector

A. Starting at the switch/connector end of the detector, install the detector into the aircraft and secure on the mounting clips.

B. Connect the electrical connector.

C. Install the engine access and the bottom engine access panels.

6-200. Fire Warning Light

Refer to paragraphs 6-169 through 6-172 for maintenance procedures.

6-201. Miscellaneous Equipment

6-202. Description – Miscellaneous Equipment

The miscellaneous equipment includes the engine power governor trim system, cyclic trim system, and dual collective engine idle stop system.

6-203. Engine Power Governor Trim System

6-204. Description – Engine Power Governor Trim System

The engine power governor trim system consists of an electrically operated linear actuator (M7) and 2 control switches (SW11 and SW12). The linear actuator (M7) is connected between the droop compensator and the power turbine governor installed on the engine. The system is used to set the governed power turbine rpm (N2). The actuator (M7) is controlled by the GOVN INCR/DECR switches (SW11 and SW12) located on the pilot's and copilot's collective control switch box. Placing the switch in the INCR position causes the linear actuator shaft to extend. Placing the switch in the DECR position causes the linear actuator shaft to retract. Refer to paragraphs 13-104 through 13-107 for the maintenance procedures for the linear actuator and paragraphs 6-12 through 6-15 for the maintenance procedures for the control switches.

6-205. Cyclic Trim System

6-206. Description – Cyclic Trim System

The cyclic trim system consists of 2 trim actuators (M1 and M2), 2 trim control units (TSU1 and TSU2), and 2 control switches (SW31 and SW32). Refer to paragraph 12-44 for a description of the cyclic trim system.

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6-207. Cyclic Trim Switches

6-208. Description – Cyclic Trim Switches

The cyclic trim control switches (SW31 and SW32) are installed on the pilot's and copilot's cyclic control stick grip. Refer to paragraphs 6-12 through 6-15 for maintenance procedures.

6-209. Trim Control Units

6-210. Description – Trim Control Units

The trim control units (TSU1 and TSU2) control the direction of the current applied to the trim actuators depending on the position of the trim control switches (SW31 and SW32). The trim control units are either solid state units (TH-28: S/N 3006, 480/480B: S/N 5001-5086) or mechanical relay units (480B: S/N 5087 and subsequent) and are located next to the trim actuators (M1 and M2). A kit is available to replace the solid state units with mechanical relay units.

6-211. Removal – Trim Control Units

A. Ensure all electrical power is off.

B. Open the engine access panel on the side of the aircraft with the defective control unit.

C. Disconnect the electrical connector from the control unit.

D. Remove the control unit from the mounting bracket.

6-212. Inspection – Trim Control Units

A. Inspect the control units for damage, broken or damaged wiring or electrical connectors, security of installation, and proper operation.

6-213. Repair – Trim Control Units

A. Repair or replace broken wiring or electrical connectors.

B. Tighten loose mounting hardware.

C. Replace control units that fail to operate.

6-214. Installation – Trim Control Units

A. Install the control unit and secure with the mounting hardware.

B. Connect the electrical connector.

C. Close the engine access panel.

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6-215. Cyclic Trim Actuators

6-216. Description – Cyclic Trim Actuators

The cyclic trim actuators (M1 and M2) consist of an electrically operated reversible motor, a cylindrical spring assembly, and a microswitch assembly. Refer to paragraphs 12-69 through 12-74 for maintenance procedures.

6-217. Main Transmission Filtration/Cooling System

6-218. Description – Main Transmission Filtration/Cooling System

The main transmission filtration/cooling system consists of a heat exchanger, an oil filter assembly, an electric pump, a pressure switch, and the associated hardware and wiring. Refer to paragraphs 11-40 through 11-44 for more detailed system description and maintenance procedures.

6-219. Engine Idle Stop System

6-220. Description – Engine Idle Stop System

The idle stop system consists of a rotary solenoid (SOL2), relay (RL41), associated wiring, and mechanical linkage actuated by depressing either switches (SW89 and SW90) on the pilot and copilot collective controls. The solenoid activated stop pin is located within the idle stop mechanism located mid-cabin and mounted to the collective torque tube. The idle stop solenoid is powered directly from the battery, so the idle stop operates regardless of the master switch position. Refer to paragraphs 6-12 through 6-15 for maintenance procedures. Refer to paragraph 13-99.1 for maintenance procedures of the idle stop system.

6-221. Collective Illuminated Panel (Figure 6-6)

6-222. Removal – Collective Illuminated Panel

A. Remove the two screws (19) and two washers (20) from the front of the illuminated panel.

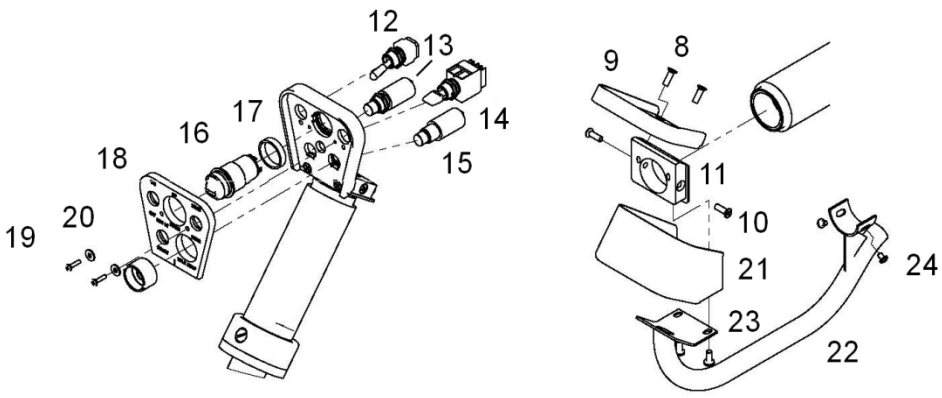
B. Lift the illuminated panel (18) to the side to remove two screws (8) from the switch plate (9).

C. Remove the two screws (23) from the handle assembly (22) and remove the switch plate cover (21).

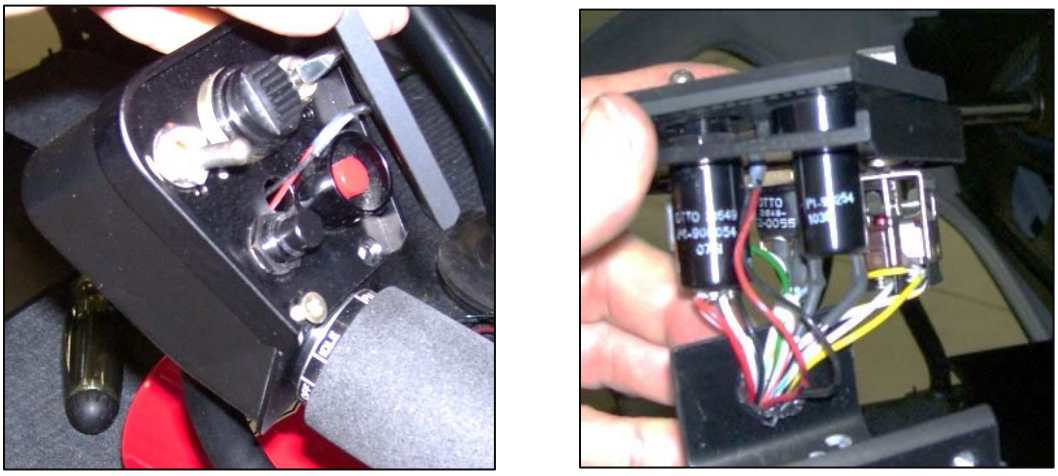
D. Cut the red and black wires 1.5 in/3.8 cm from the back of the switch plate (9) and remove the illuminated panel (18).

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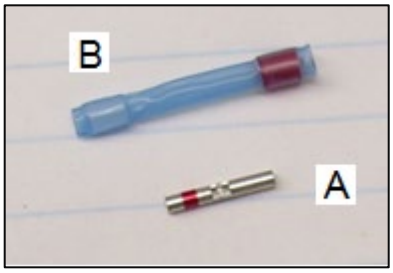
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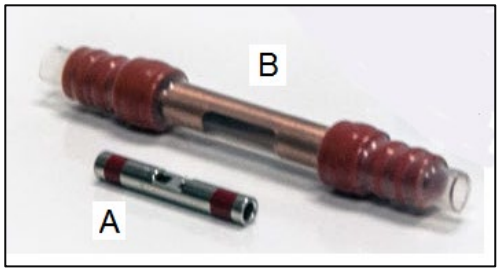
Collective Illuminated Panel Assembly



Illuminated Panel Disassembly



Butt Splice Connector
(P/N D-436-36)



Heatless Crimp Splice Connector
(P/N H-C2015N)

Figure 6-6. Collective Illuminated Panel Removal/Installation

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6-223. Installation – Collective Illuminated Panel (Figure 6-6)

A. Connect the red and black wires to the replacement illuminated panel (18).

(1) Strip 0.25 in/6.4 mm of the insulation from the cut ends of the two red wires.

(2) Crimp the connector part (A) on to the end of the red wire of the illuminated panel (18).

(3) Slide the insulator part (B) over the crimped red wire and behind the connector (A) to provide clearance for crimping the second red wire.

(4) Crimp the connector to the second red wire.

(5) Slide the insulator over the splice and shrink it with a heat gun, if required. (Heat is not required for heatless crimp splice type.)

(6) Repeat this operation with the black wires.

B. Install the switch plate cover (21) under the handle assembly (22) and install two screws (23) into the housing (11). Torque the screws 10.8 in-lb/1.22 Nm.

C. Install the switch plate (9) onto the housing (11) and secure with two screws (8). Torque the screws 10.8 in-lb/1.22 Nm.

D. Install the illuminated panel (18) on to the switch plate (9) and secure it with two screws (19) and washers (20). Torque the screws 2 in-lb/0.23 Nm.

E. Verify that the illuminated switch panel operates correctly.

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6-224. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Cable ties	Cable ties, Panduit Brand	SST1M-MP
Cable ties	Cable ties, Panduit Brand	SST1.5I-MP
Cable ties	Cable ties, Panduit Brand	SST2S-MP
Cable ties	Cable ties, Panduit Brand	ILT2S-M
Cable ties	Cable ties, Panduit Brand	CBR1M-M
Cable ties	Cable ties, Panduit Brand	CBR2M-M
Cable ties	Cable ties, Panduit Brand	CBR3I-M
Cable ties	Cable ties, Panduit Brand	CBR3S-M
Cleaner	Contact Cleaner (any brand)	
Connector rings	Connector rings, Panduit Brand	CR2-M

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6-225. Schematic Diagrams

The following schematic diagrams are for standard equipped 480s and 480Bs. While some information concerning optional equipment is provided in the schematics, the majority of the schematic information for any optional equipment, especially customer specified avionics installations, is provided in a separate schematic package.

Table 6-3. List of Diagrams

Diagram 6-1	Power Distribution
Diagram 6-1.1	Power Distribution (S/N 5134 and 5135)
Diagram 6-1.2	Power Distribution (S/N 5136 and Subsequent)
Diagram 6-2	Terminal Strip Interface
Diagram 6-3	Connector Interface
Diagram 6-4	External Power System
Diagram 6-5	Starter/Generator System
Diagram 6-5.1	Starter/Generator System (S/N 5134 and 5135)
Diagram 6-5.2	Starter/Generator System (S/N 5136 and Subsequent)
Diagram 6-6	Engine Oil Temperature/Pressure System
Diagram 6-7	Torque System
Diagram 6-8	D.C. Volt/Amp System
Diagram 6-9	N_1 Indicating System
Diagram 6-10	Turbine Outlet Temperature (TOT) System
Diagram 6-11	N_2/N_R Indicating System
Diagram 6-12	Fuel Quantity System
Diagram 6-13	M/R Transmission Oil Temperature System
Diagram 6-14	Trim System
Diagram 6-14.1	Trim System (S/N 5154 and Subsequent)
Diagram 6-15	Caution/Warning System
Diagram 6-15.1	Caution/Warning System (S/N 5134 and 5135)
Diagram 6-15.2	Caution/Warning System (S/N 5136 and Subsequent)
Diagram 6-15.3	Caution/Warning System (S/N 5155 and Subsequent)
Diagram 6-16	Fire Detection System
Diagram 6-17	Cockpit/Map Light
Diagram 6-17.1	Cockpit Dome Light
Diagram 6-17.2	Cockpit Dome Light
Diagram 6-18	Instrument Lighting
Diagram 6-18.1	Instrument Lighting (S/N 5134 and Subsequent)
Diagram 6-19	Landing Light
Diagram 6-19.1	Pulse Landing Light (S/N 5121 only)
Diagram 6-19.2	Pulse Landing Light (LED) (Aircraft equipped with G1000H)
Diagram 6-20	Position/Navigation Lighting
Diagram 6-20.1	LED Anticollision Lights
Diagram 6-20.2	LED Position and Strobe Light Assembly
Diagram 6-21	Flight Instrument Interconnect
Diagram 6-22	N_2 Governor Control
Diagram 6-23	Windshield Demister
Diagram 6-24	Hour Meter
Diagram 6-24.1	Hour Meter (S/N 5134 and Subsequent)
Diagram 6-25	M/R Transmission Filtration/Cooling System

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Table 6-3. List of Diagrams – Continued

Diagram 6-26	Airframe Ground
Diagram 6-27	Start Counter
Diagram 6-28	Overhead Cooling Fan
Diagram 6-29	SpectroLab SX-5 Starburst® Searchlight Interface
Diagram 6-30	Cargo Hook Sling Release
Diagram 6-31	Engine Idle Stop
Diagram 6-32	Heated Pitot System Interface
Diagram 6-33	Fuel Flow System
Diagram 6-34	Avionics Cooling Fan
Diagram 6-35	Day/Night Panel Annunciator Lamp Power
Diagram 6-36	28V to 14V 9A Converter

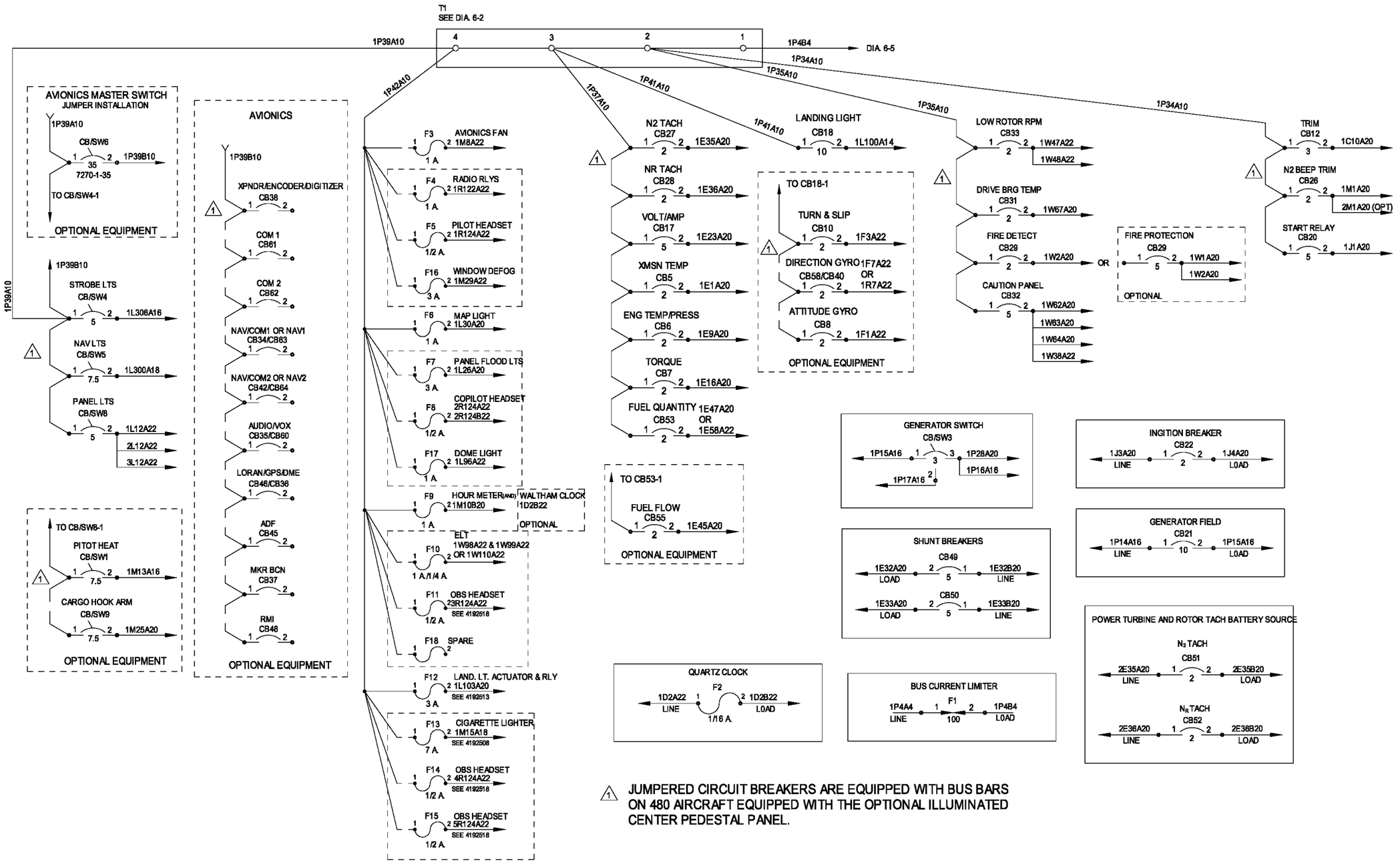
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⚠1 JUMPERED CIRCUIT BREAKERS ARE EQUIPPED WITH BUS BARS ON 480 AIRCRAFT EQUIPPED WITH THE OPTIONAL ILLUMINATED CENTER PEDESTAL PANEL.

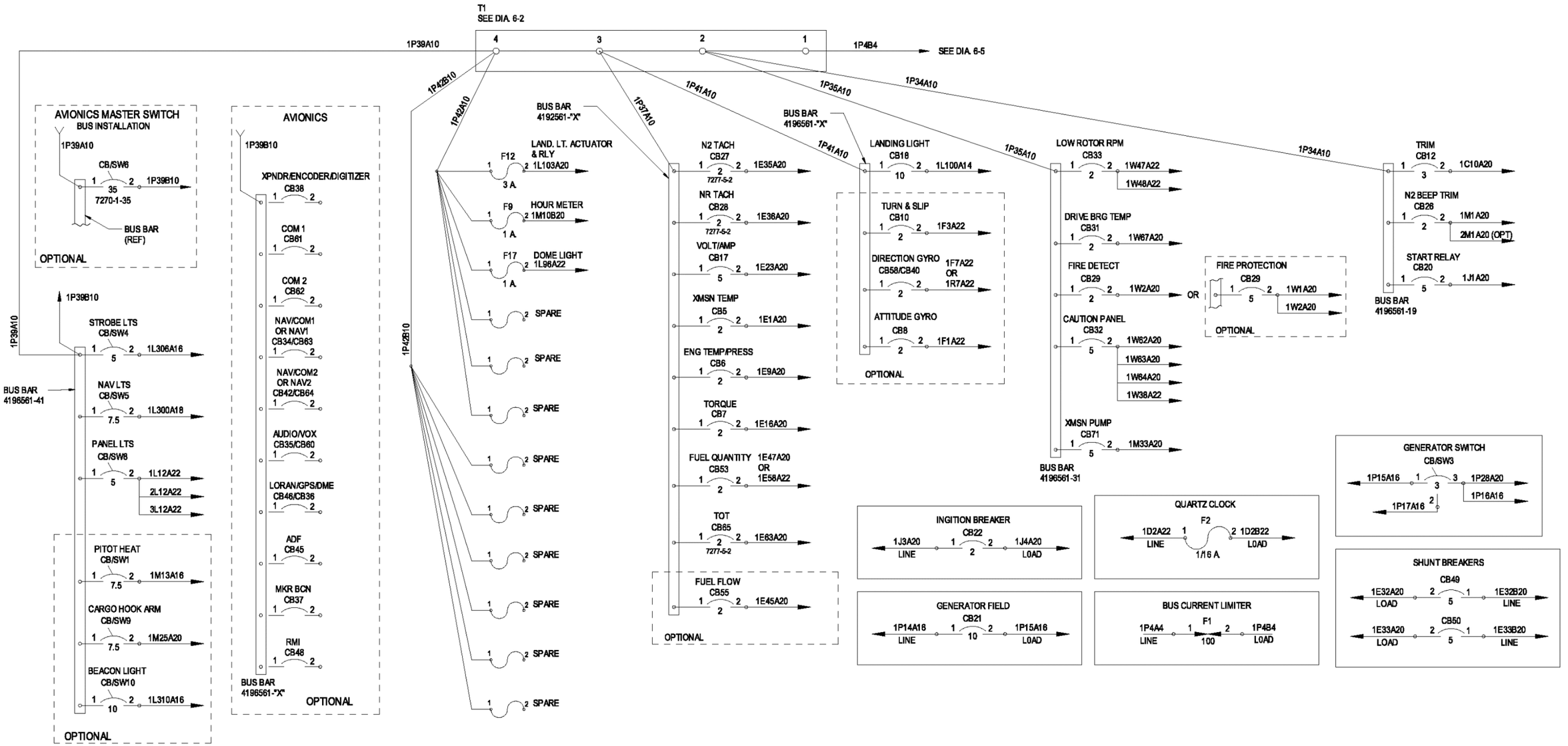
Diagram 6-1. Power Distribution, Sheet 1 of 3

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480B Serial Numbers: 5039 - 5045, and 5047

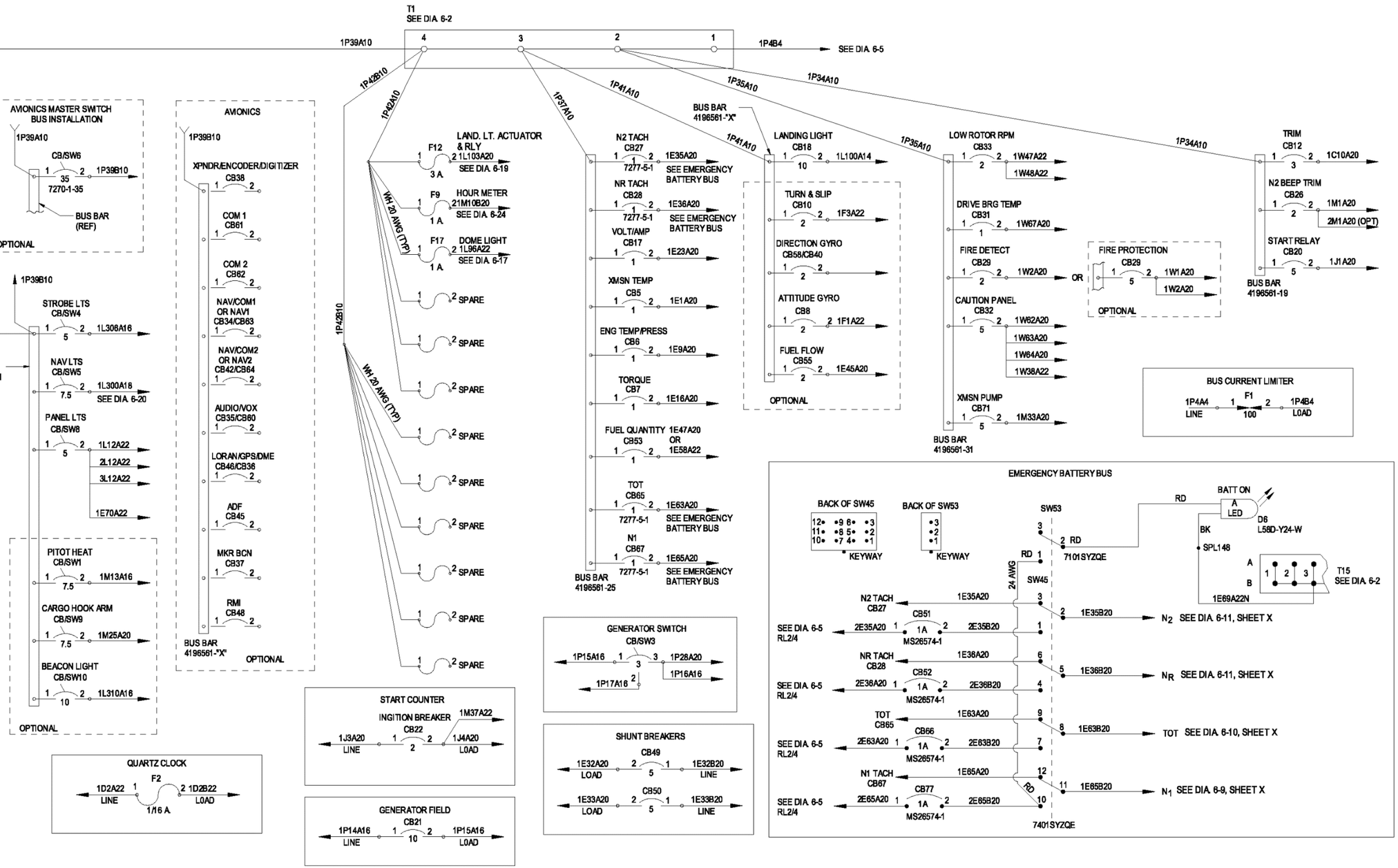
Diagram 6-1. Power Distribution, Sheet 2 of 3

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480B Serial Numbers: 5046, 5048 and Subsequent

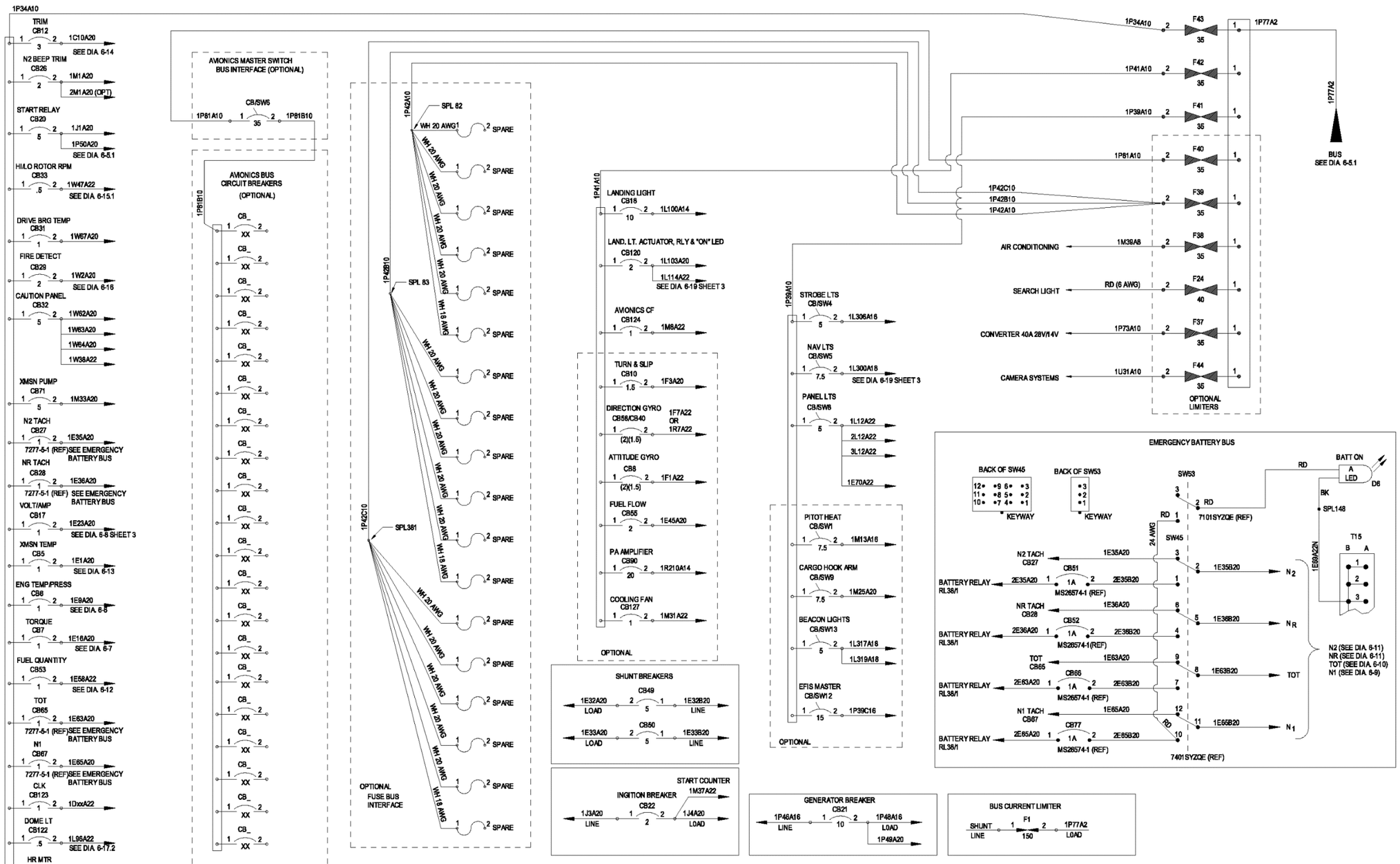
Diagram 6-1. Power Distribution, Sheet 3 of 3

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480B Serial Numbers: 5134 and 5135

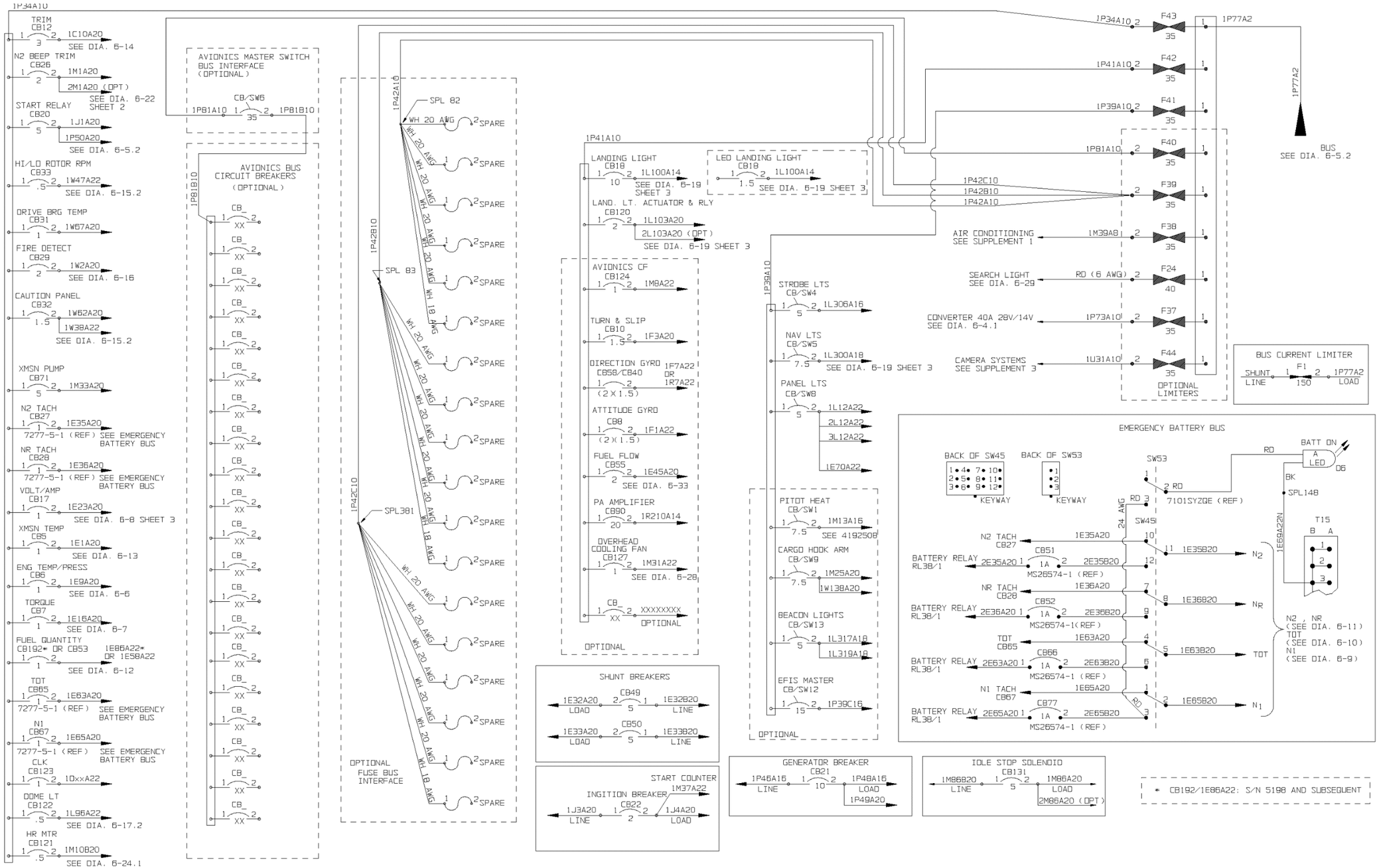
Diagram 6-1.1. Power Distribution

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480B Serial Numbers: 5136 and Subsequent

Diagram 6-1.2. Power Distribution

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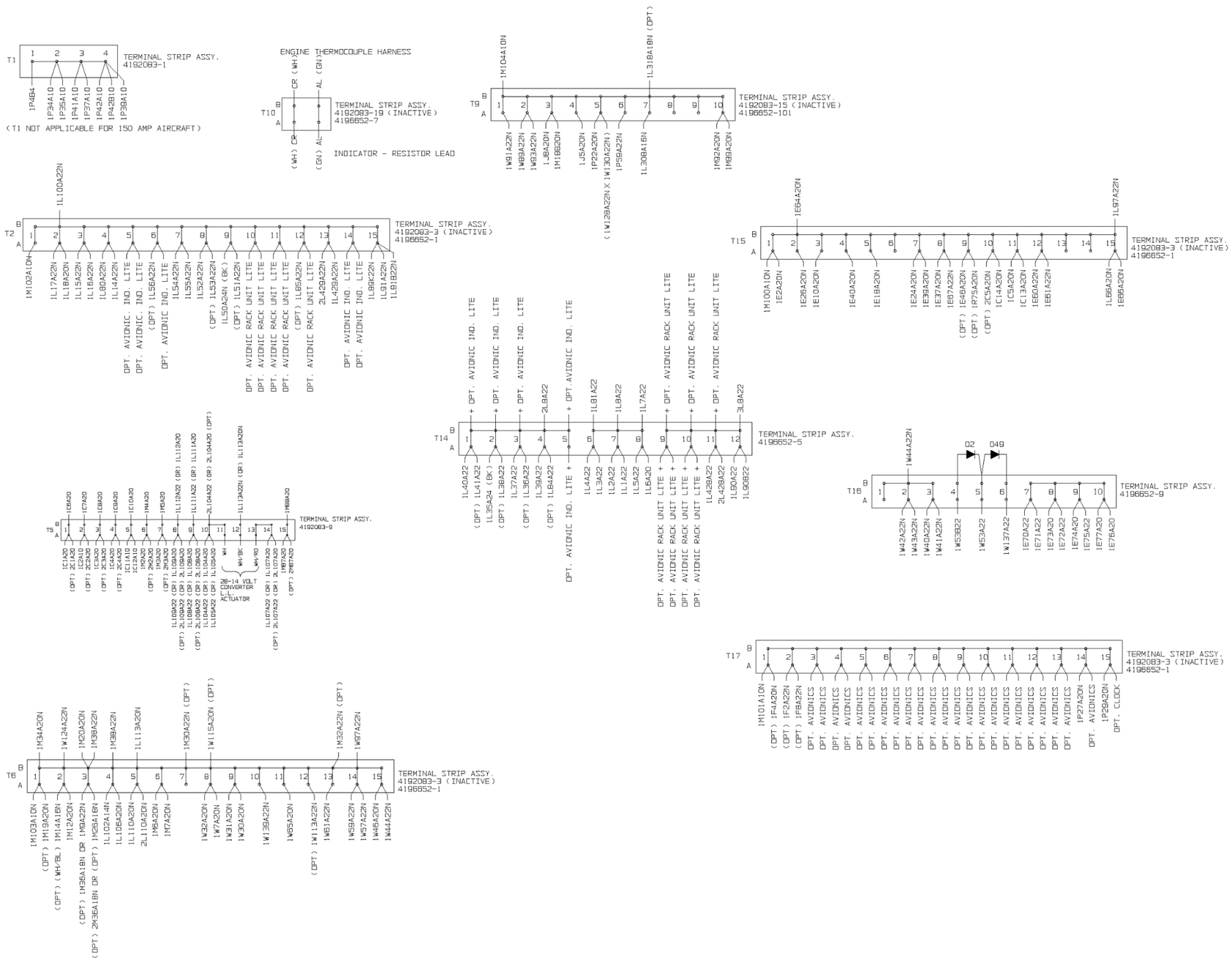


Diagram 6-2. Terminal Strip Interface

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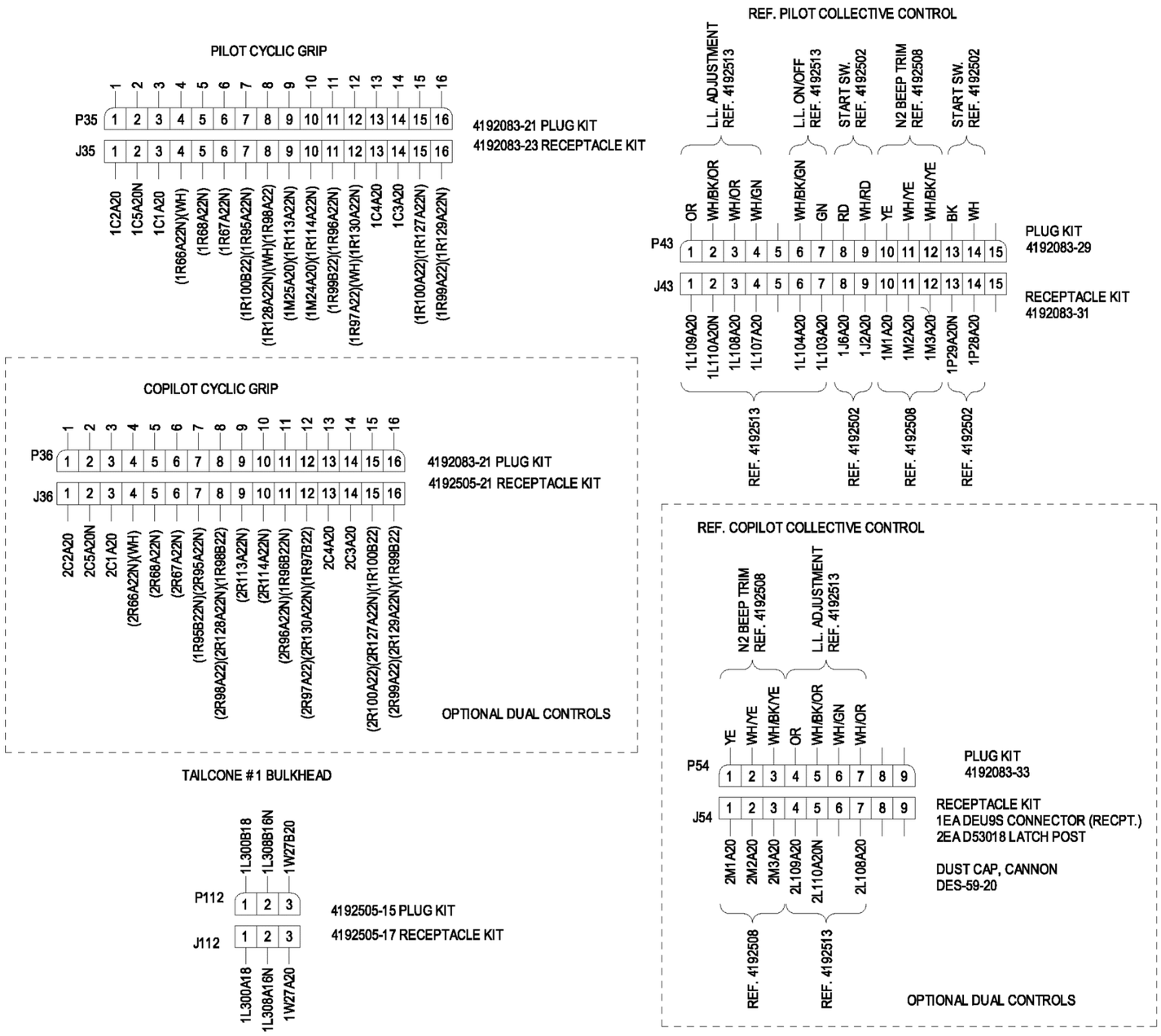


Diagram 6-3. Connector Interface

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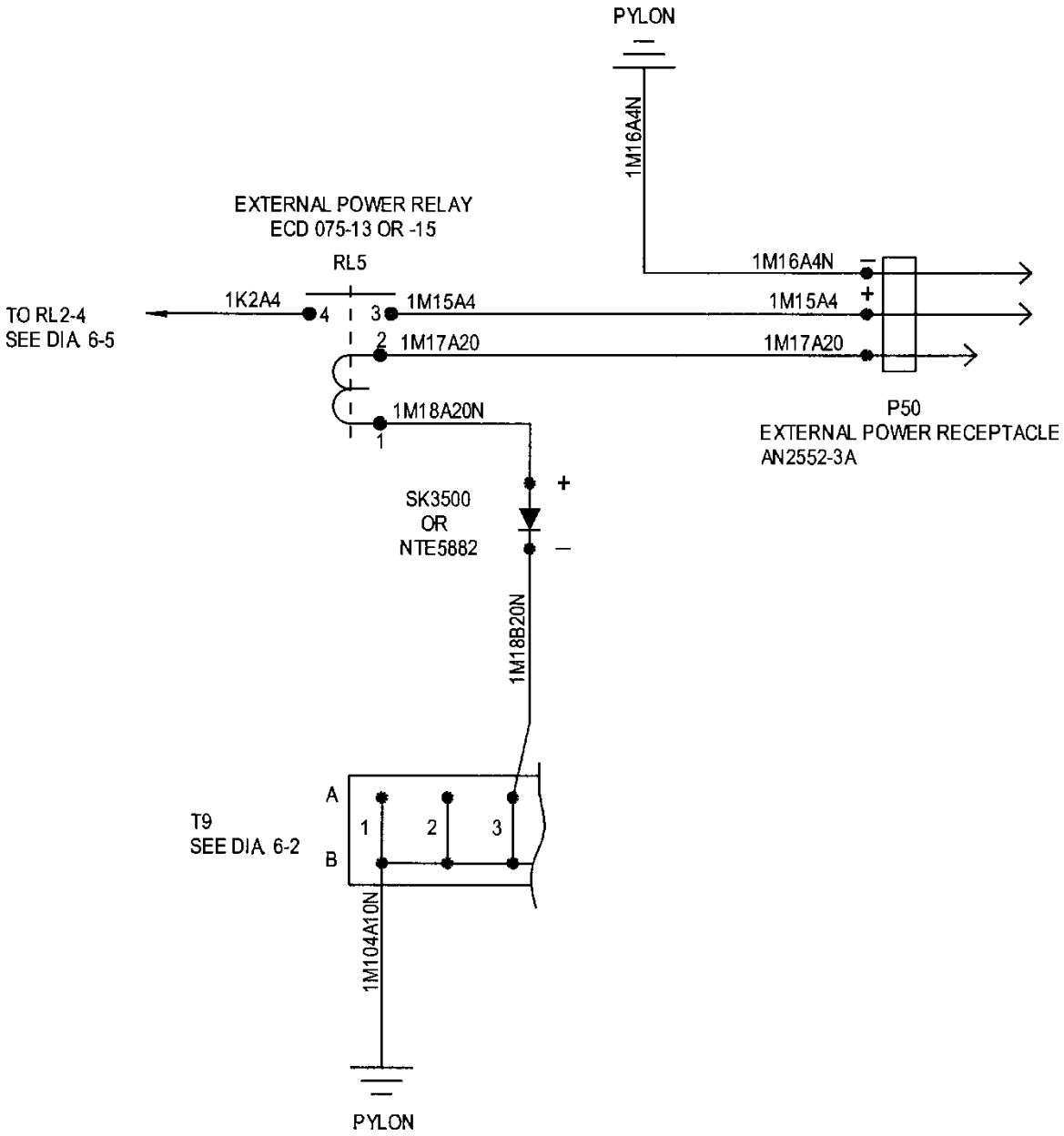
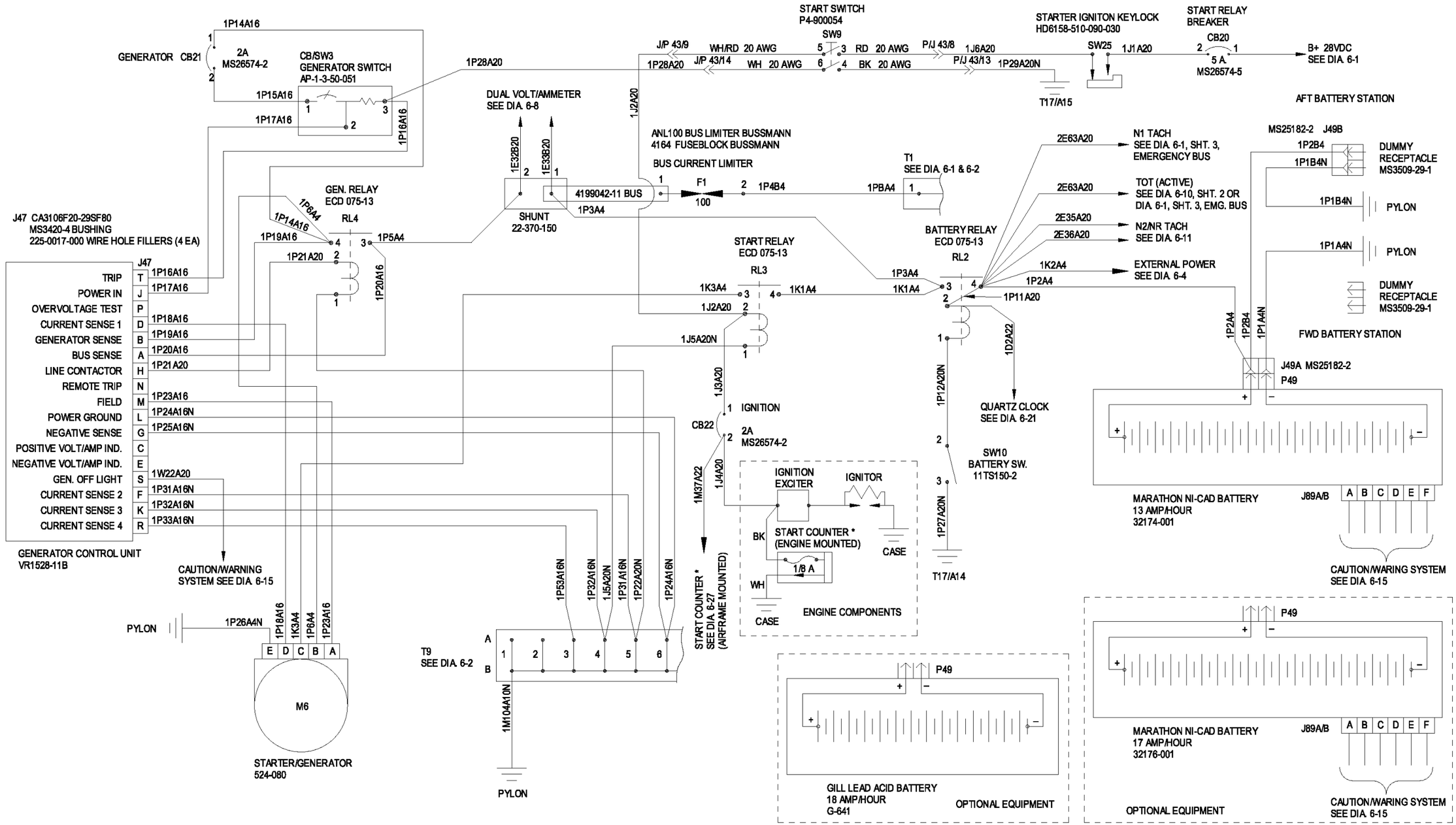


Diagram 6-4. External Power

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Auxilec/Thales Starter/Generator System

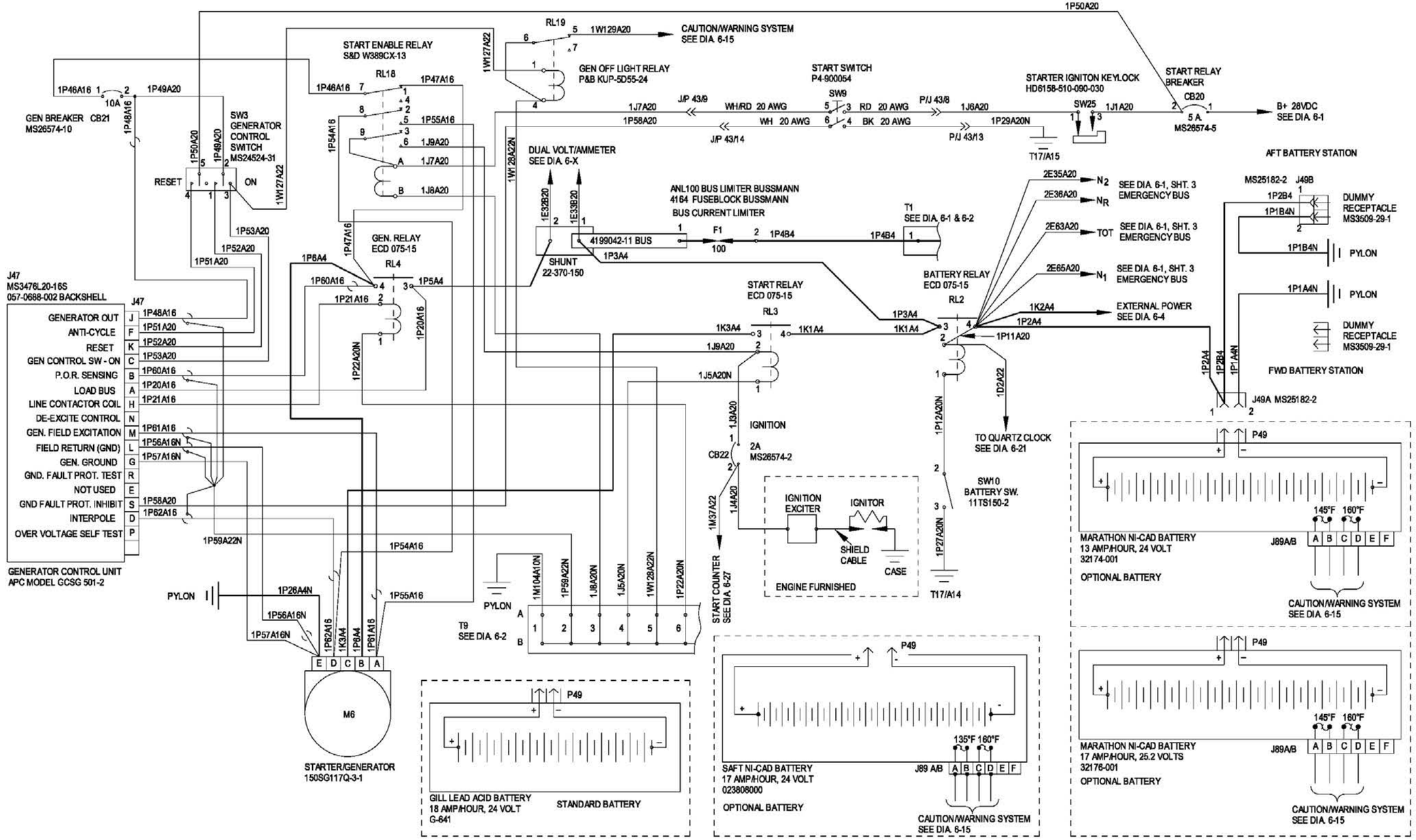
Diagram 6-5. Starter/Generator System, Sheet 1 of 2

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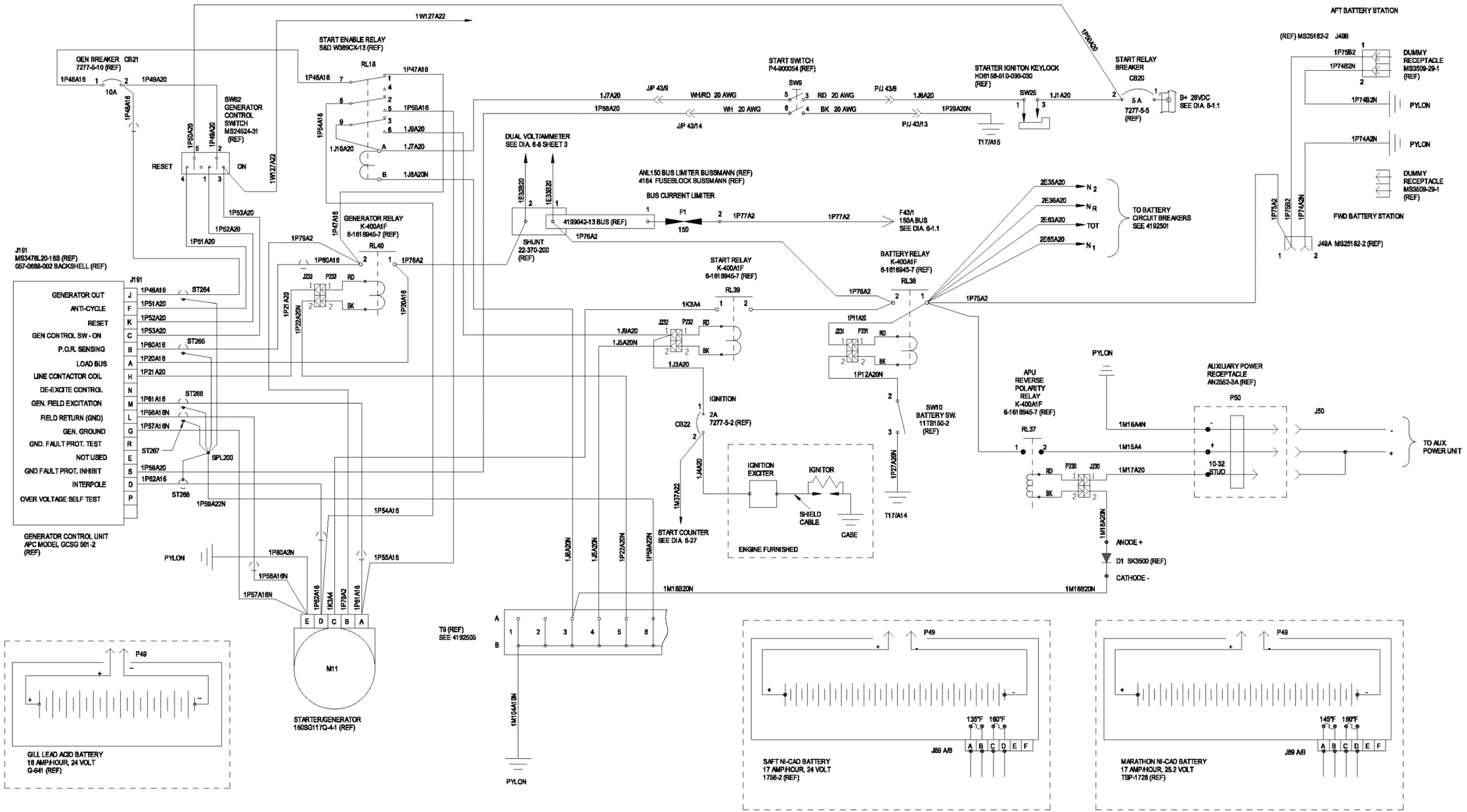
Diagram 6-5. Starter/Generator System, Sheet 2 of 2

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480B Serial Numbers: 5134 and 5135

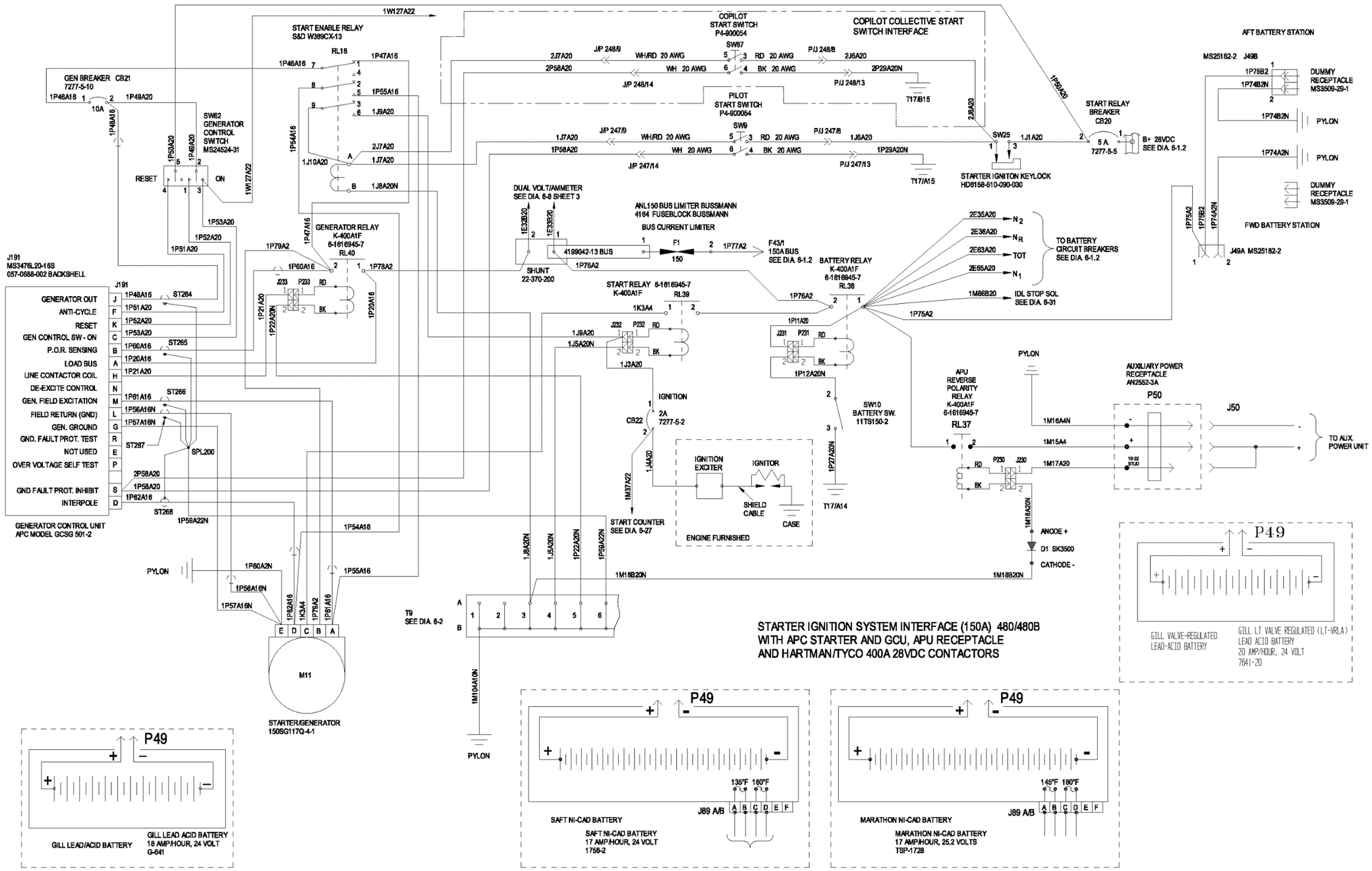
Diagram 6-5.1. Starter/Generator System

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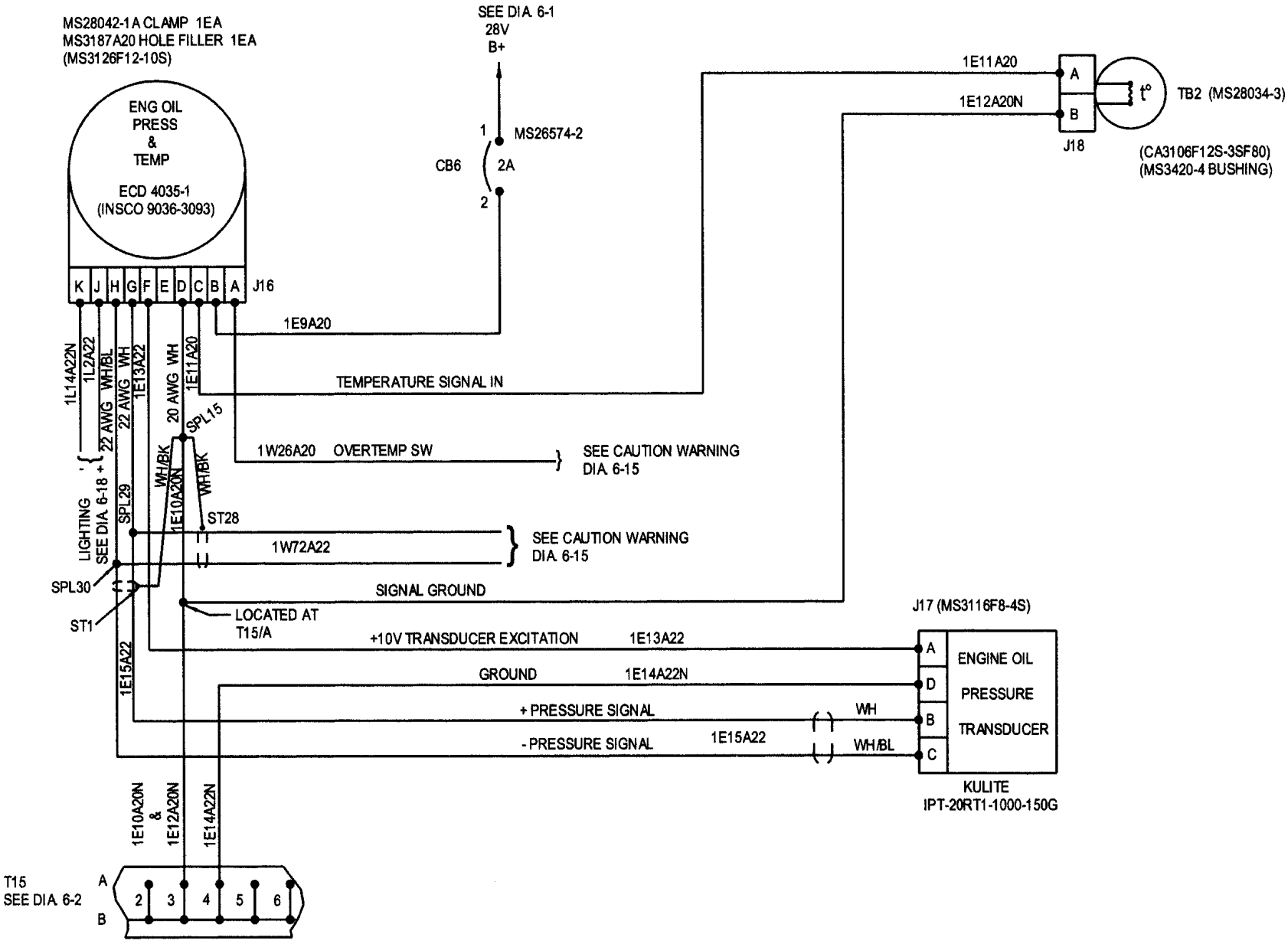
Diagram 6-5.2. Starter/Generator System

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Sheet 1 of 3

Diagram 6-6. Engine Oil Temperature/Pressure System

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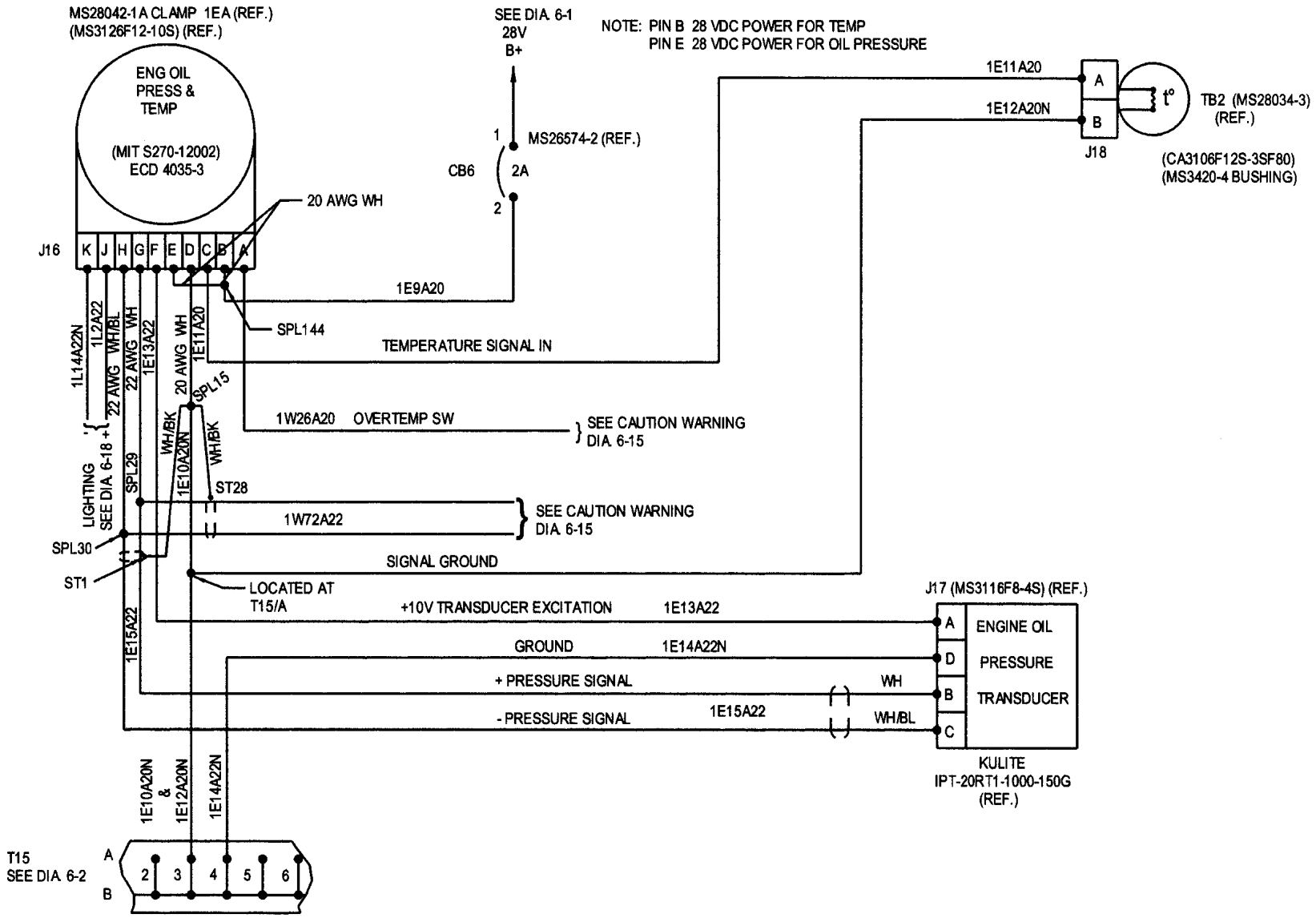
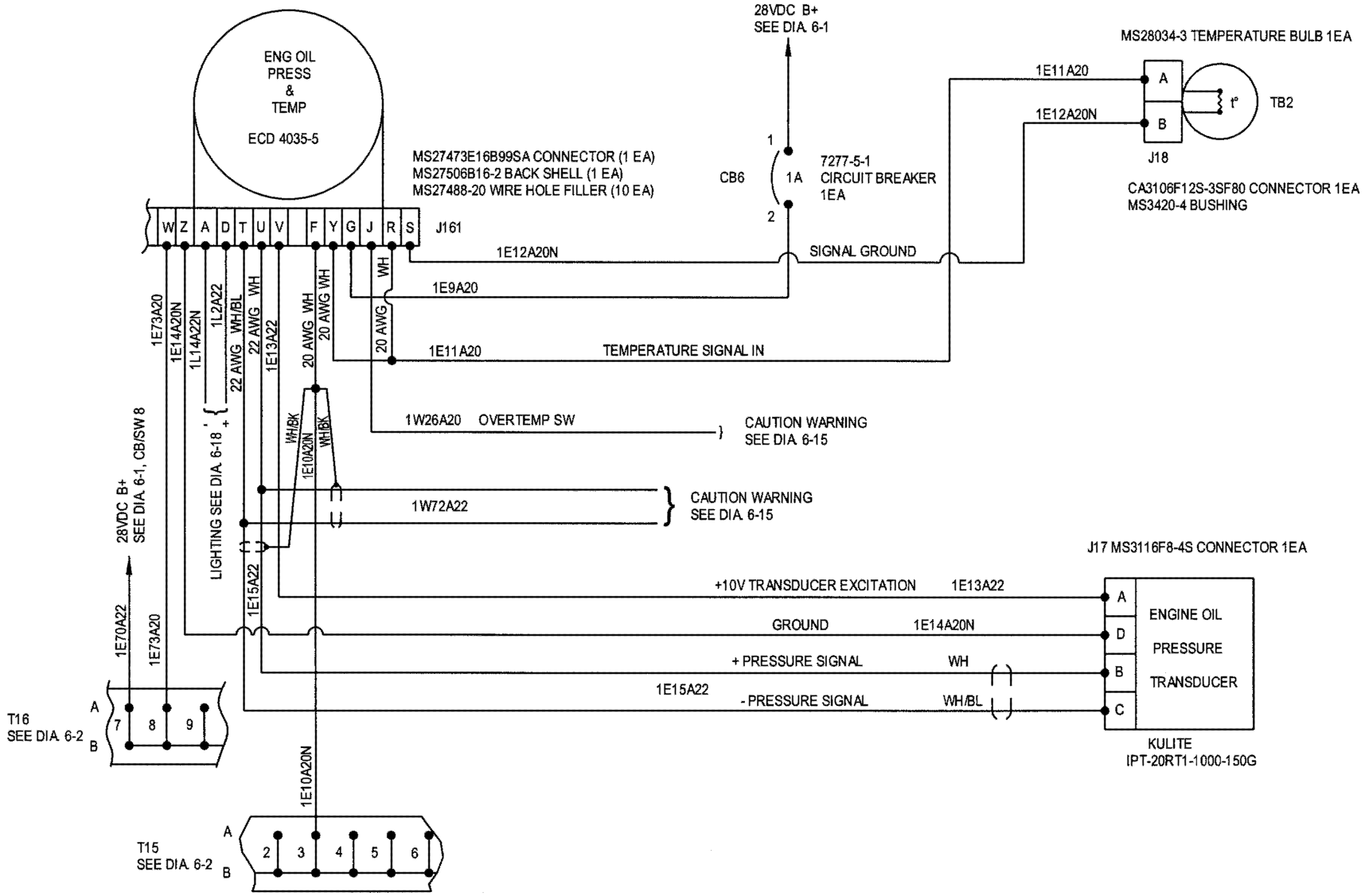


Diagram 6-6. Engine Oil Temperature/Pressure System

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Diagram 6-6. Engine Oil Temperature/Pressure System

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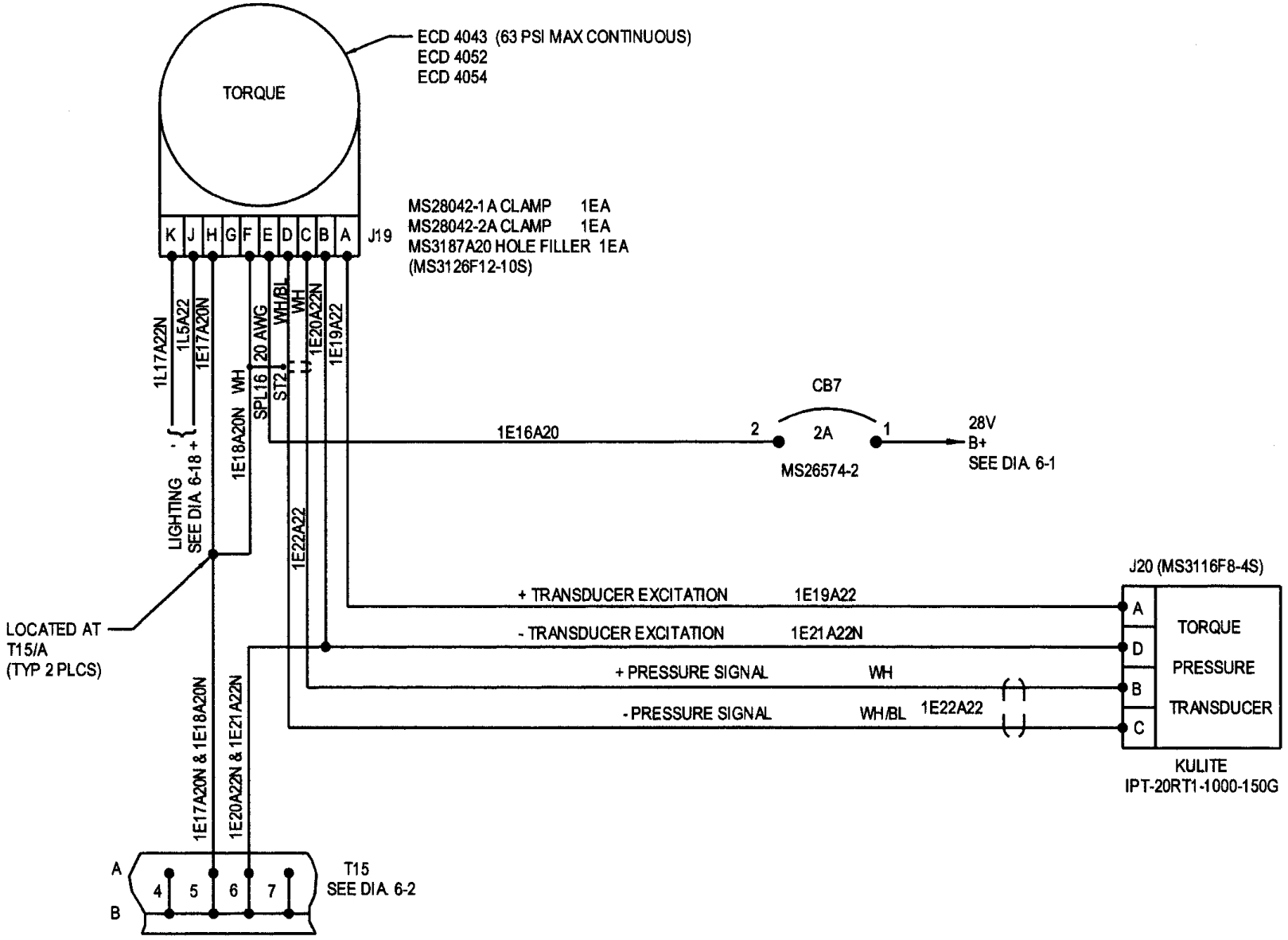
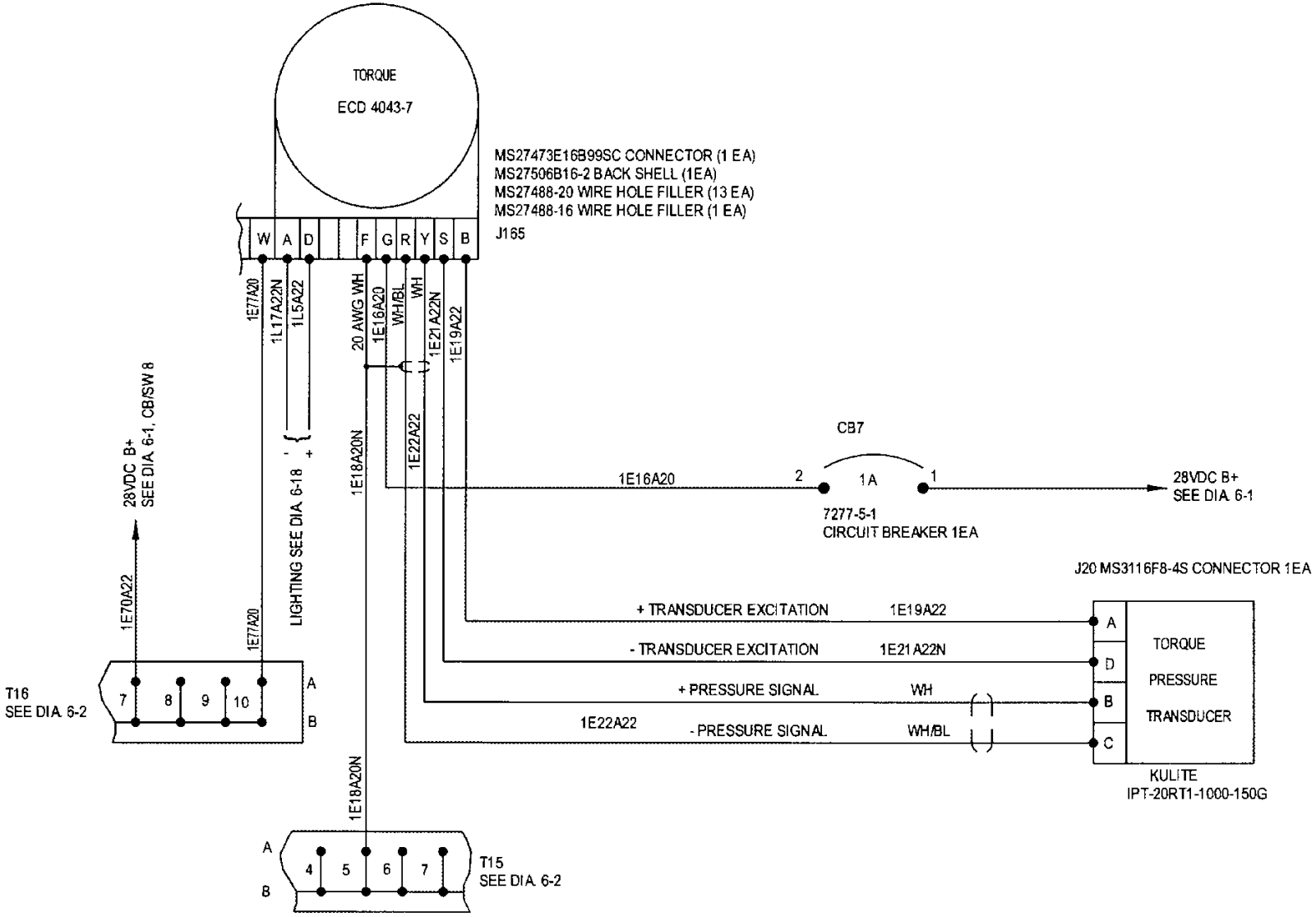


Diagram 6-7. Torque System

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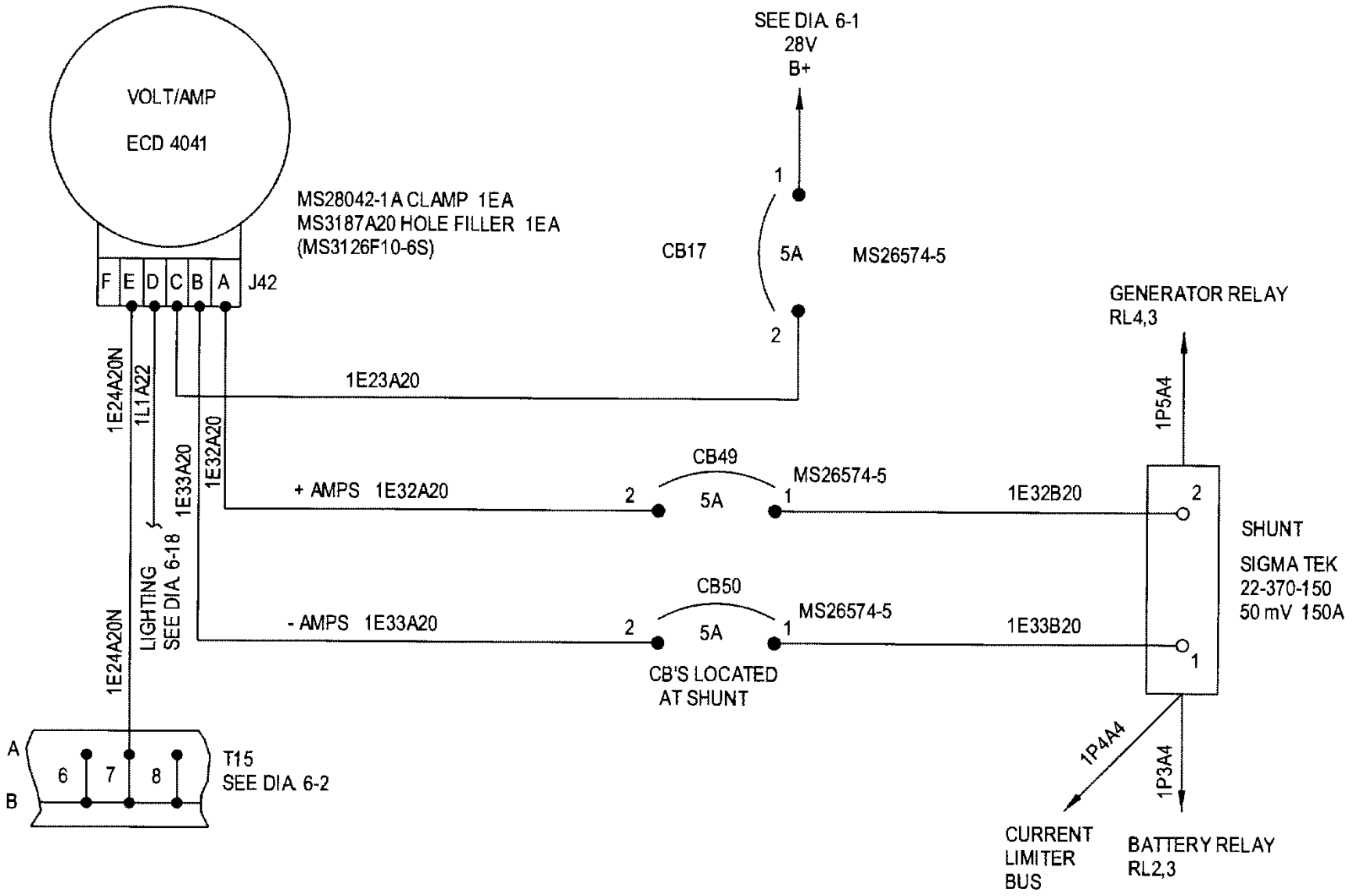


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Diagram 6-7. Torque System

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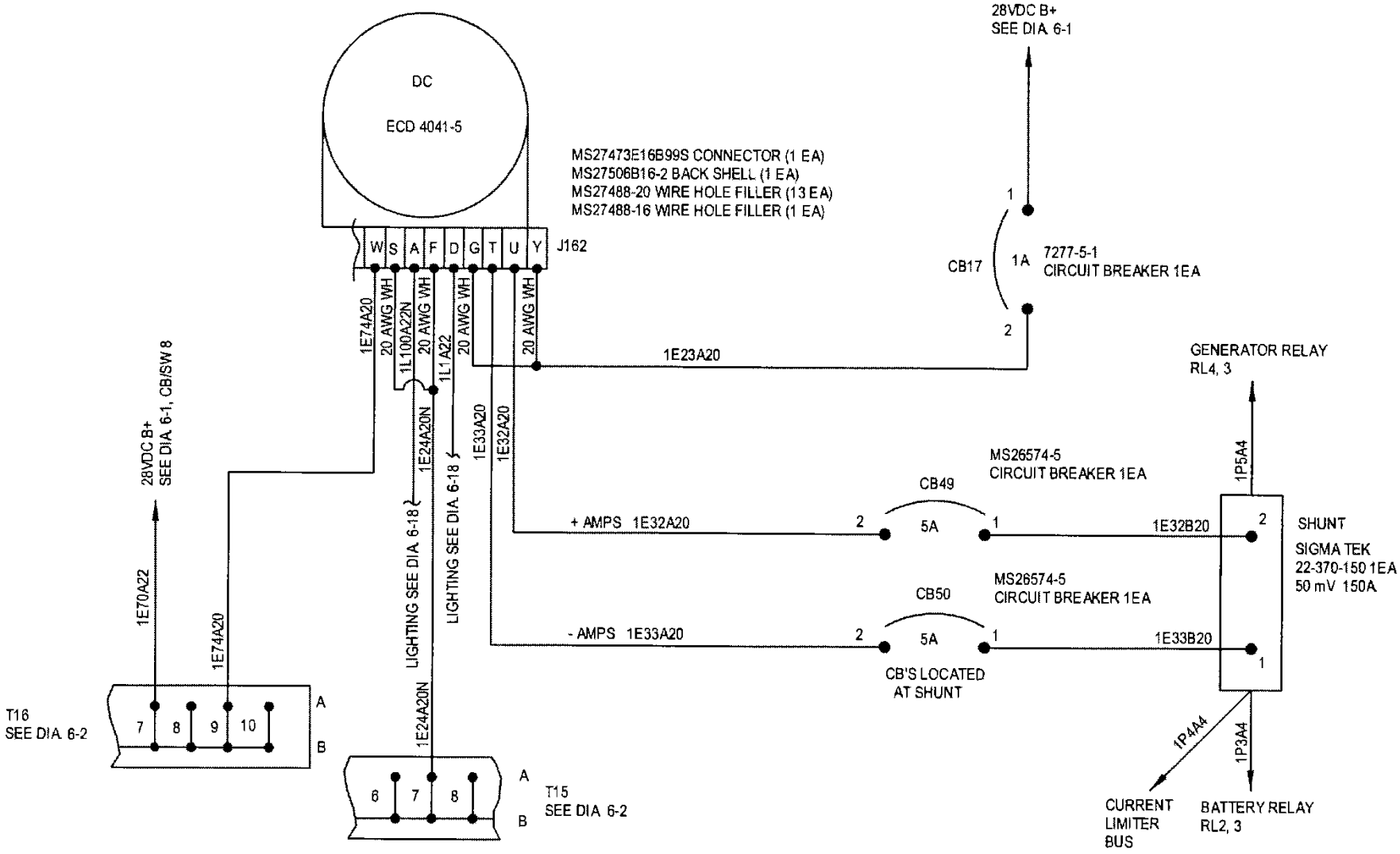


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Diagram 6-8. D.C. Volt/Amp System

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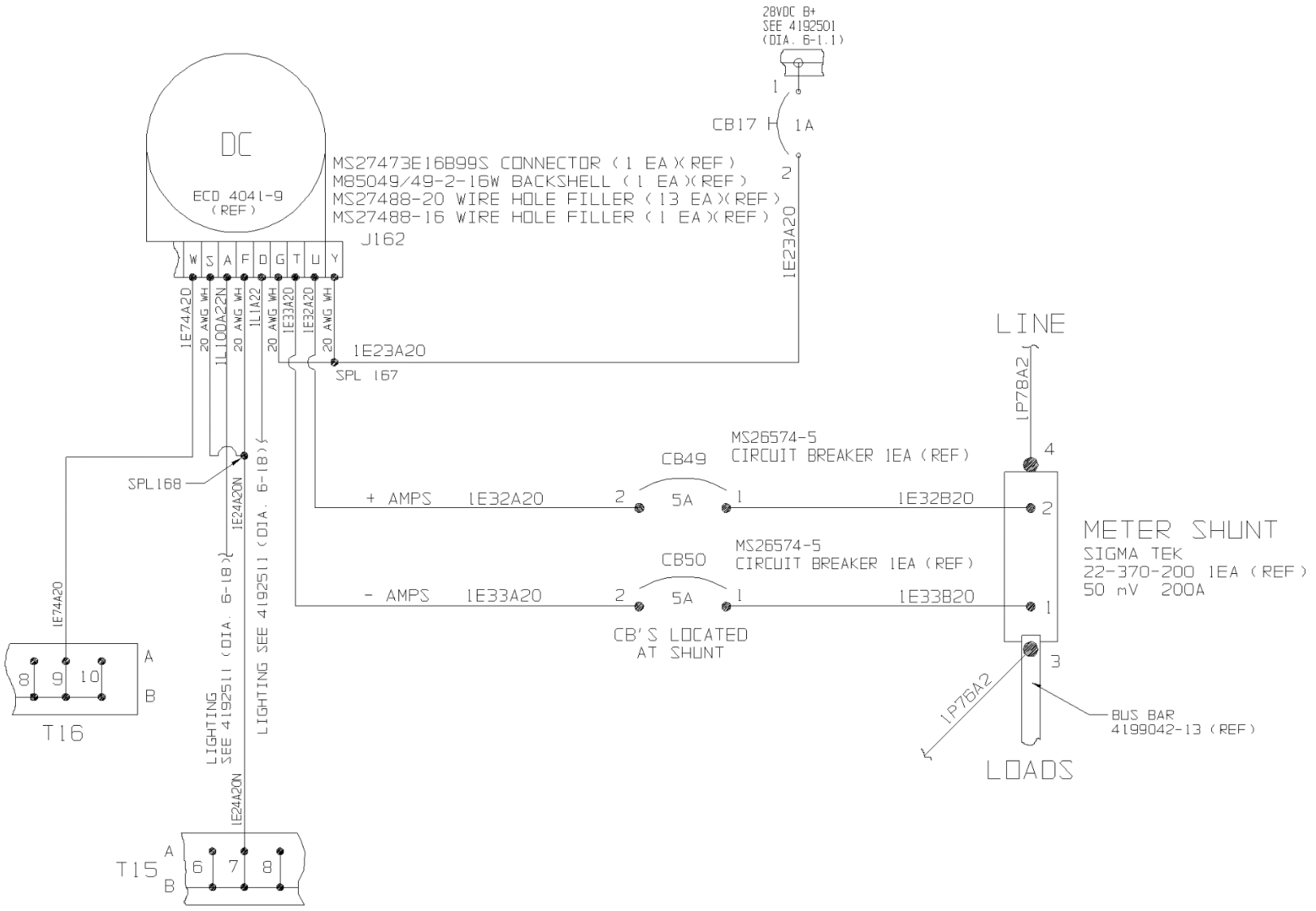


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Diagram 6-8. D.C. Volt/Amp System

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Diagram 6-8. D.C. Volt/Amp System

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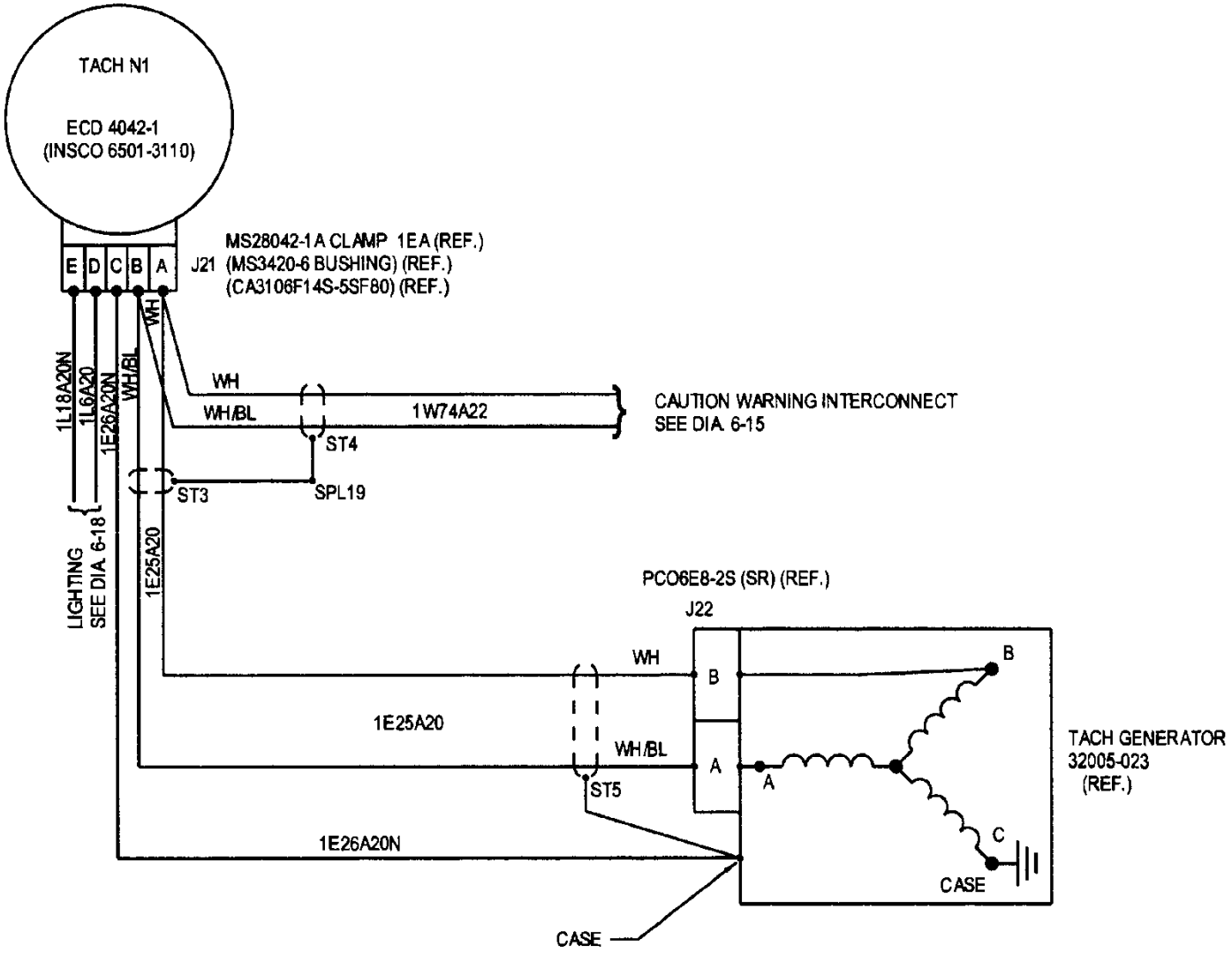
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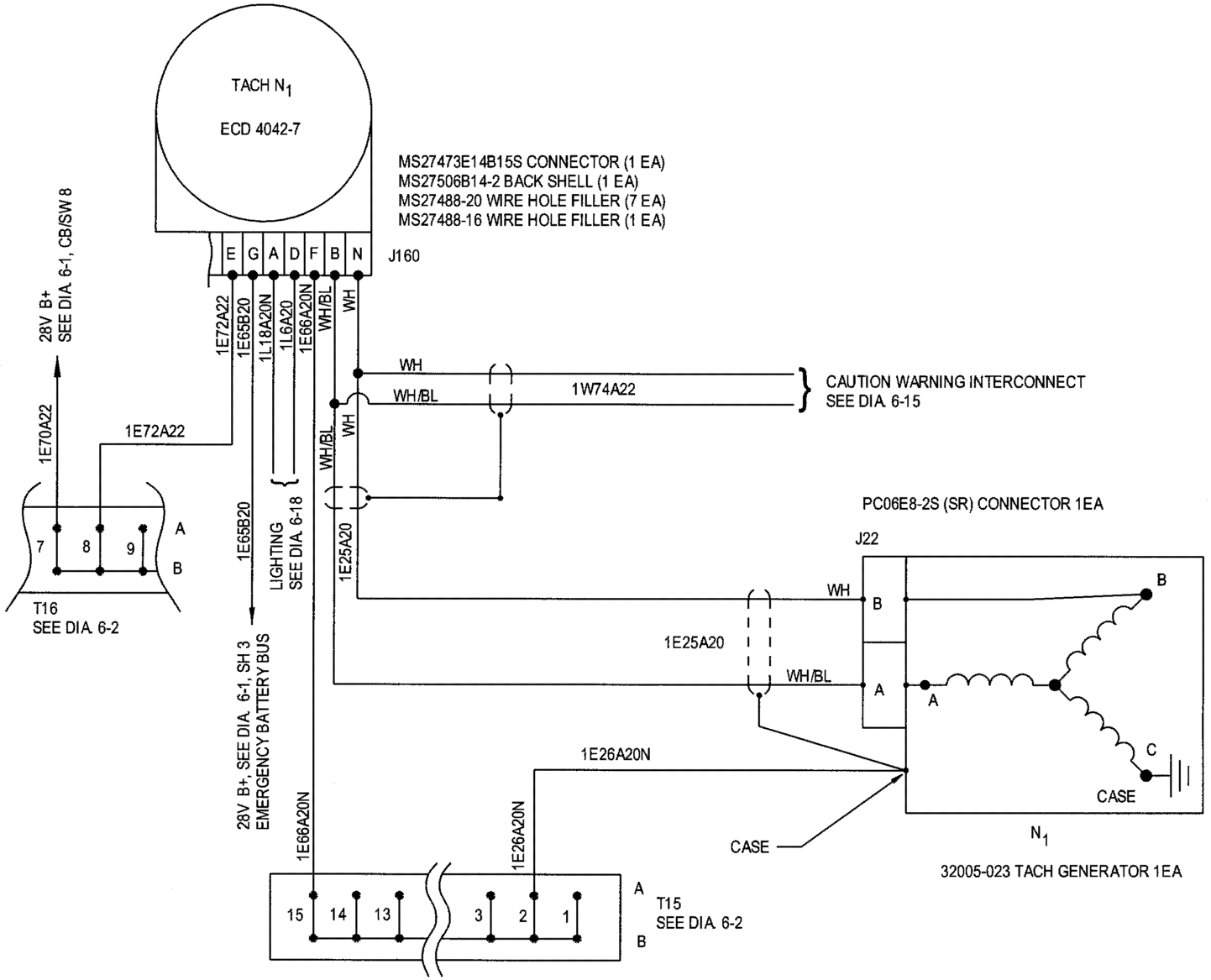
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Diagram 6-9. N_1 Indicating System

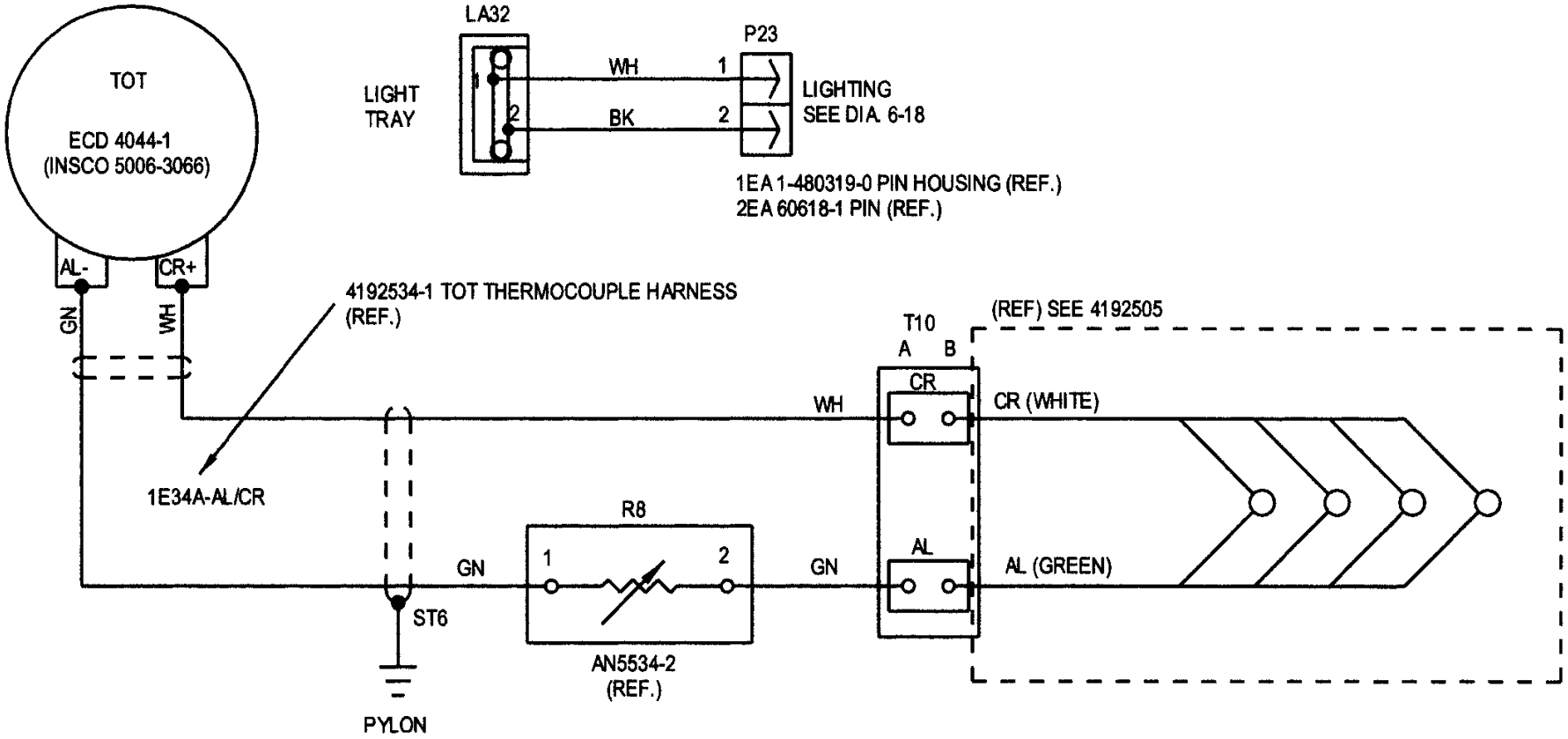
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Diagram 6-9. N_1 Indicating System

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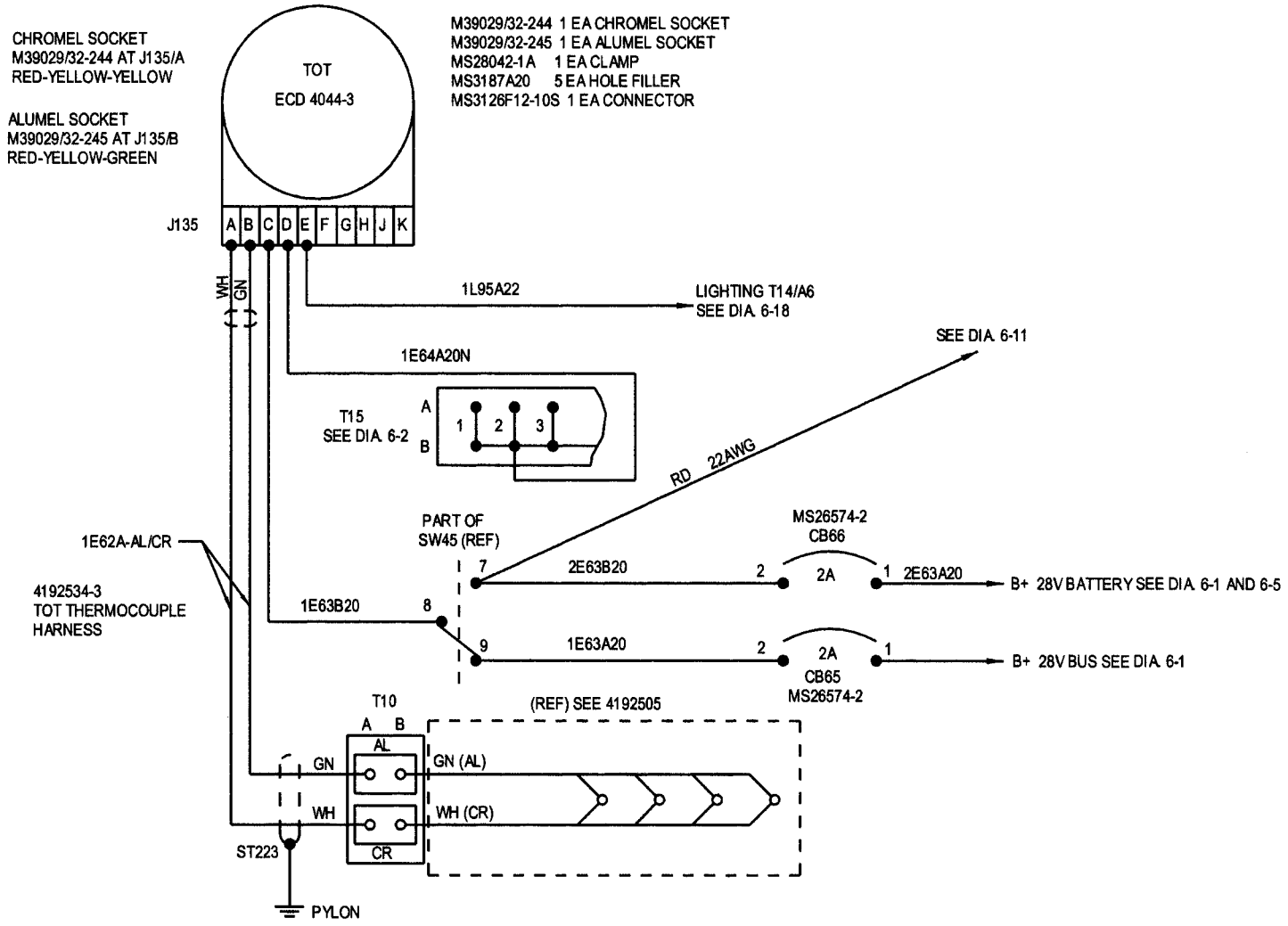


Sheet 1 of 3
Passive System

Diagram 6-10. Turbine Outlet Temperature (TOT) System

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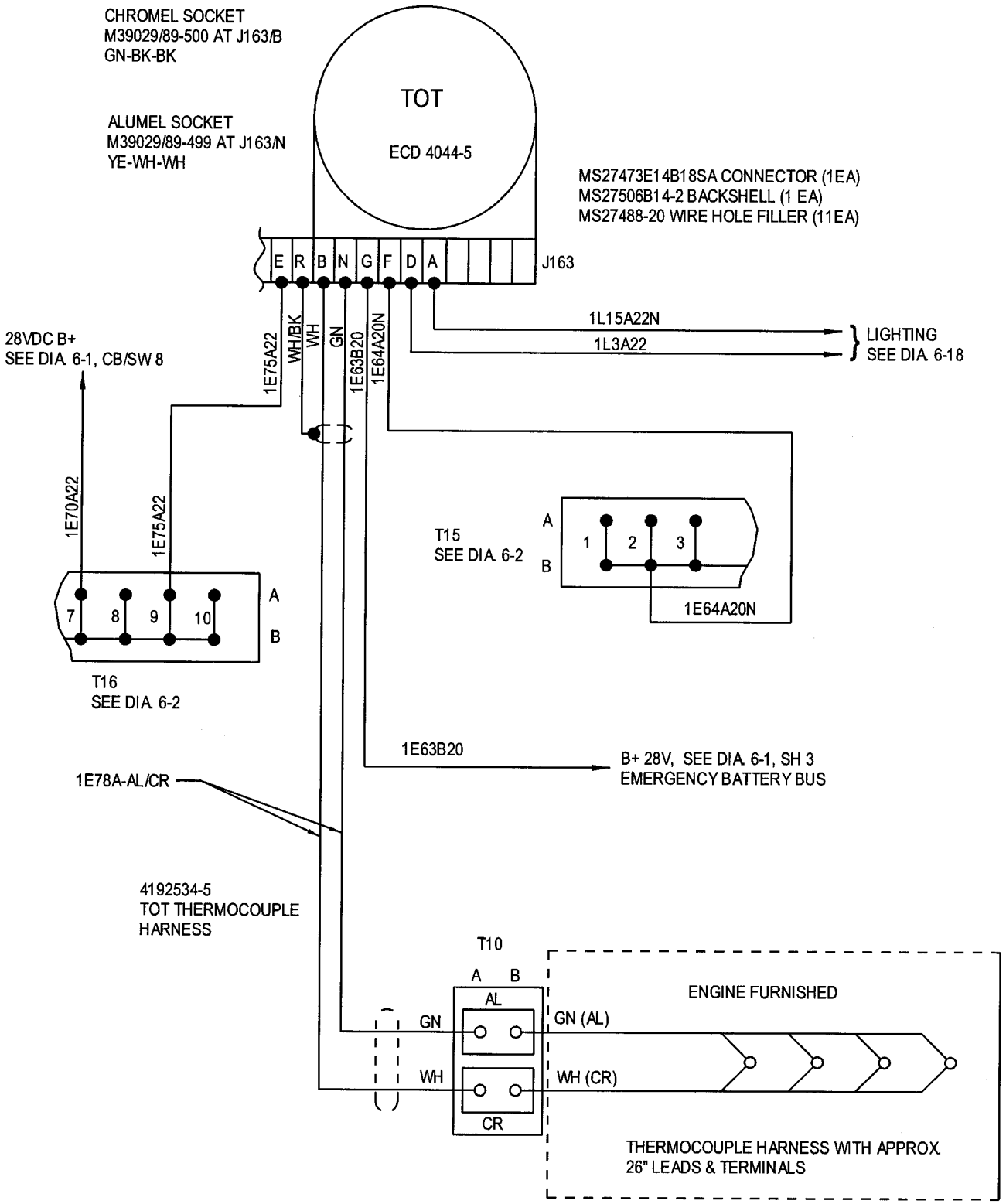


Sheet 2 of 3
Active System

Diagram 6-10. Turbine Outlet Temperature (TOT) System

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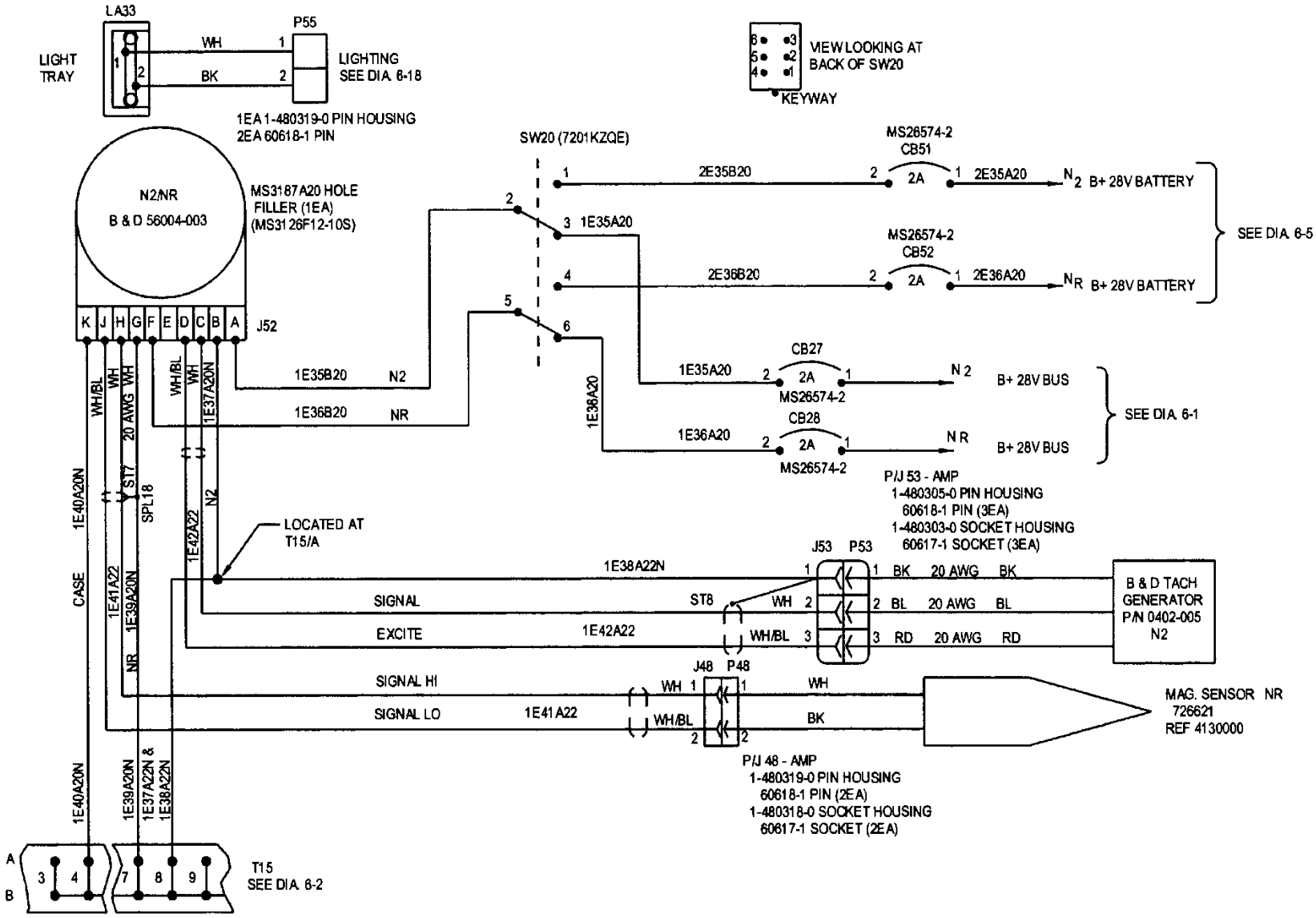
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Figure 6-10. Turbine Outlet Temperature (TOT) System

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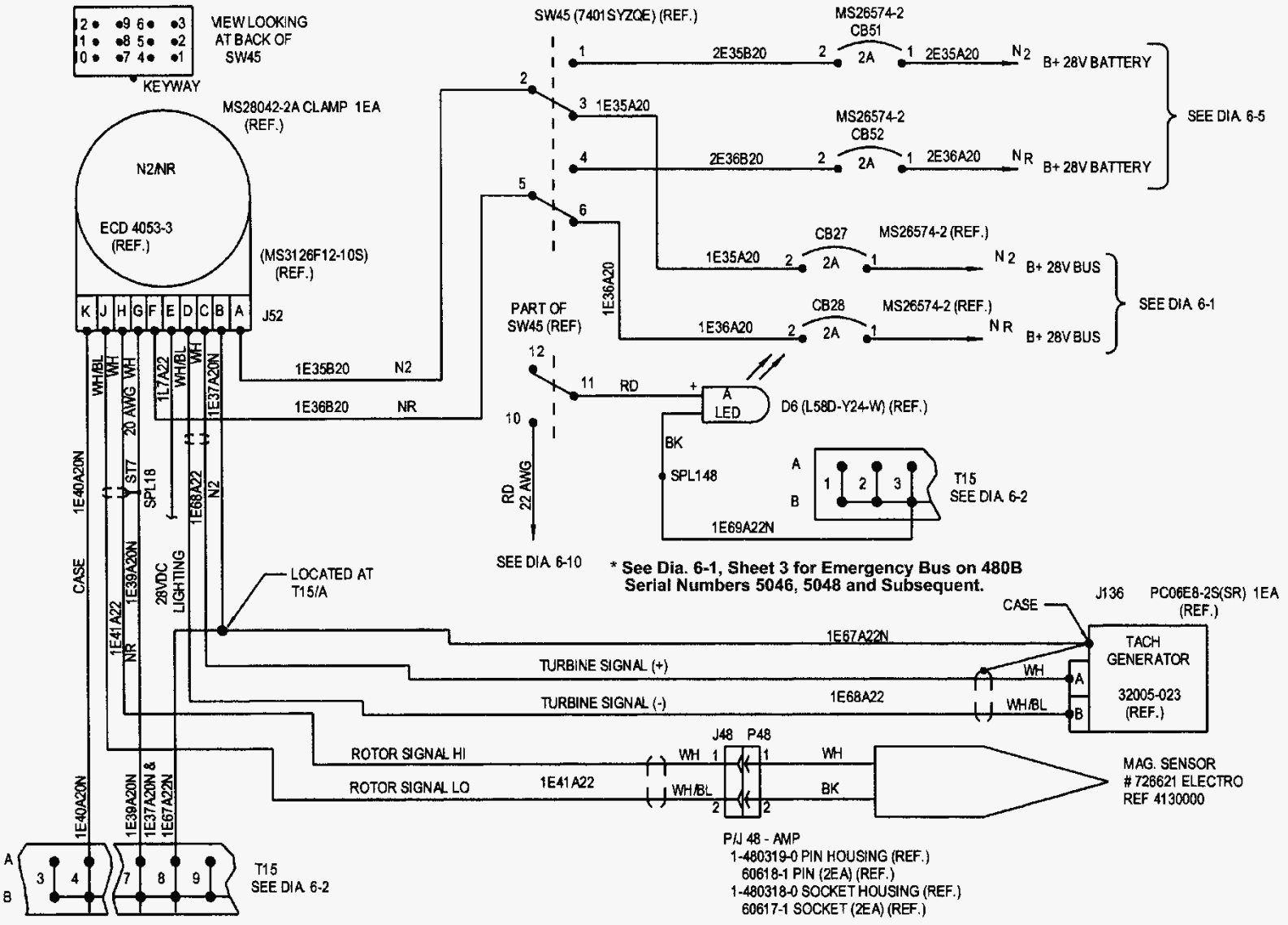


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Diagram 6-11. N_2/N_R Indicating System

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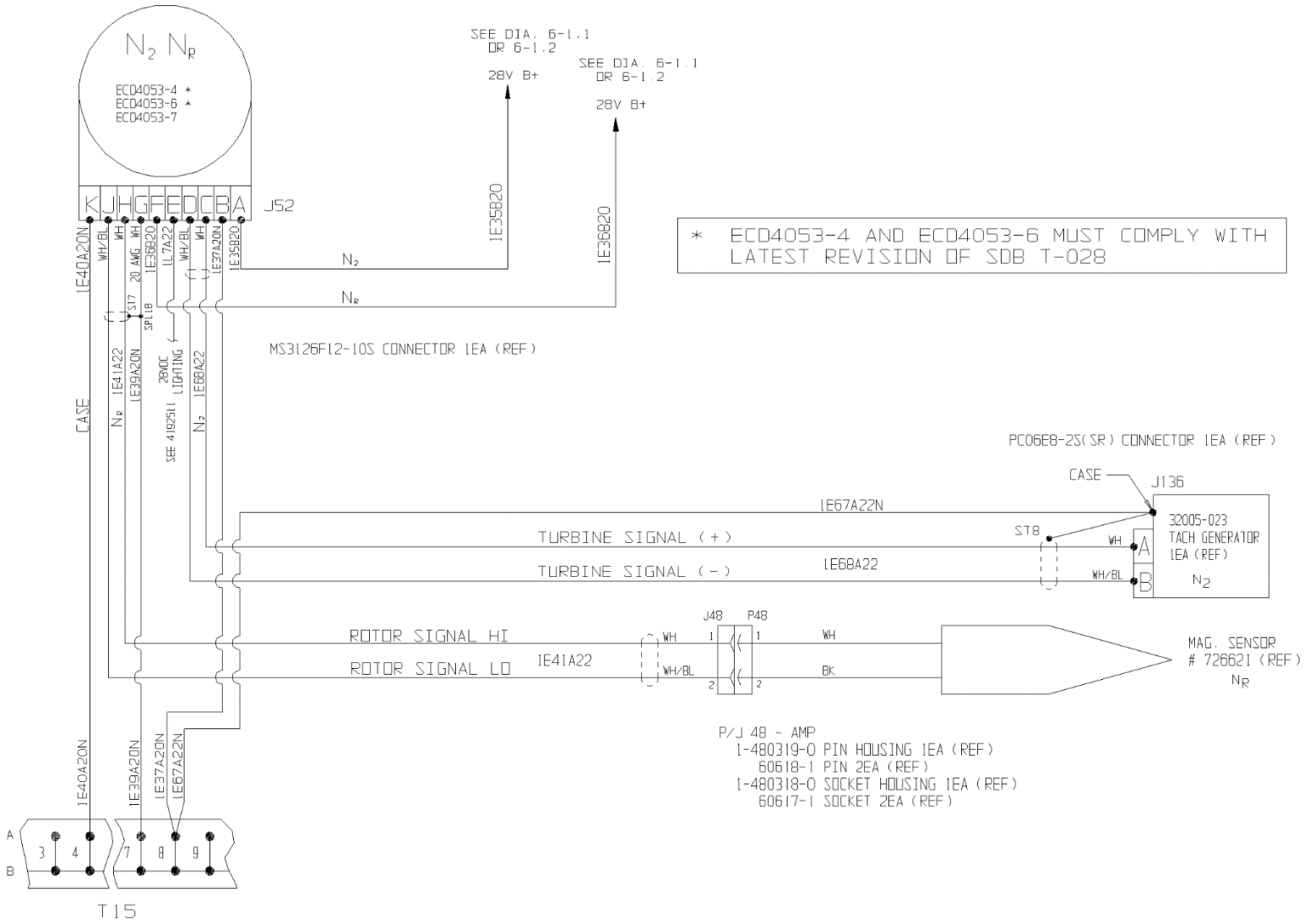


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Diagram 6-11. N_2/N_R Indicating System

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Diagram 6-11. N_2/N_R Indicating System

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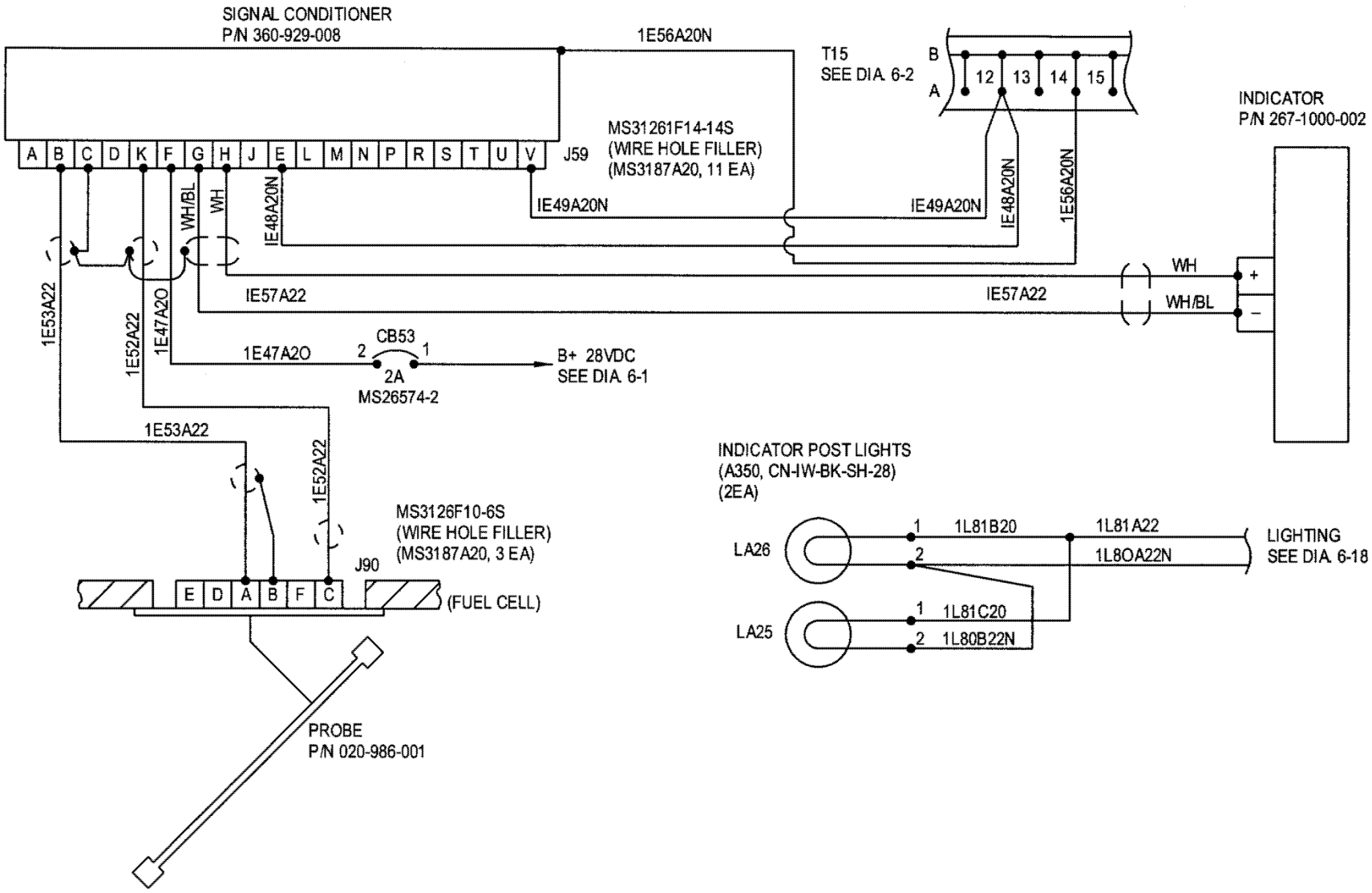
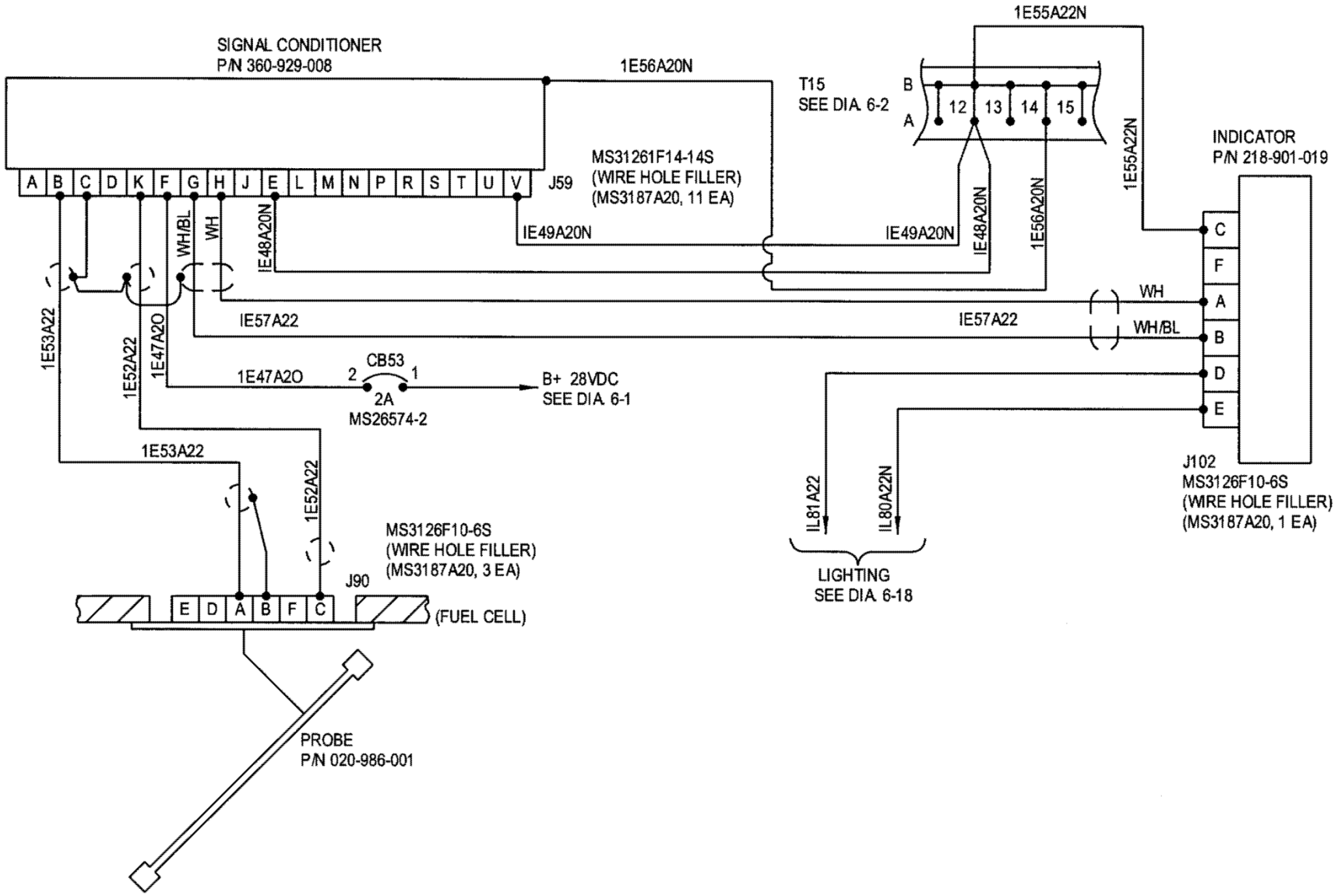


Diagram 6-12. Fuel Quantity System

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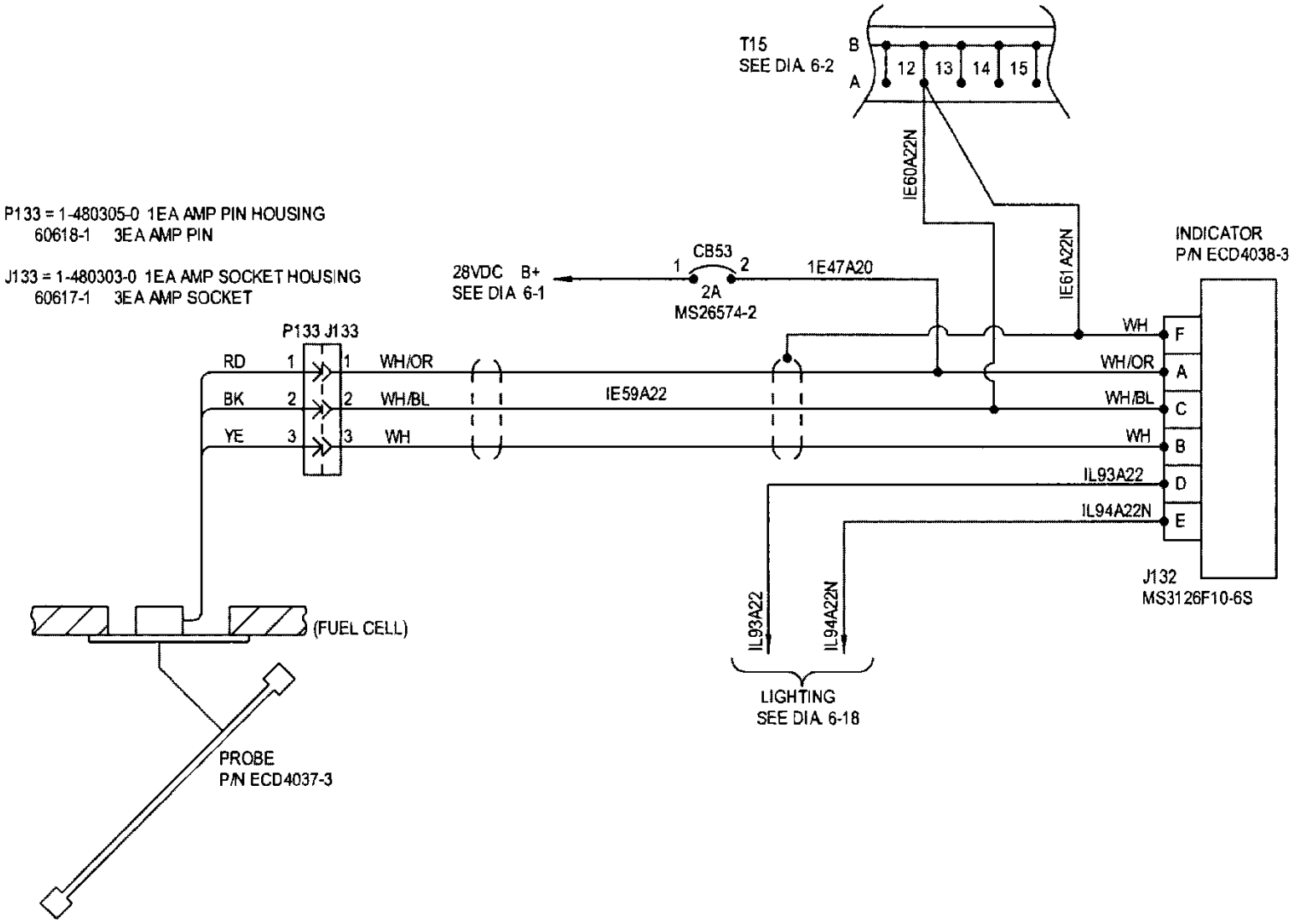


Sheet 2 of 5

Diagram 6-12. Fuel Quantity System

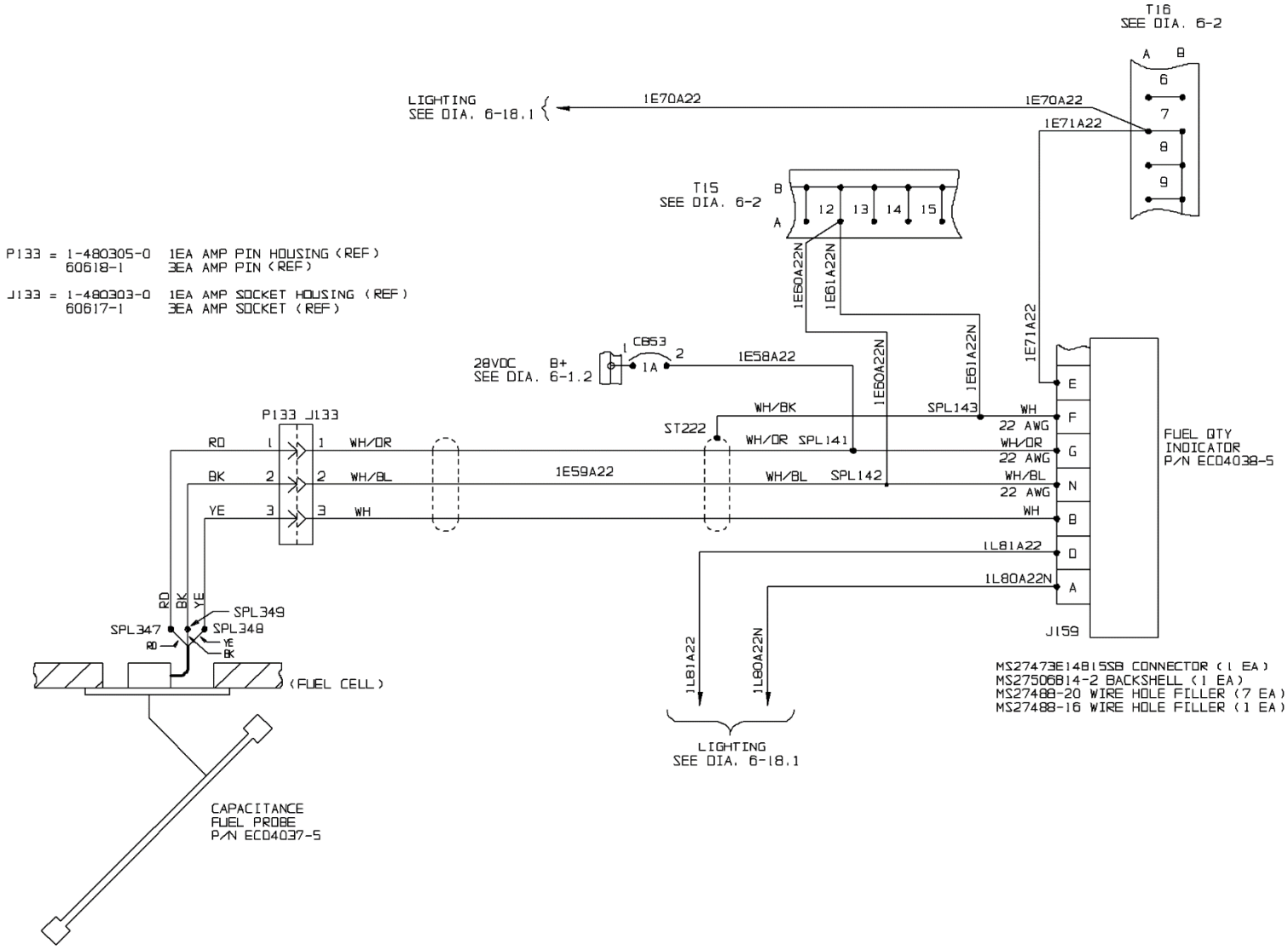
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Diagram 6-12. Fuel Quantity System



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Diagram 6-12. Fuel Quantity System

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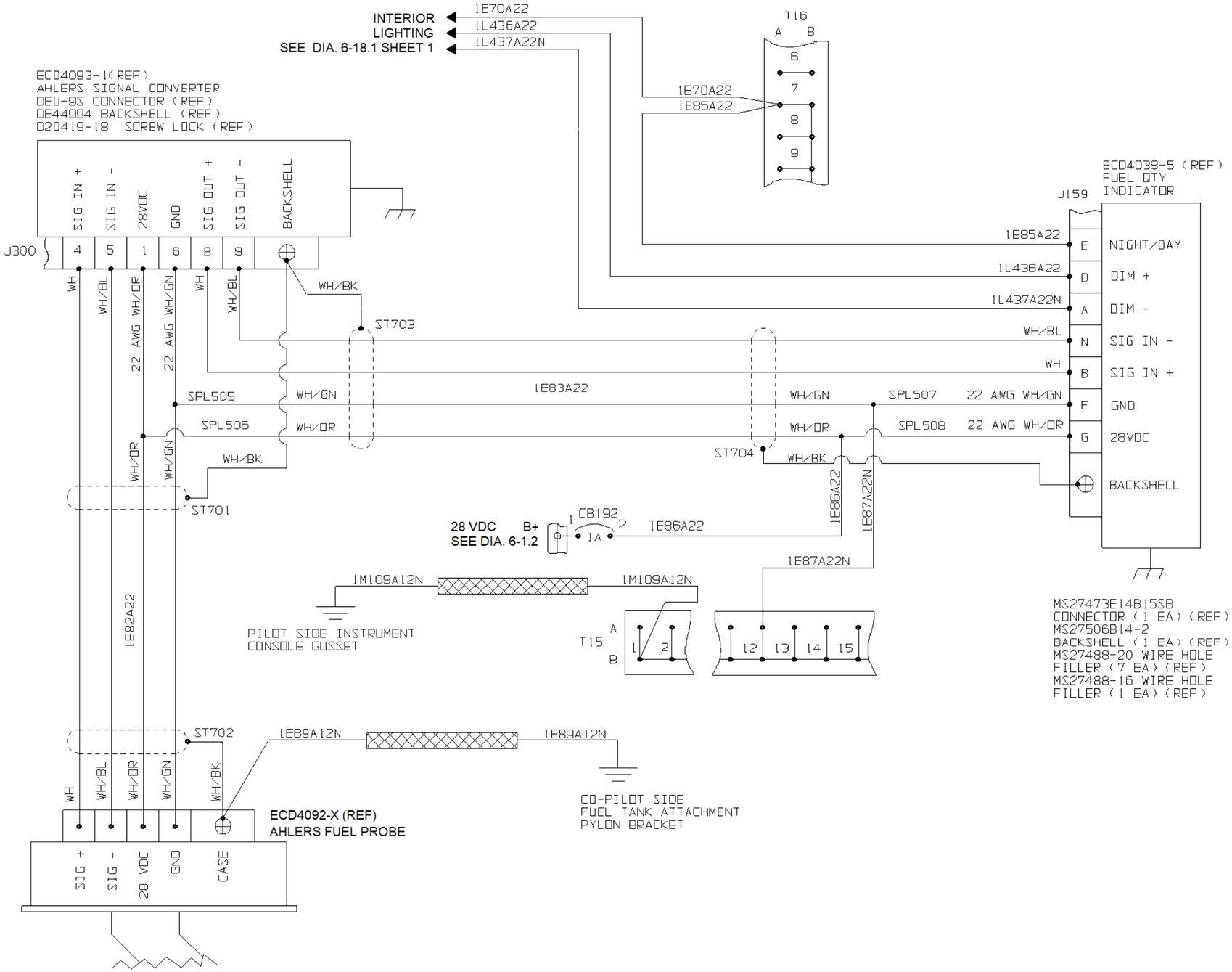


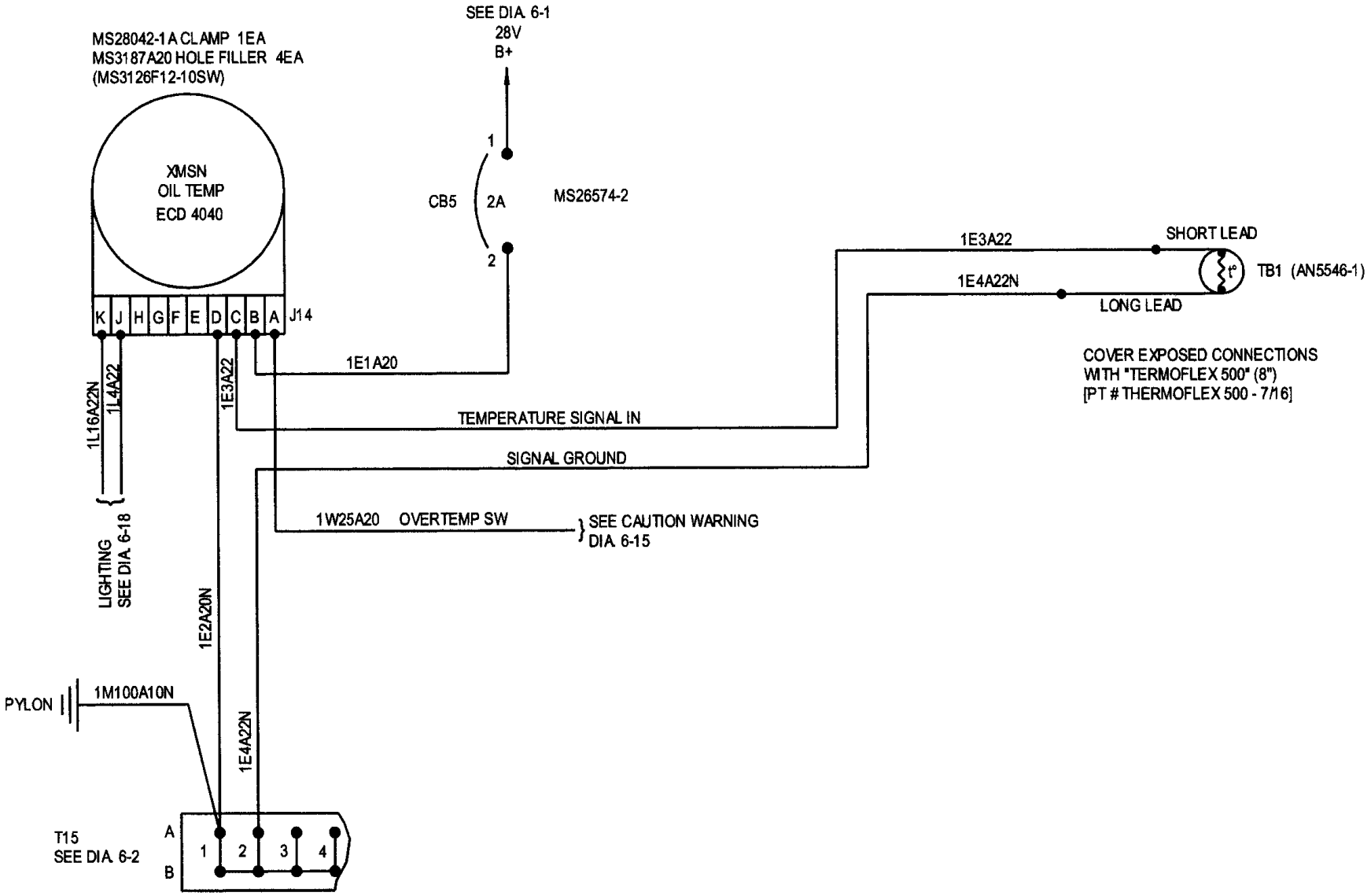
Diagram 6-12. Fuel Quantity System (Ref. 4192504 Rev. K)

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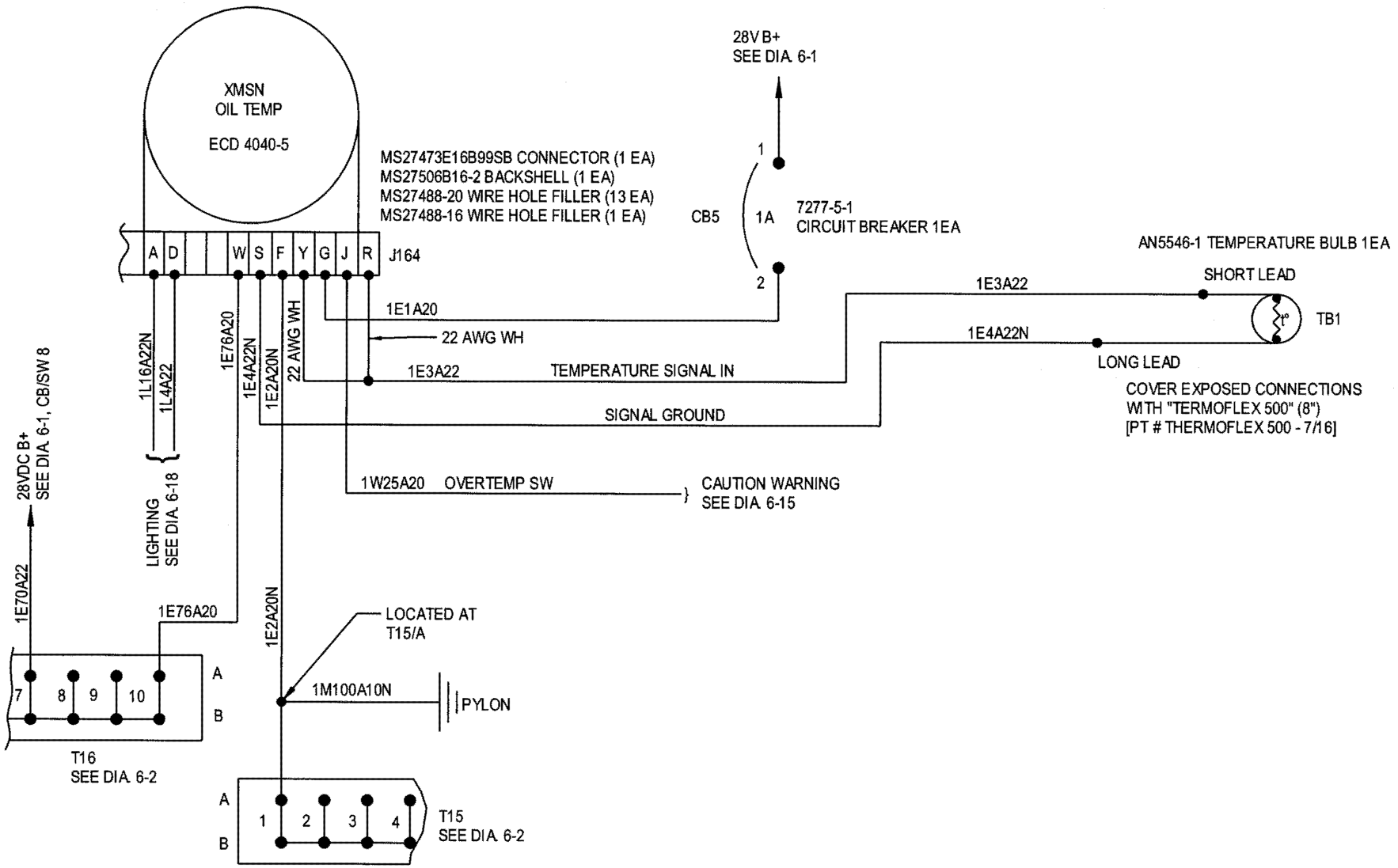
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Diagram 6-13. M/R Transmission Oil Temperature System

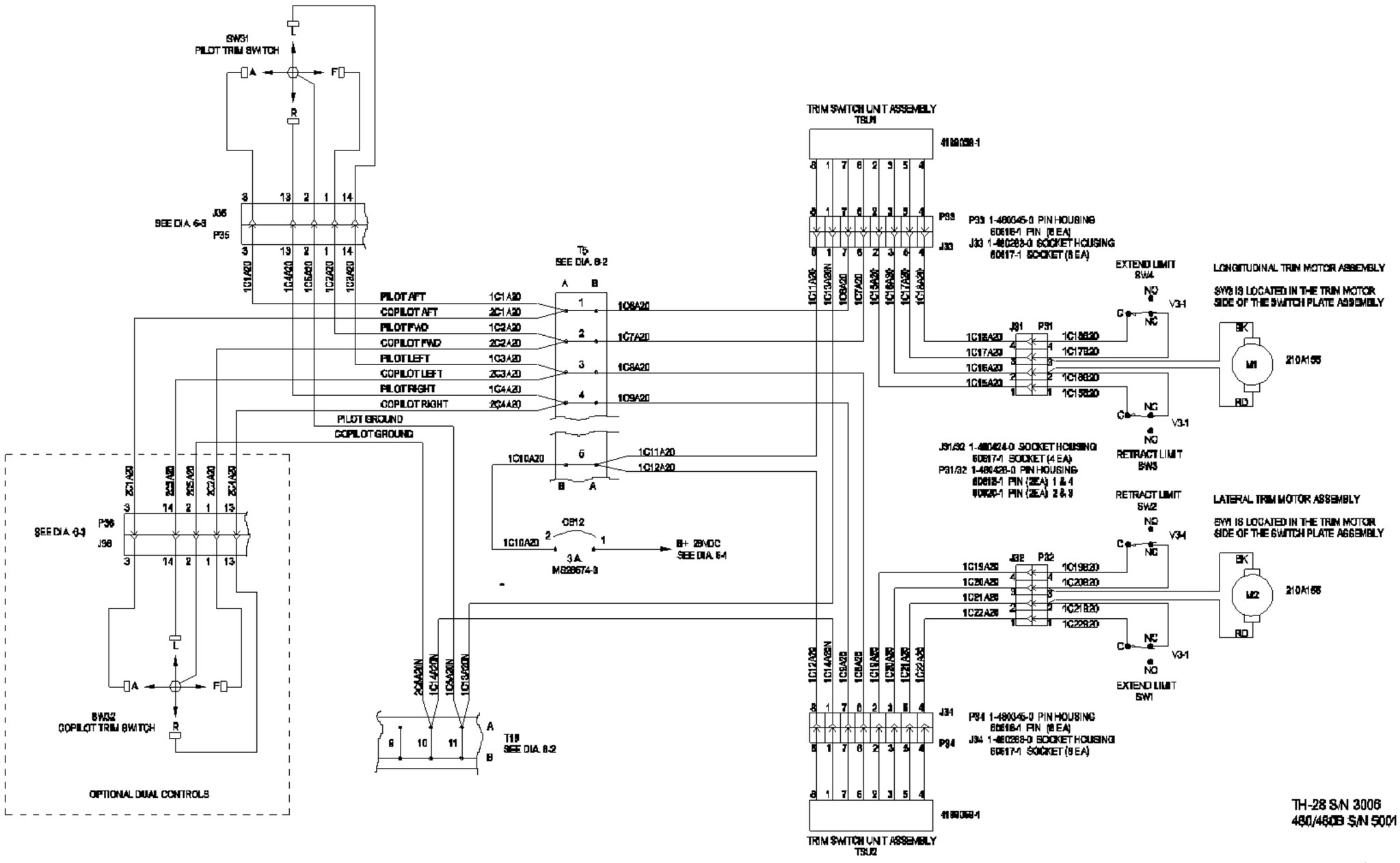
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Diagram 6-13. M/R Transmission Oil Temperature System

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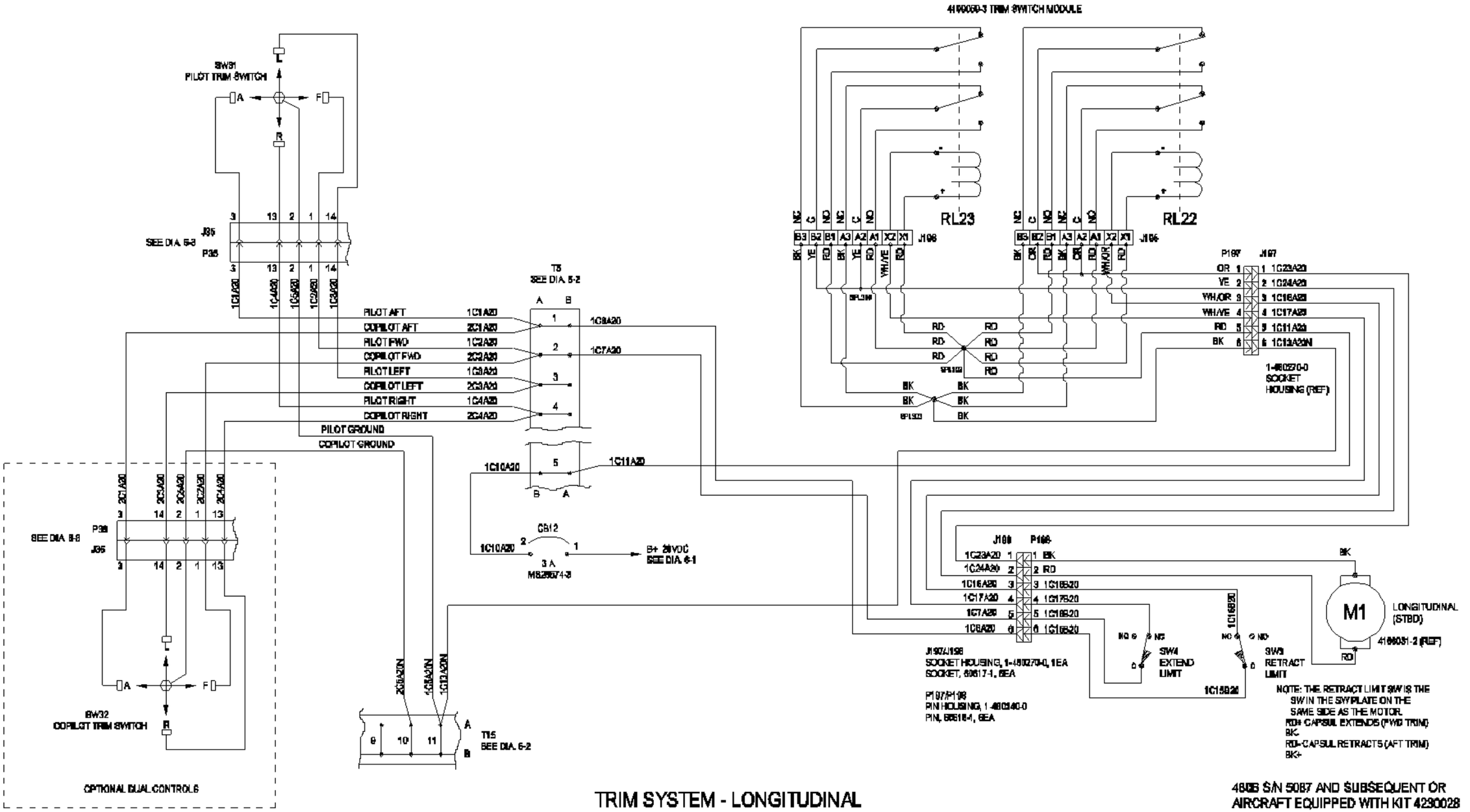
Diagram 6-14. Trim System

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TRIM SYSTEM - LONGITUDINAL

480B S/N 5087 AND SUBSEQUENT OR AIRCRAFT EQUIPPED WITH KIT 4230028

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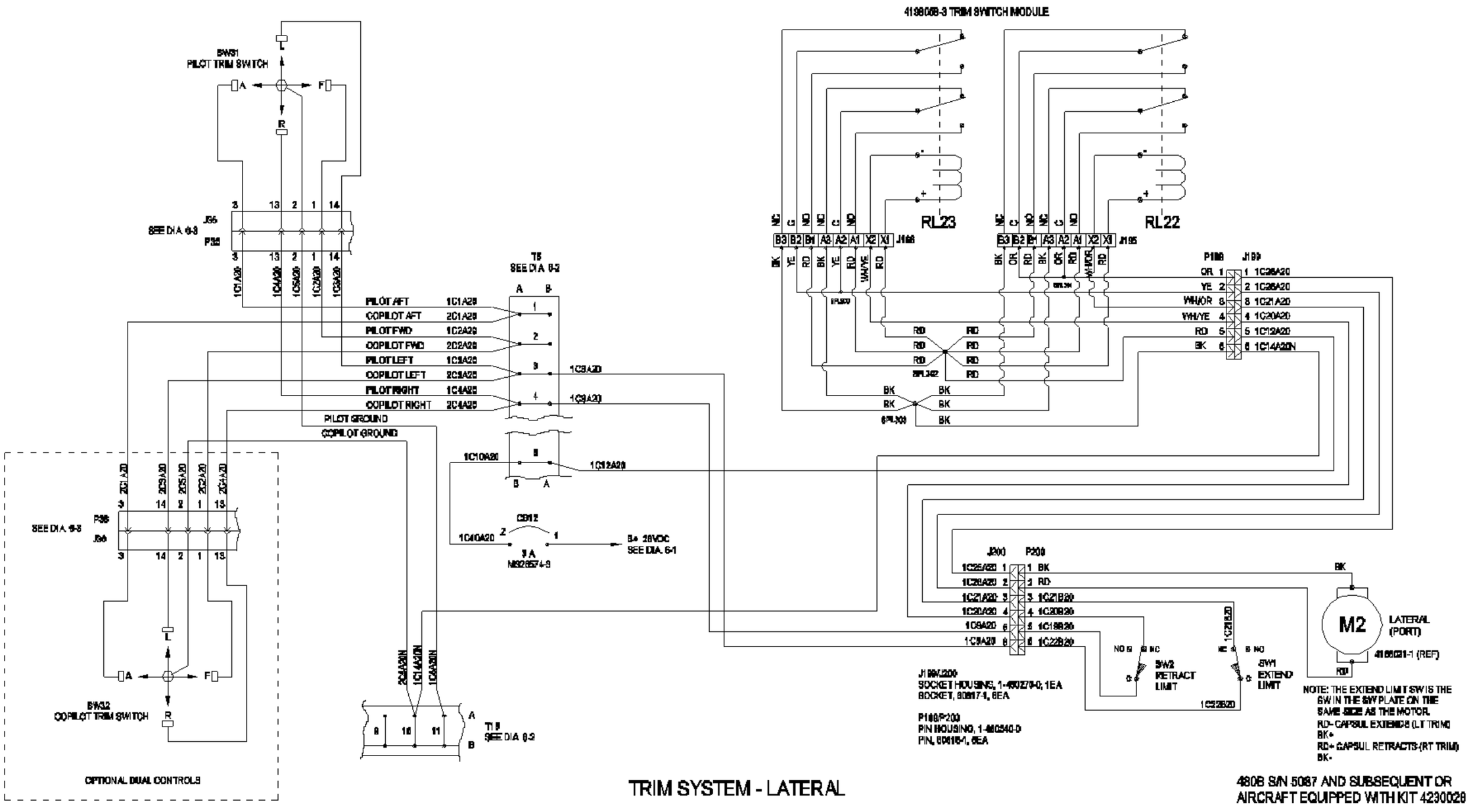
Diagram 6-14. Trim System

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TRIM SYSTEM - LATERAL

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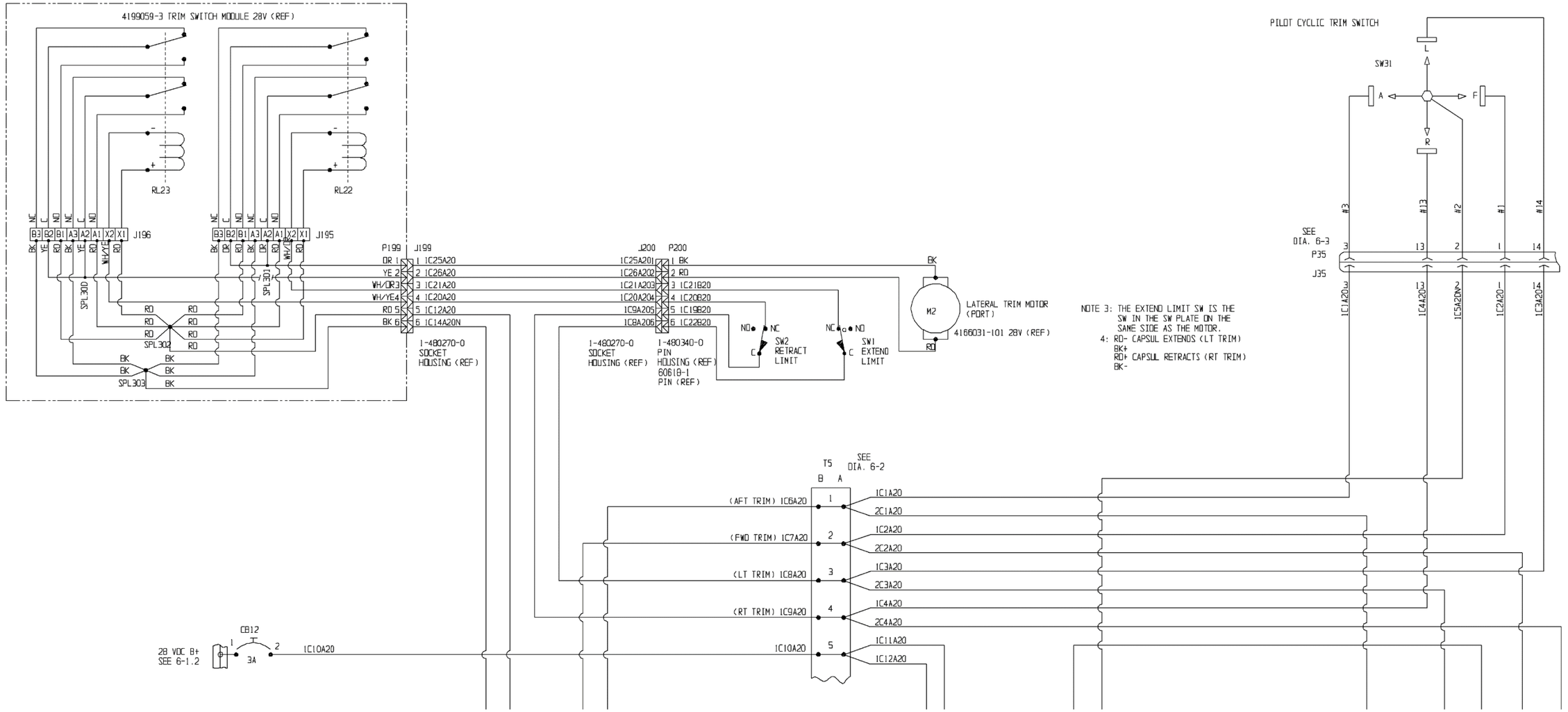
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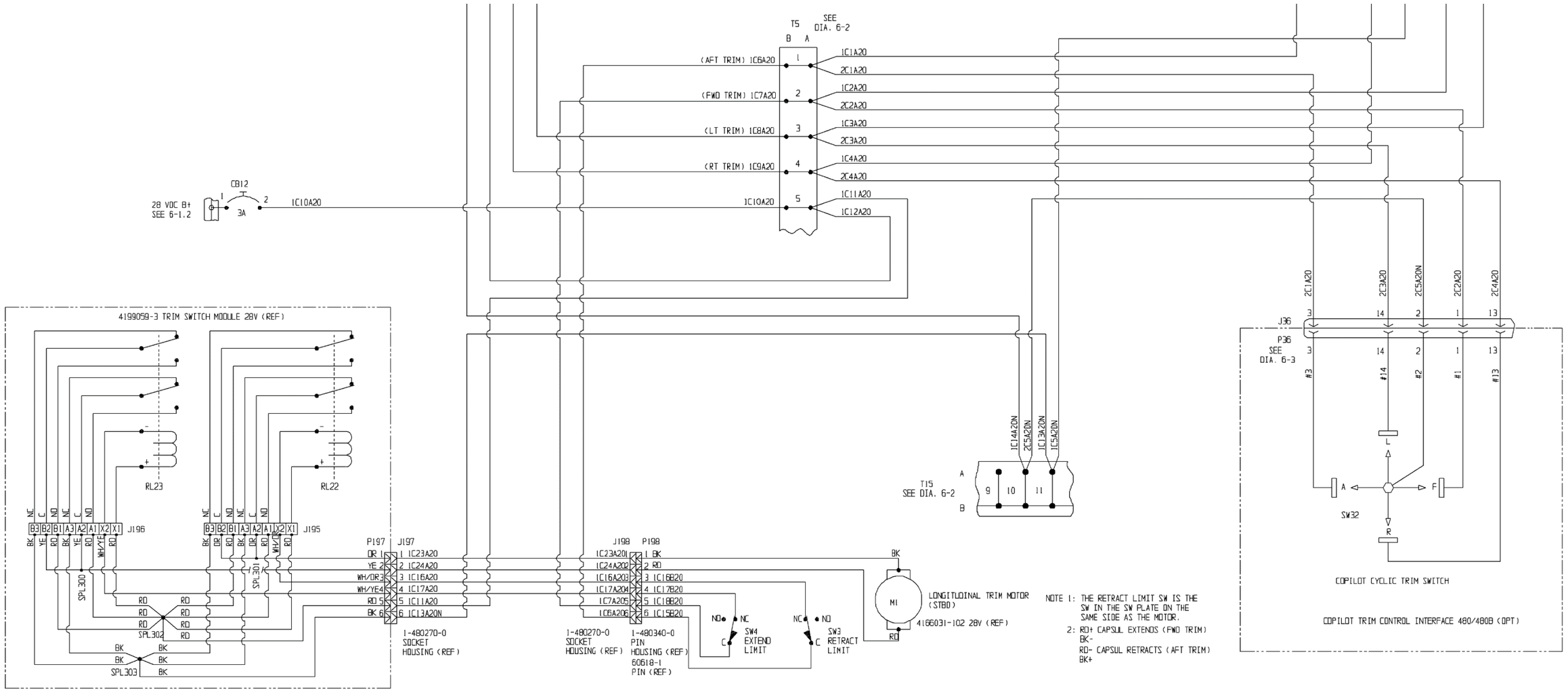
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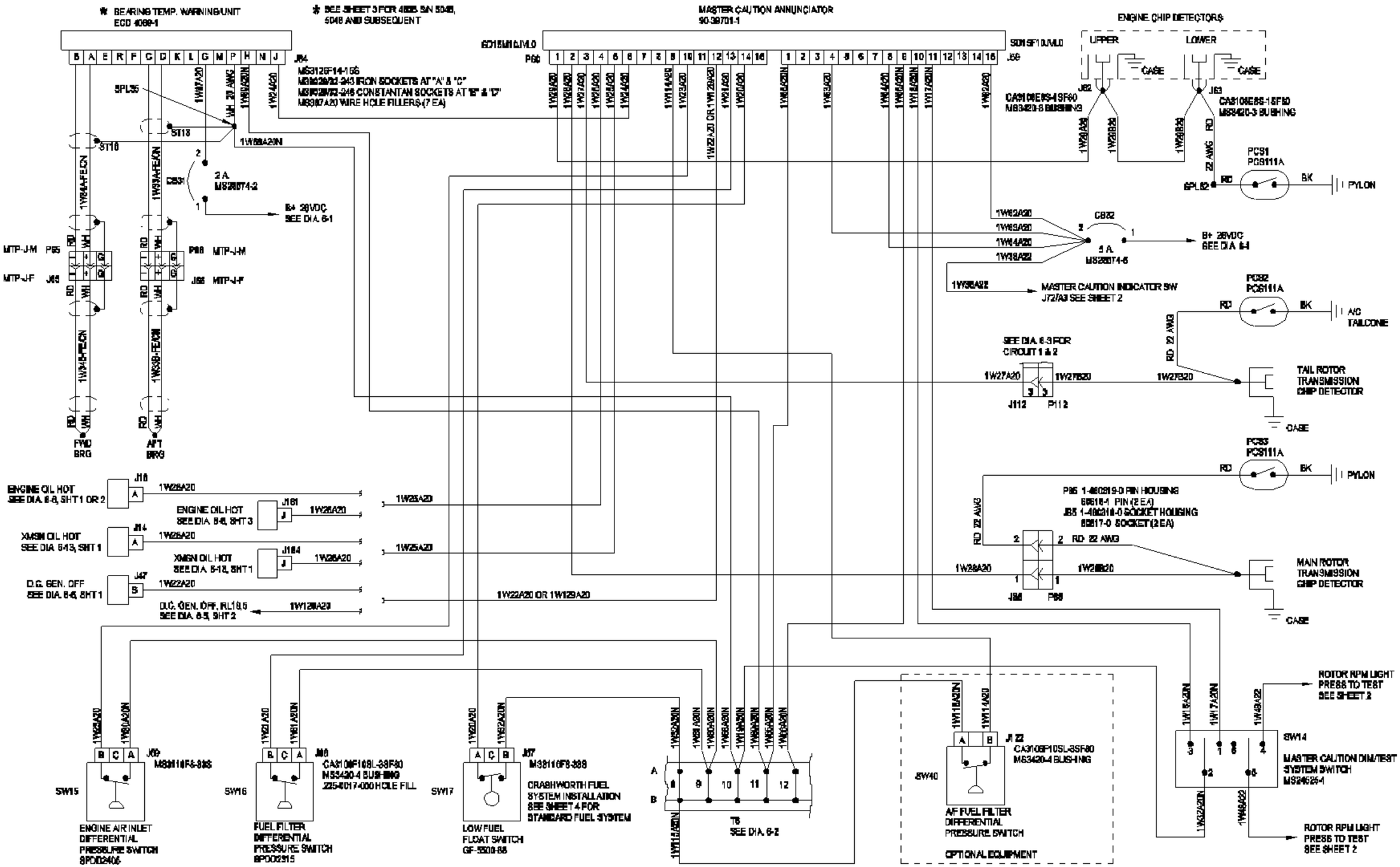


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* BEARING TEMP. WARNING UNIT ECD 4068-1
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ENGINE CHIP DETECTORS
UPPER
LOWER
CASE
J64
MS3126F14-15S
MS3420-3 BUSHING
MS3420-4 BUSHING
MS3420-5 BUSHING
MS3420-8 BUSHING
MS3420-9 BUSHING
MS3420-10 BUSHING
MS3420-11 BUSHING
MS3420-12 BUSHING
MS3420-13 BUSHING
MS3420-14 BUSHING
MS3420-15 BUSHING
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MS3420-22 BUSHING
MS3420-23 BUSHING
MS3420-24 BUSHING
MS3420-25 BUSHING
MS3420-26 BUSHING
MS3420-27 BUSHING

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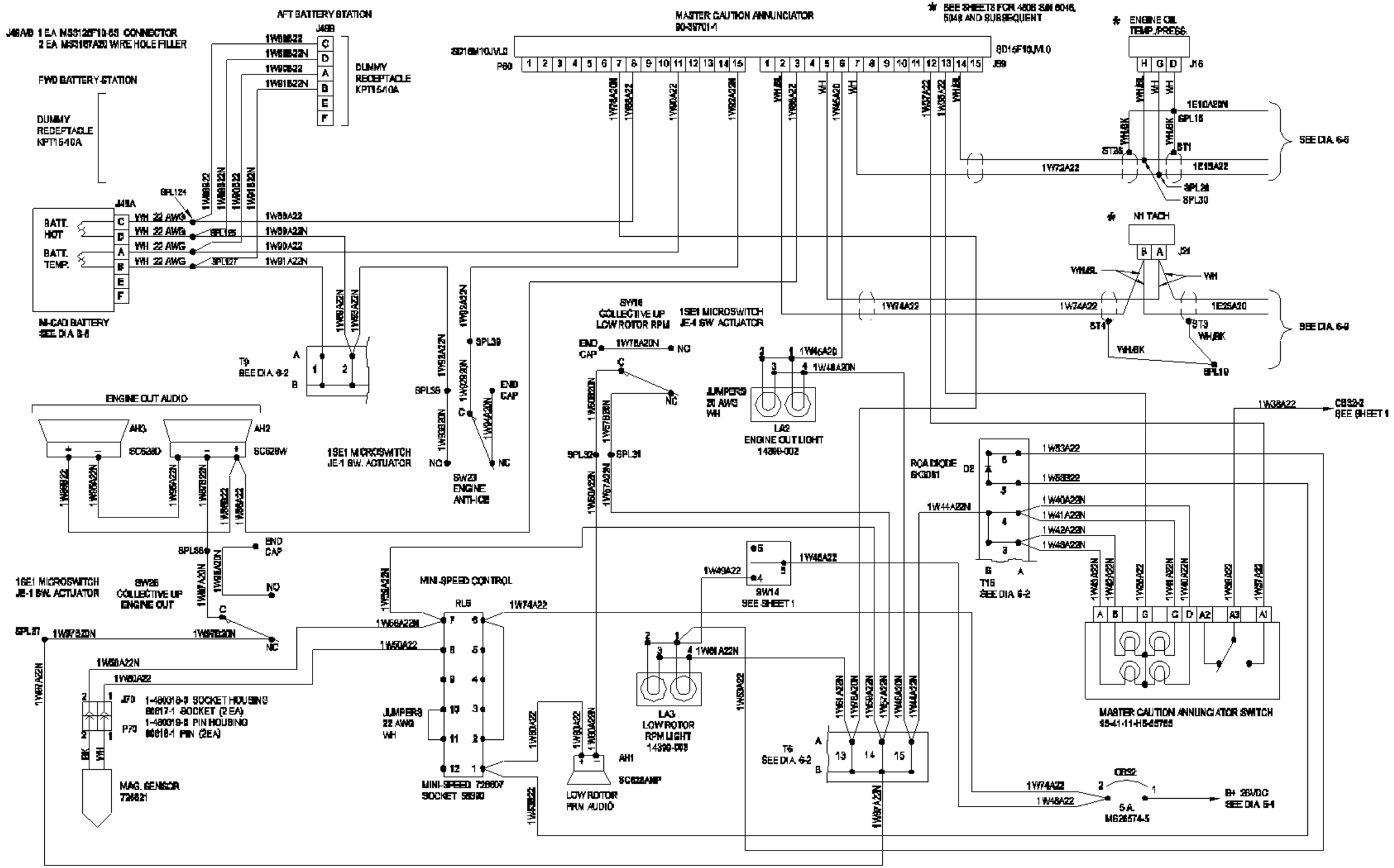


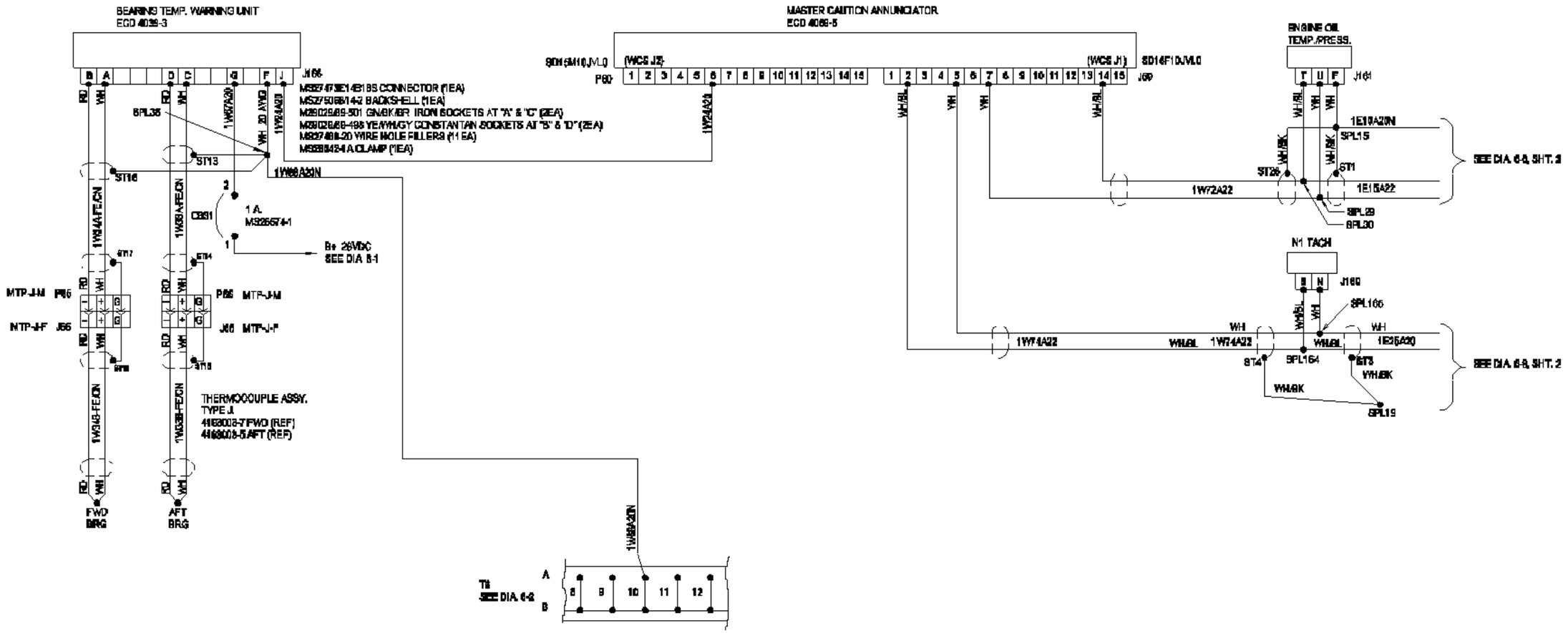
Diagram 6-15. Caution/Warning System, Sheet 2 of 5

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480B Serial Numbers: 5046, 5048 and Subsequent

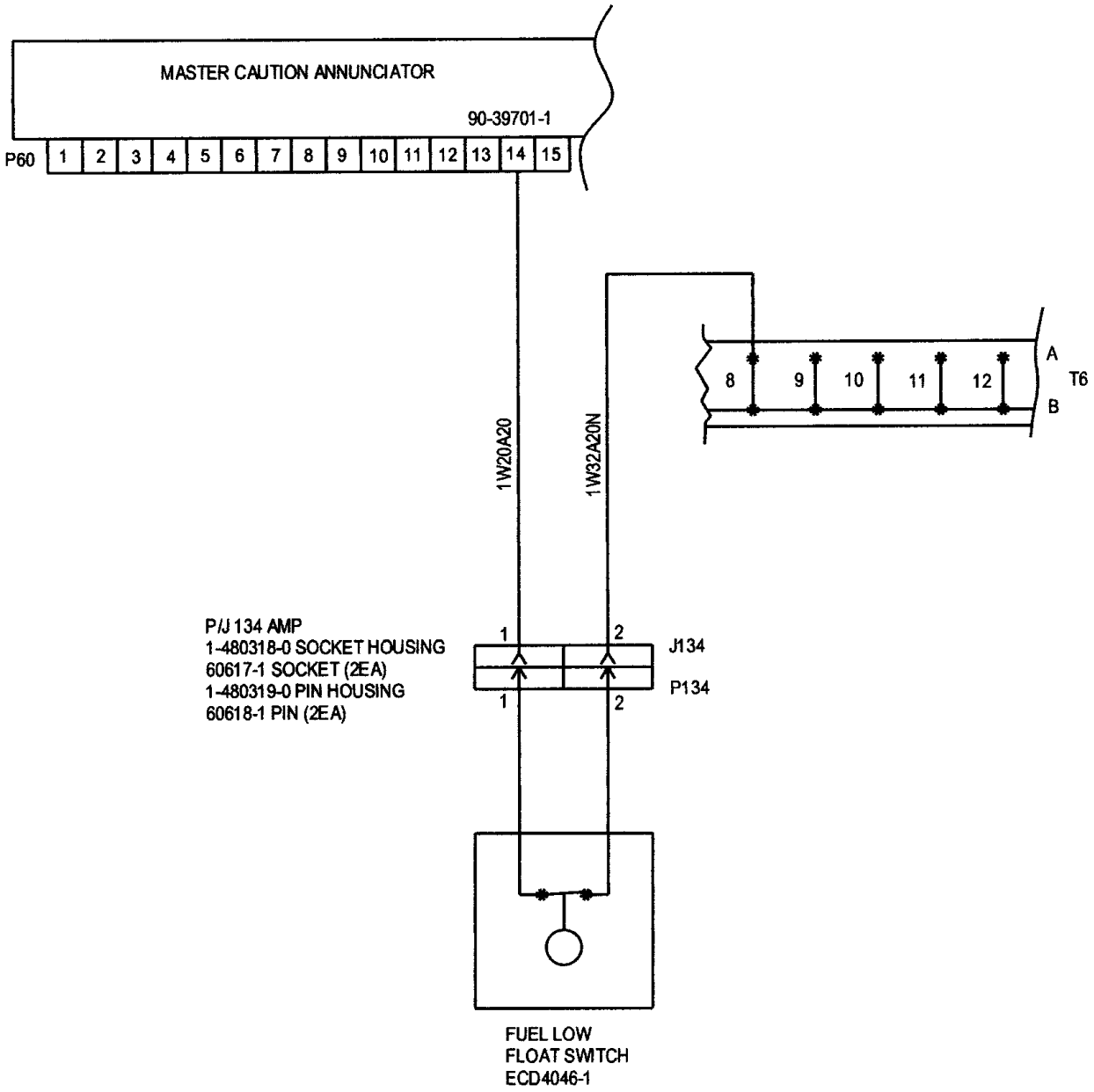
Diagram 6-15. Caution/Warning System, Sheet 3 of 5
Rev. 5
Aug 4/06
MM-6-98.15/MM-6-98.16 (Blank)

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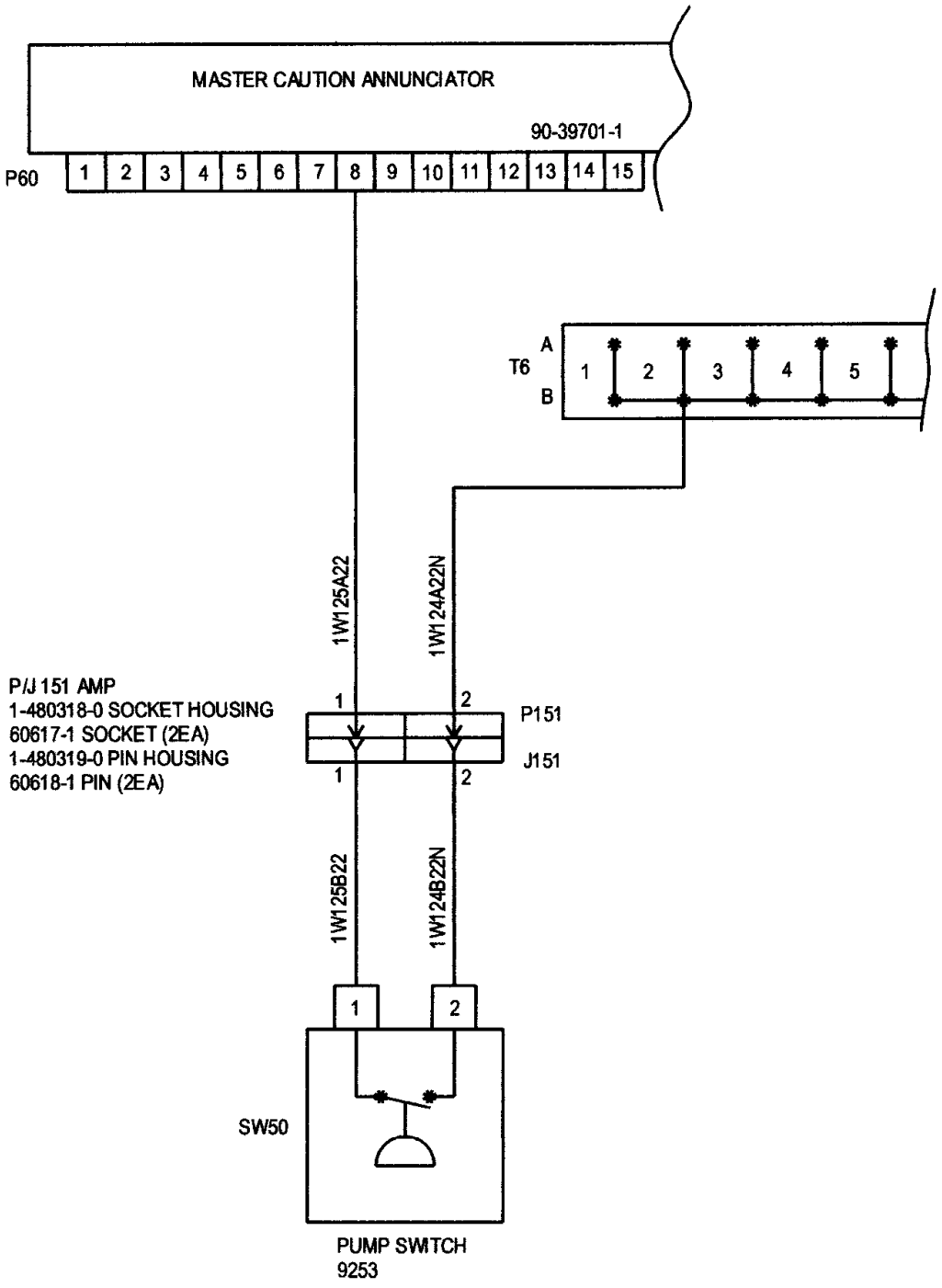
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Sheet 4 of 5
480B Serial Numbers: 5007, 5013 and Subsequent

Diagram 6-15. Caution/Warning System

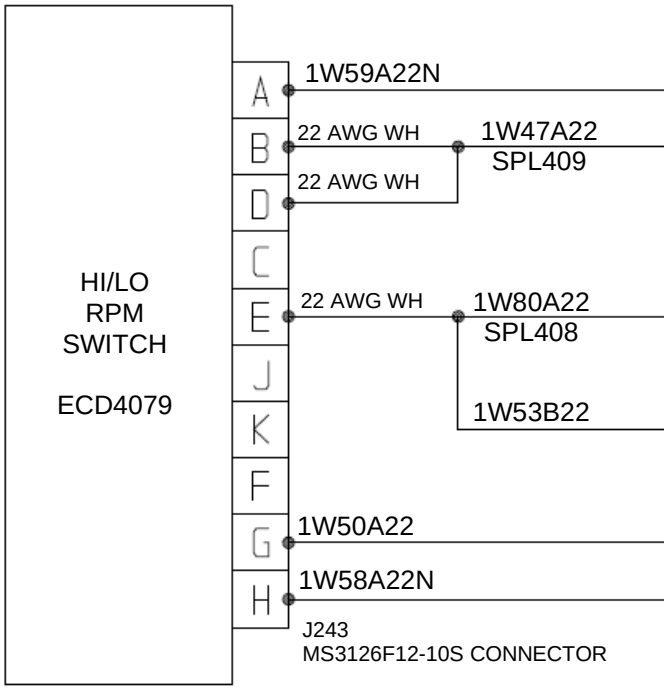
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Sheet 5 of 5
480B Serial Numbers: 4039 and Subsequent

Diagram 6-15. Caution/Warning System

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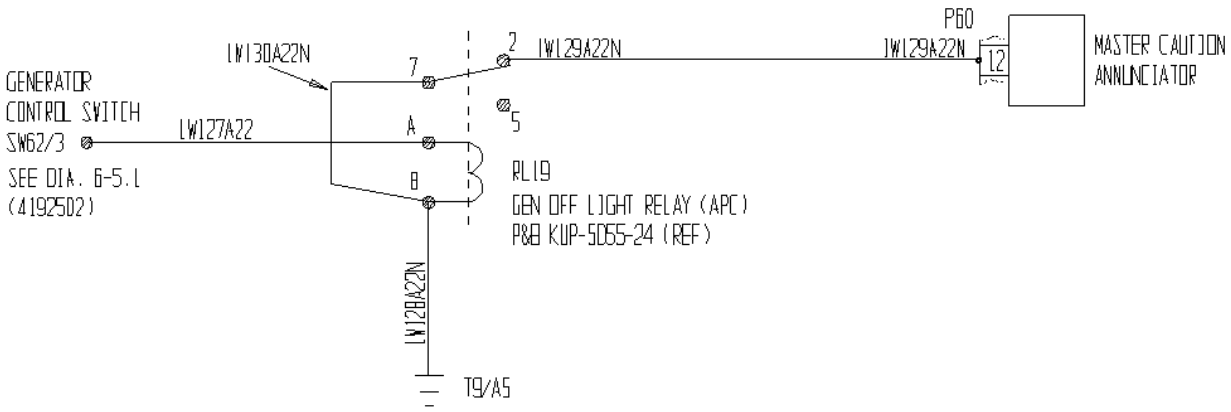


Sheet 1 of 2

480B Serial Numbers: 5134 and 5135

Diagram 6-15.1. Caution/Warning System – Hi/Lo Rotor RPM

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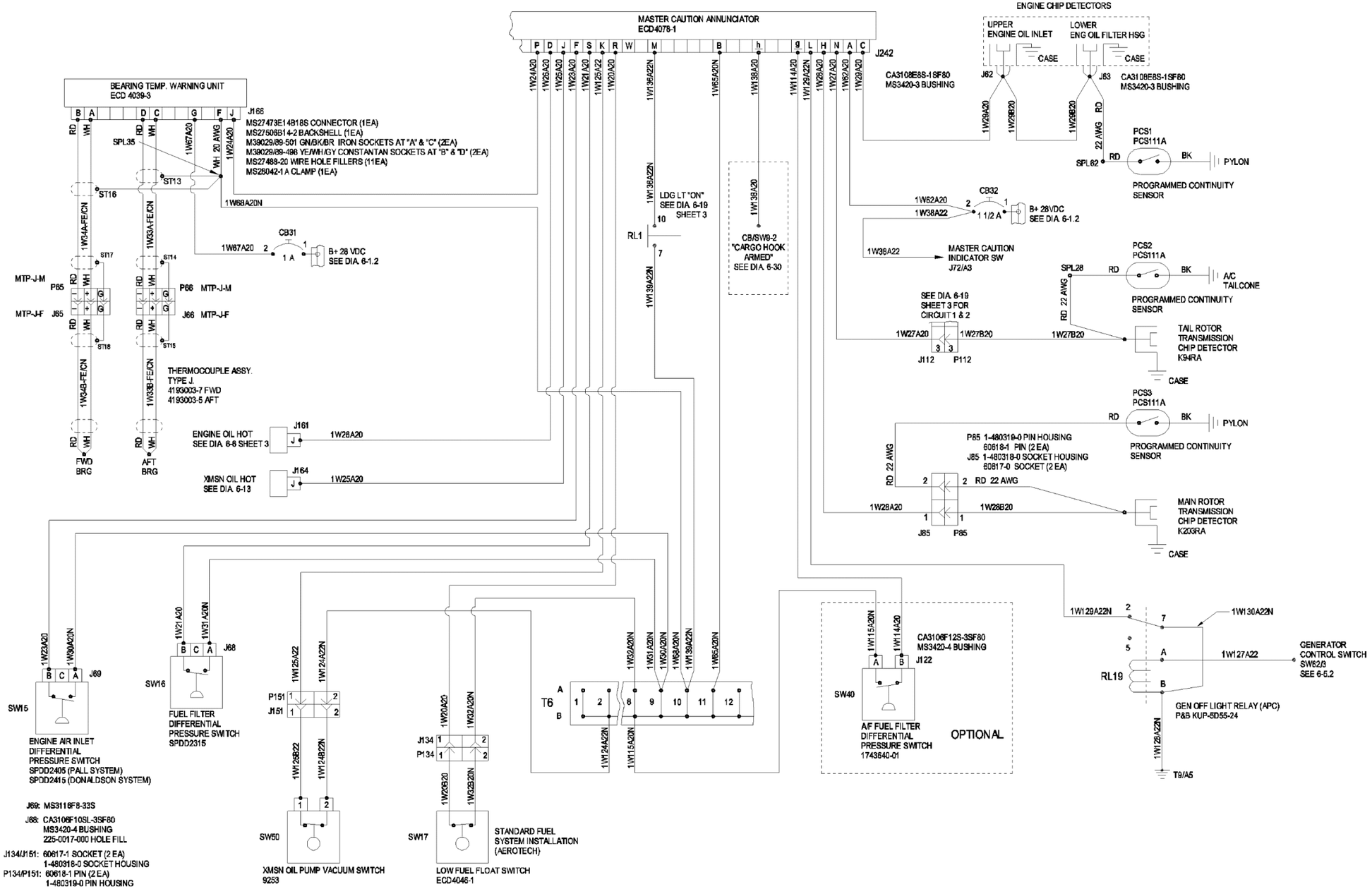


Sheet 2 of 2

480B Serial Numbers: 5134 and 5135

Diagram 6-15.1. Caution/Warning System – Generator Off Light Relay

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480B Serial Numbers: 5136-5154

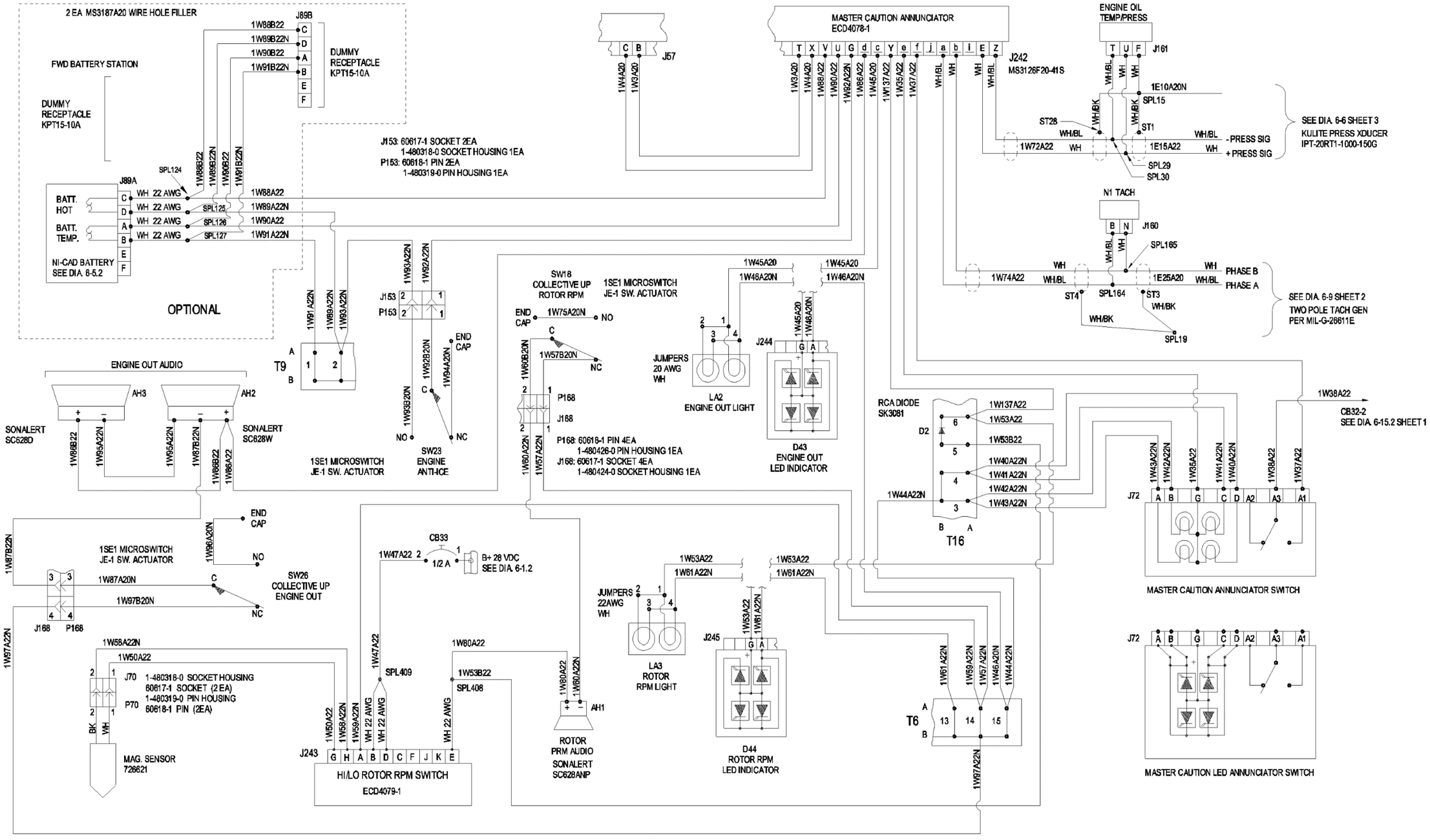
Diagram 6-15.2. Caution/Warning System, Sheet 1 of 2

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Diagram 6-15.2. Caution/Warning System, Sheet 2 of 2

Rev. 17

Jun 24/11

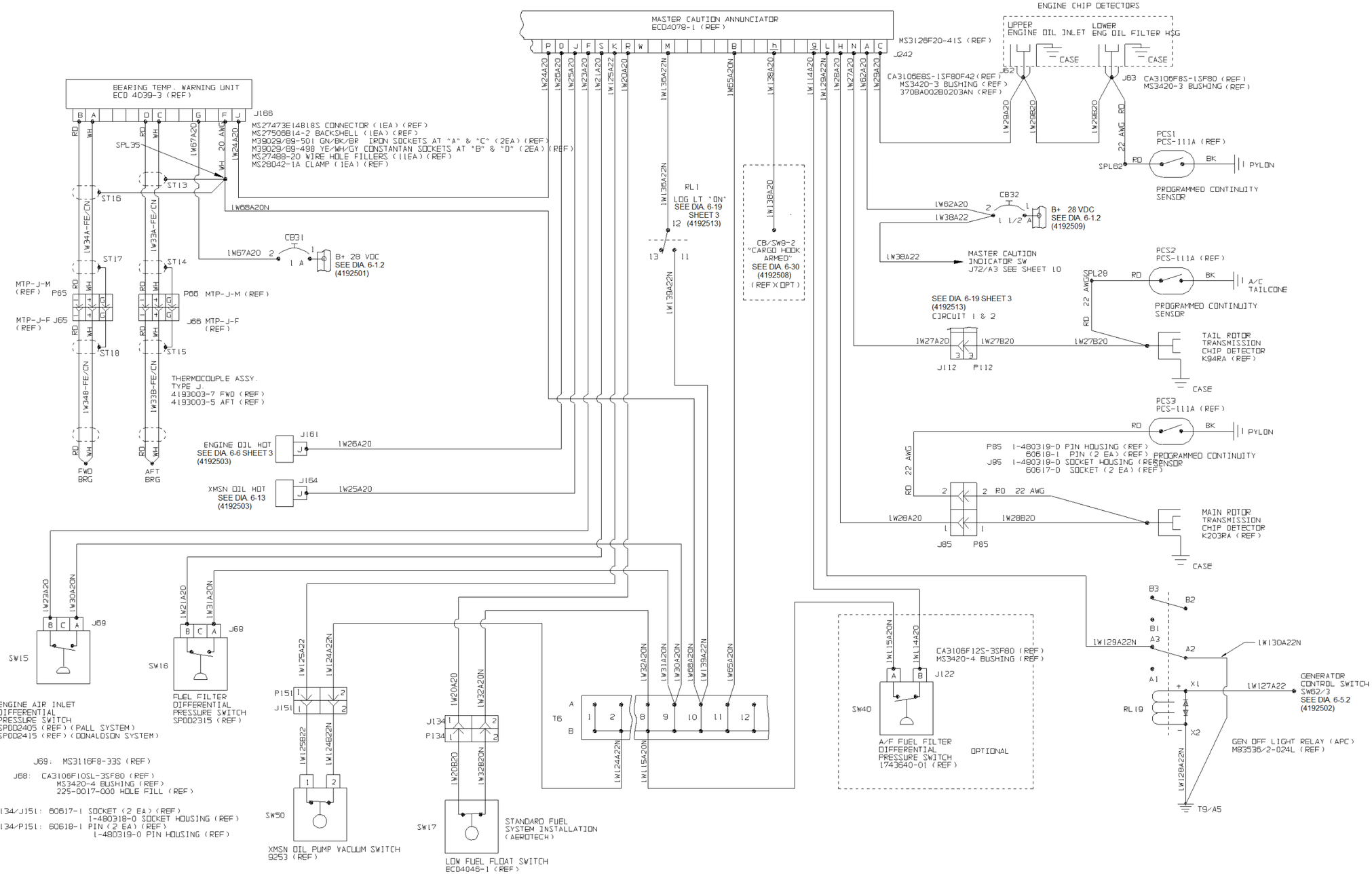
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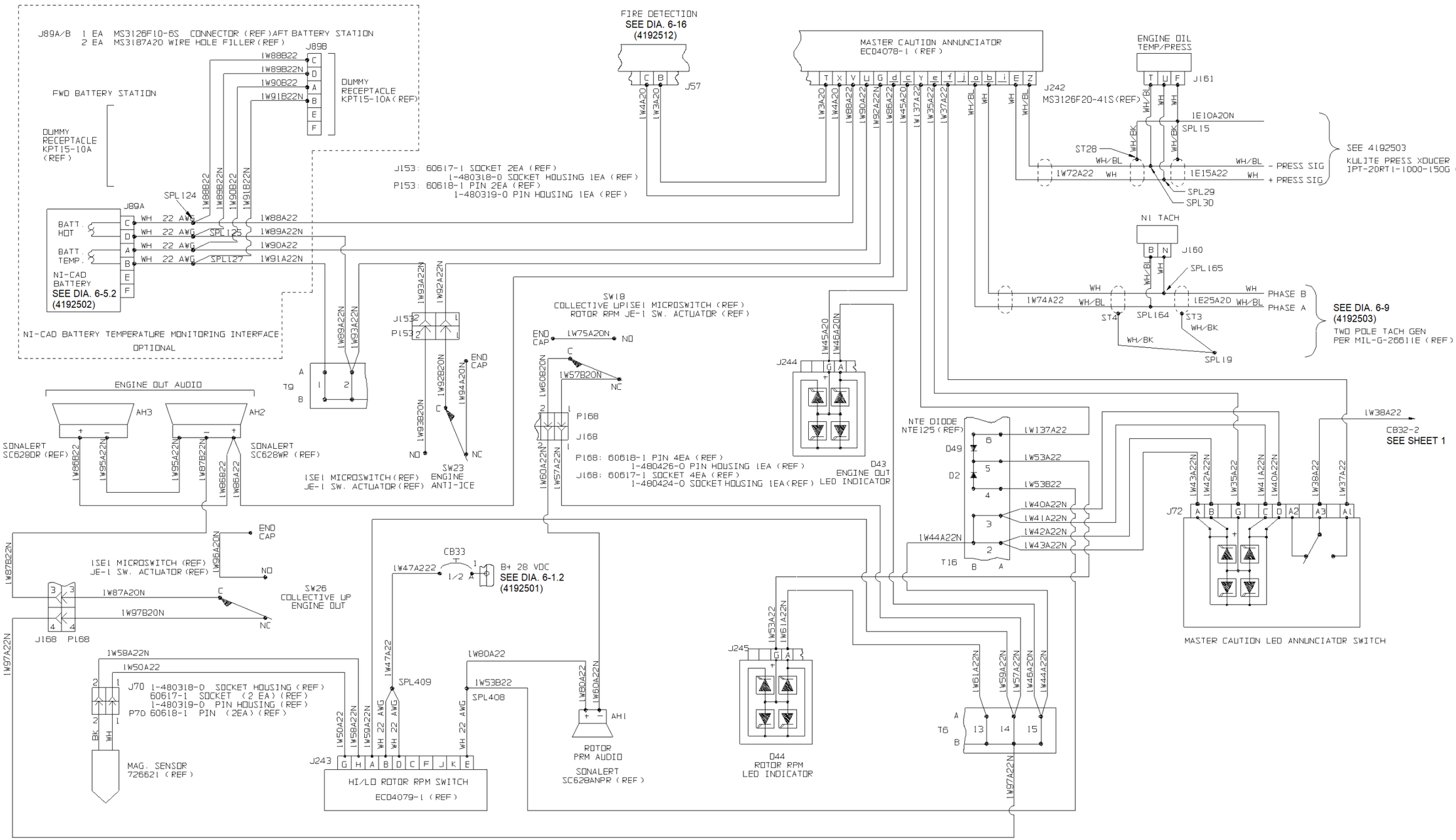
Diagram 6-15.3. Caution/Warning System (Ref. 4192509 Rev. H)

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480B Serial Numbers: 5155 and Subsequent

Diagram 6-15.3. Caution/Warning System (Ref. 4192509 Rev. H)

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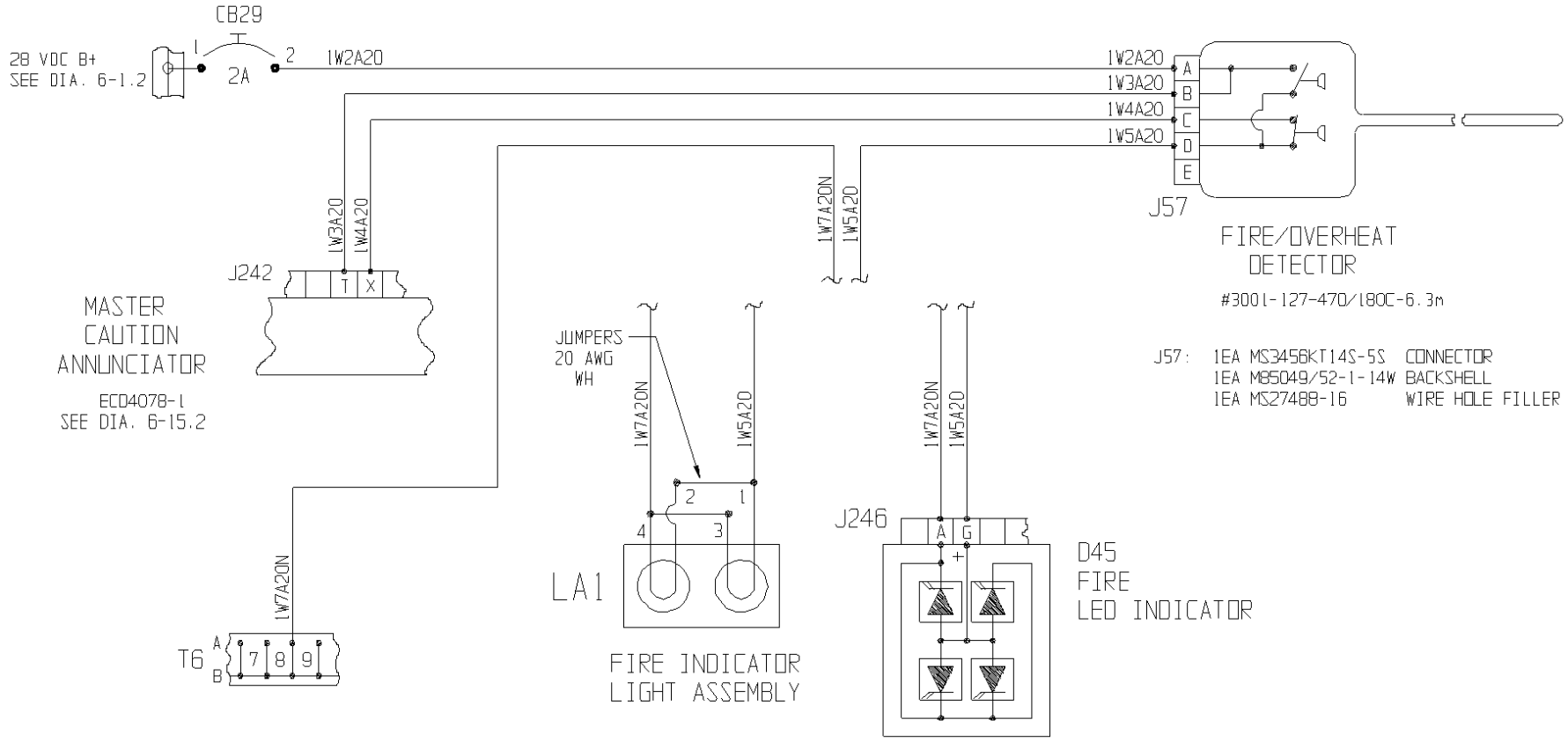


Diagram 6-16. Fire Detection System

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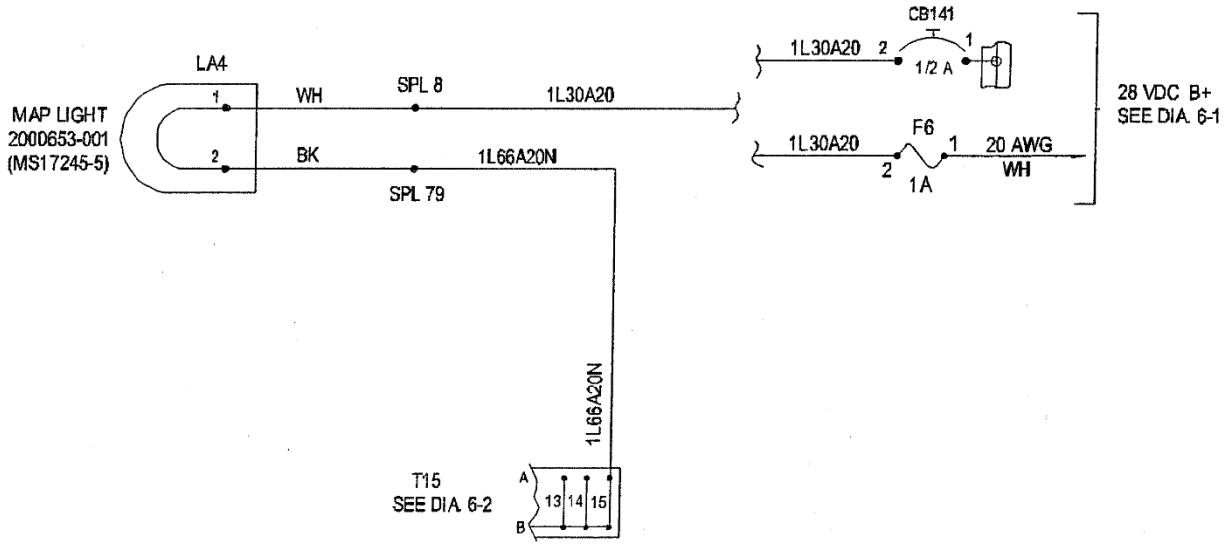
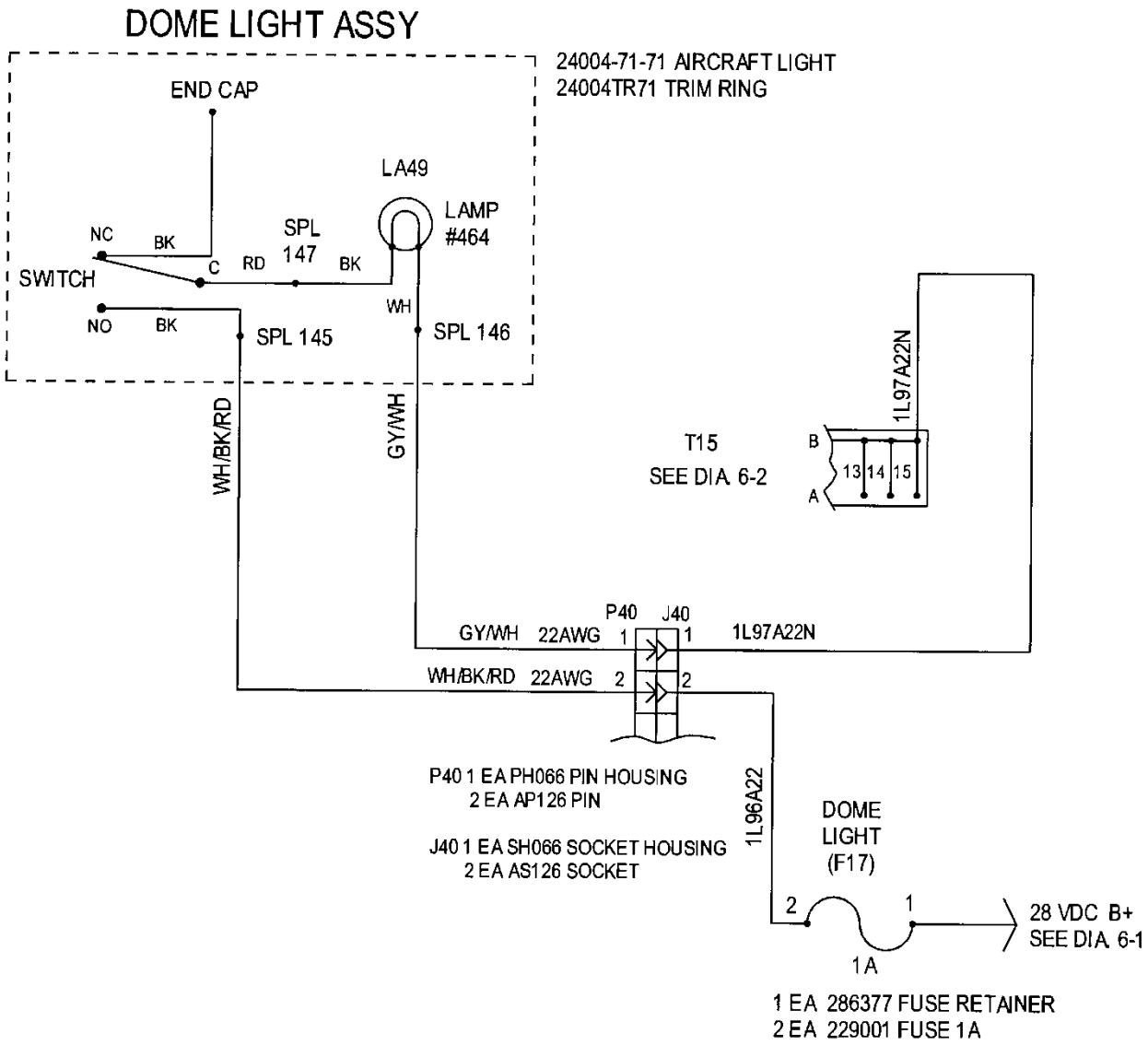
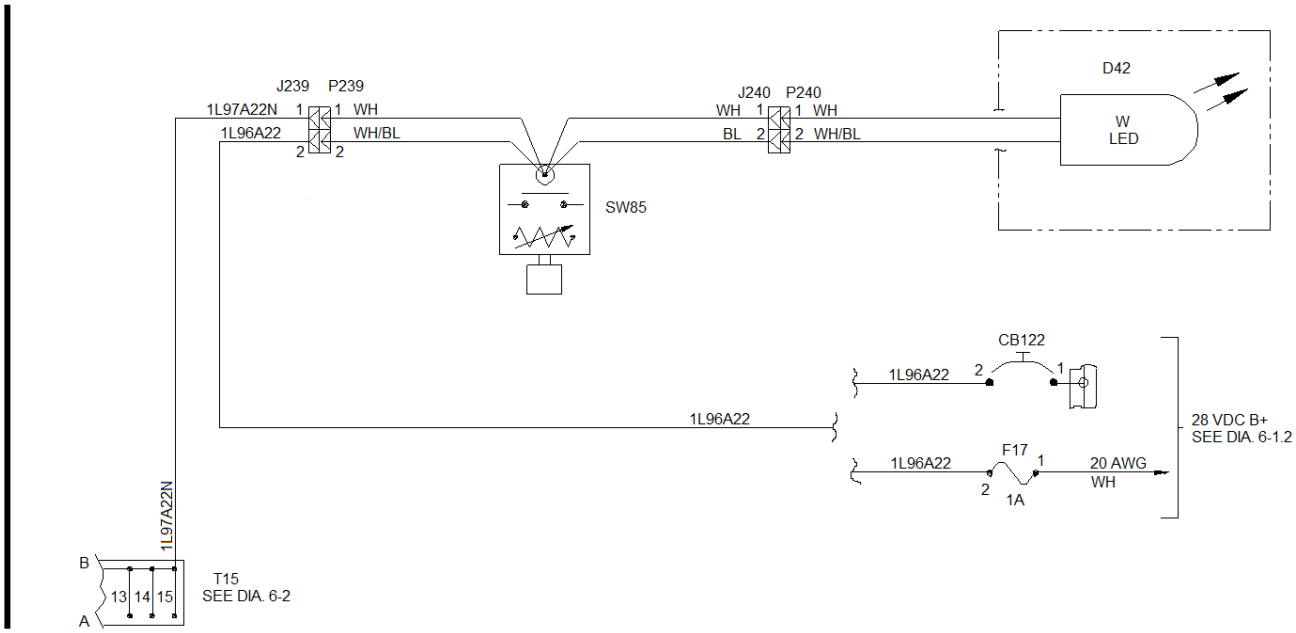


Diagram 6-17. Cockpit/Map Light



480B Serial Numbers: All except 5133 and earlier
Sheet 1 of 2

Diagram 6-17.1. Cockpit Dome Light



S/N 5134 and Subsequent
Sheet 2 of 2

Diagram 6-17.2. Cockpit Dome Light

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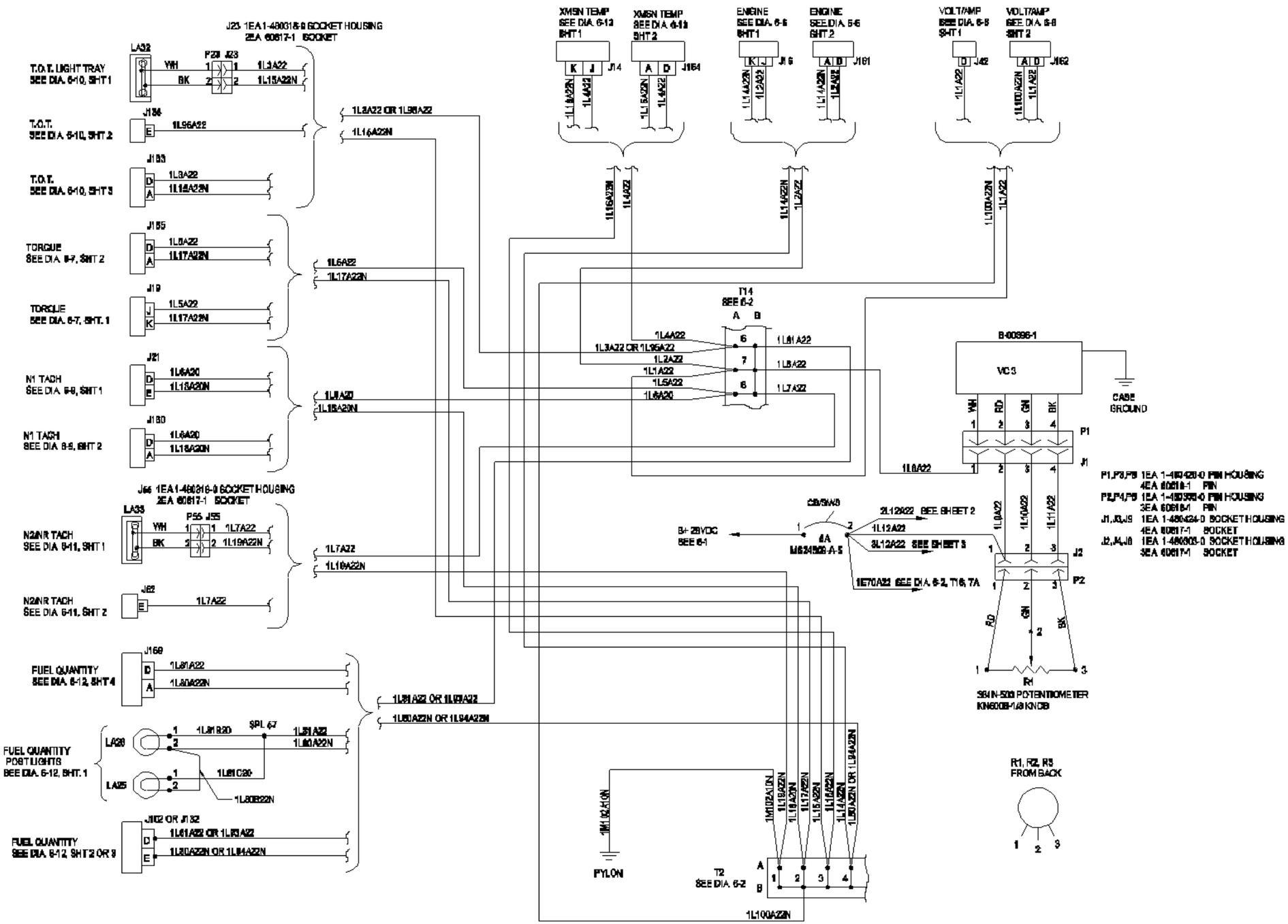


Diagram 6-18. Instrument Lighting, Sheet 1 of 3

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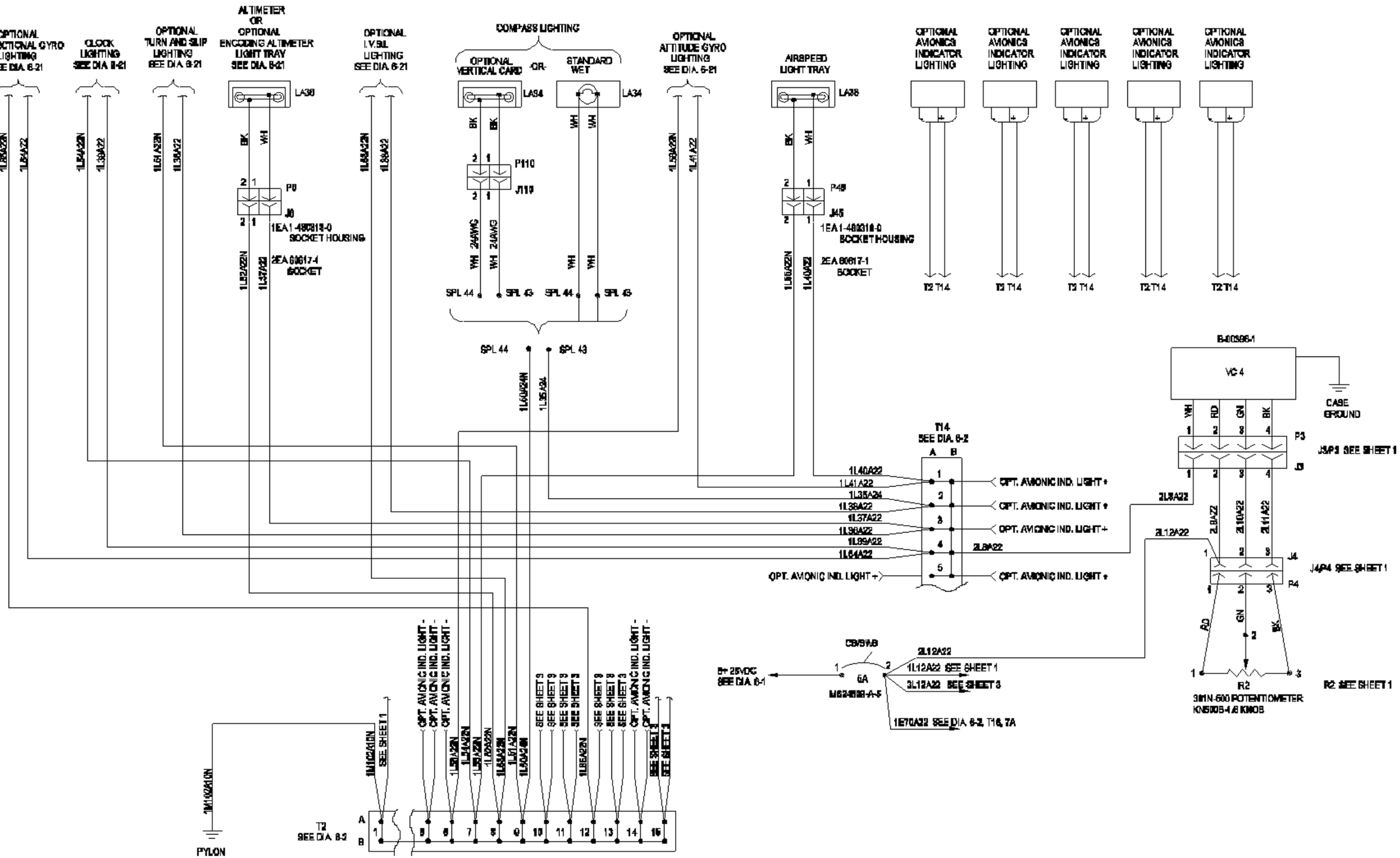


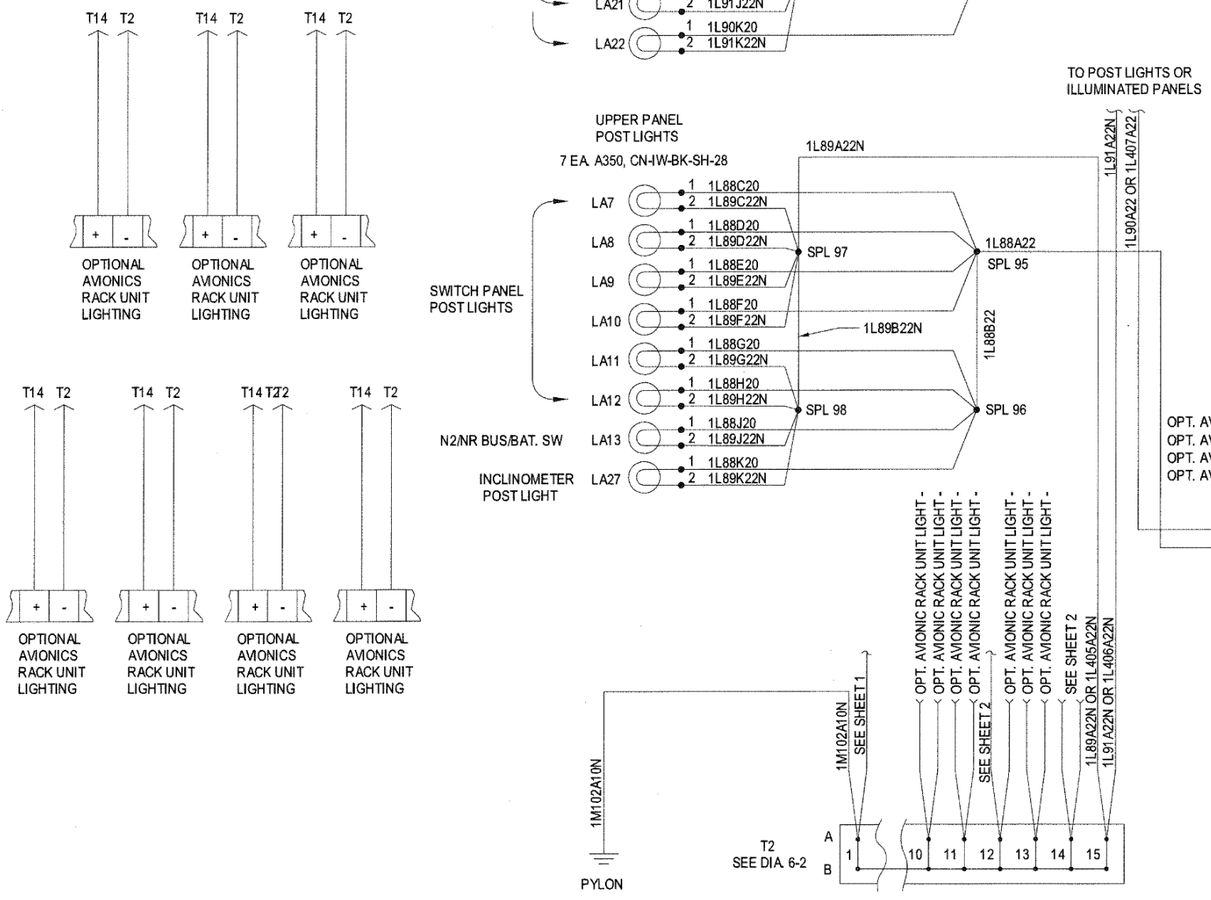
Diagram 6-18. Instrument Lighting, Sheet 2 of 3

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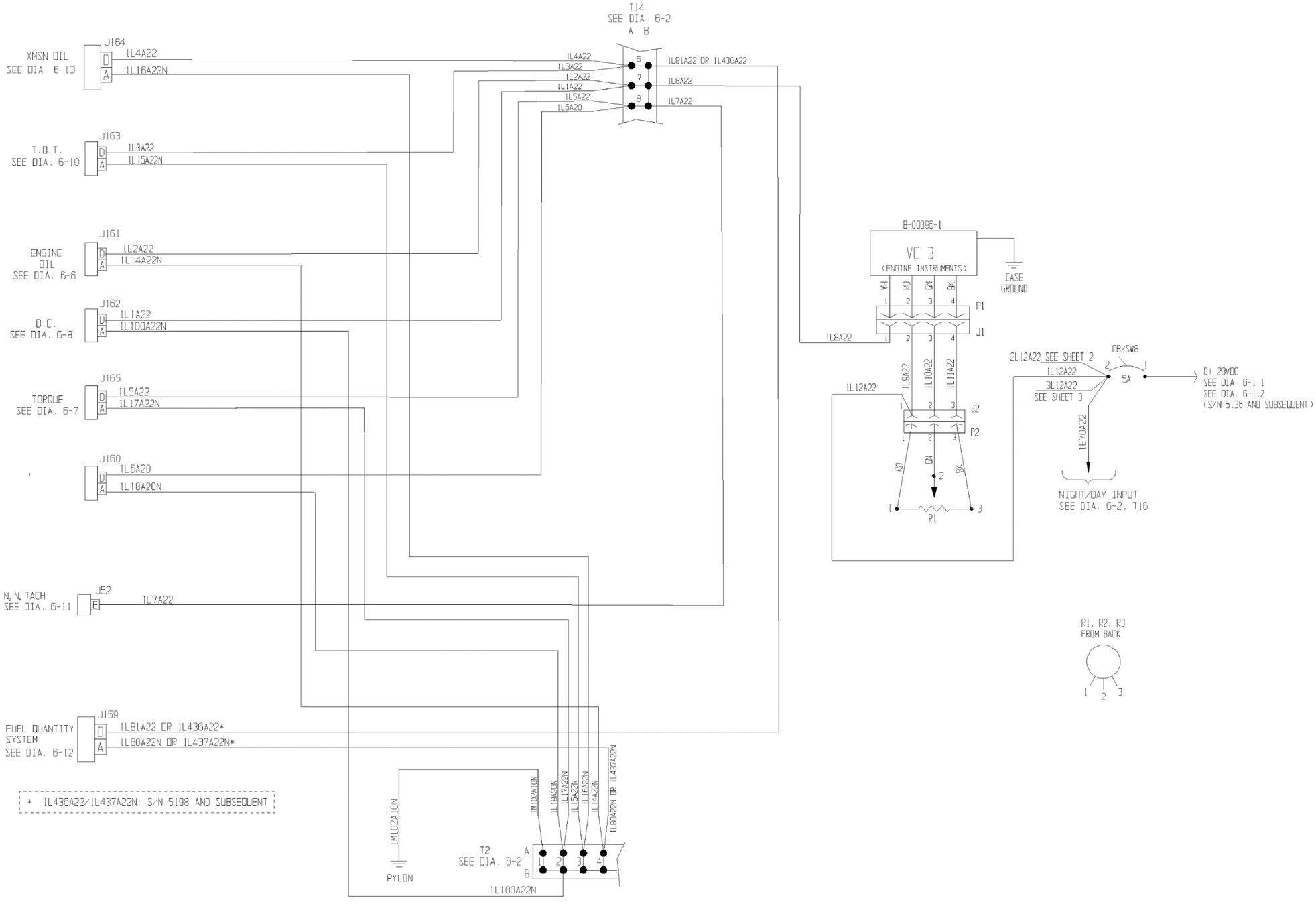


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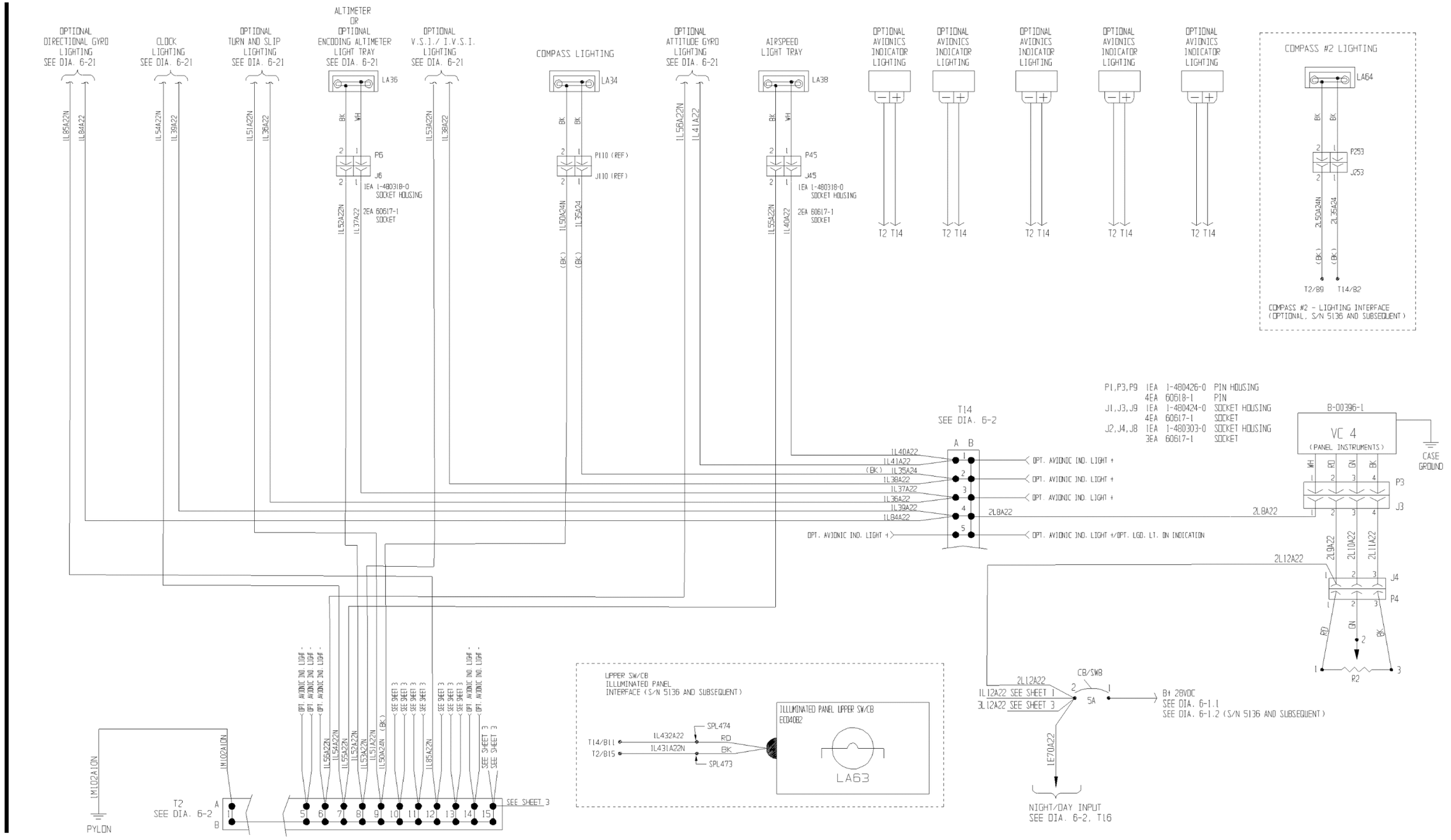
Diagram 6-18.1. Instrument Lighting, Sheet 1 of 3
Rev. 22, Jun 25/14
MM-6-106.3/MM-6-106.4 (Blank)

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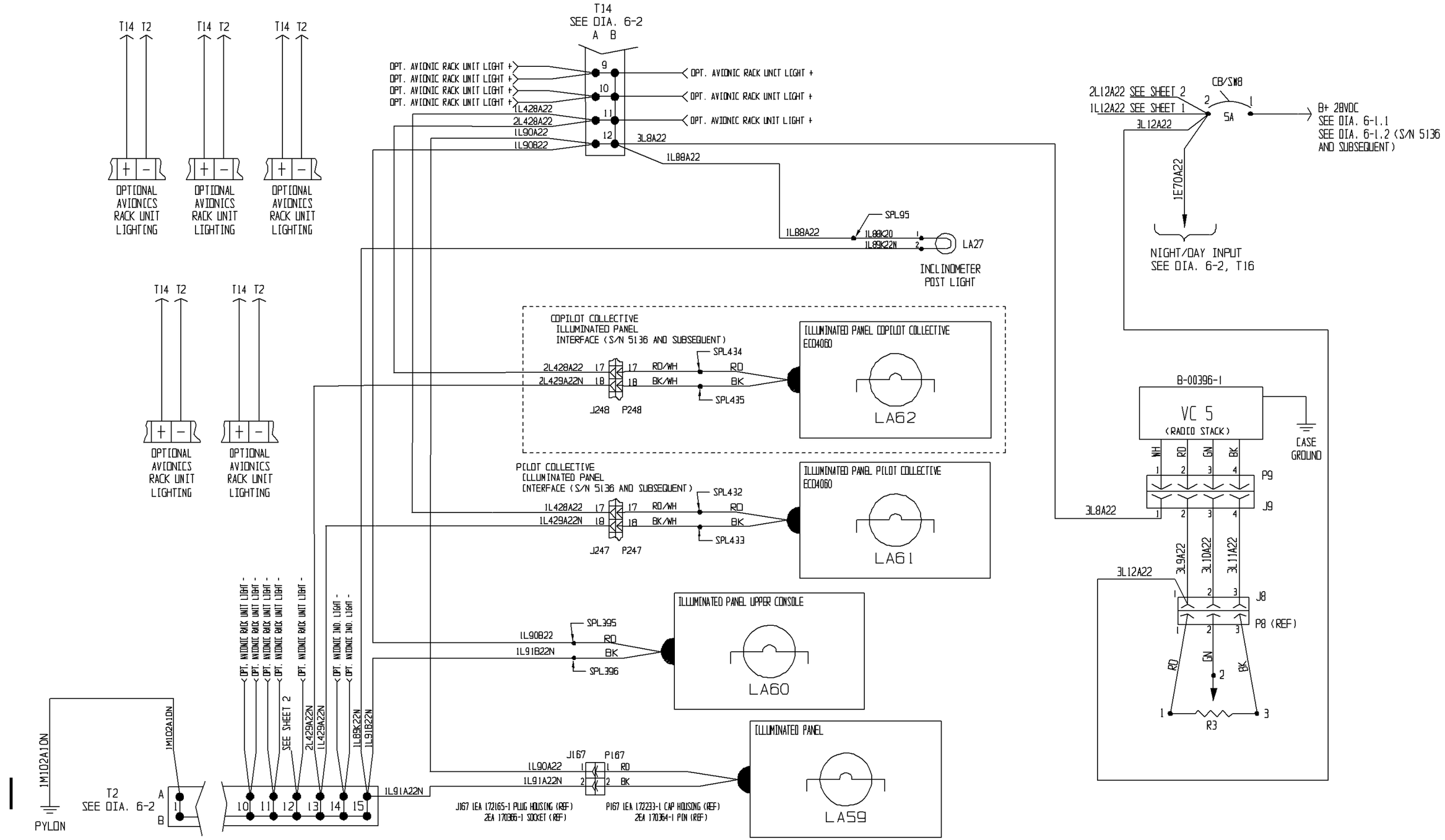
Diagram 6-18.1. Instrument Lighting, Sheet 2 of 3
Rev. 15, Nov 15/10
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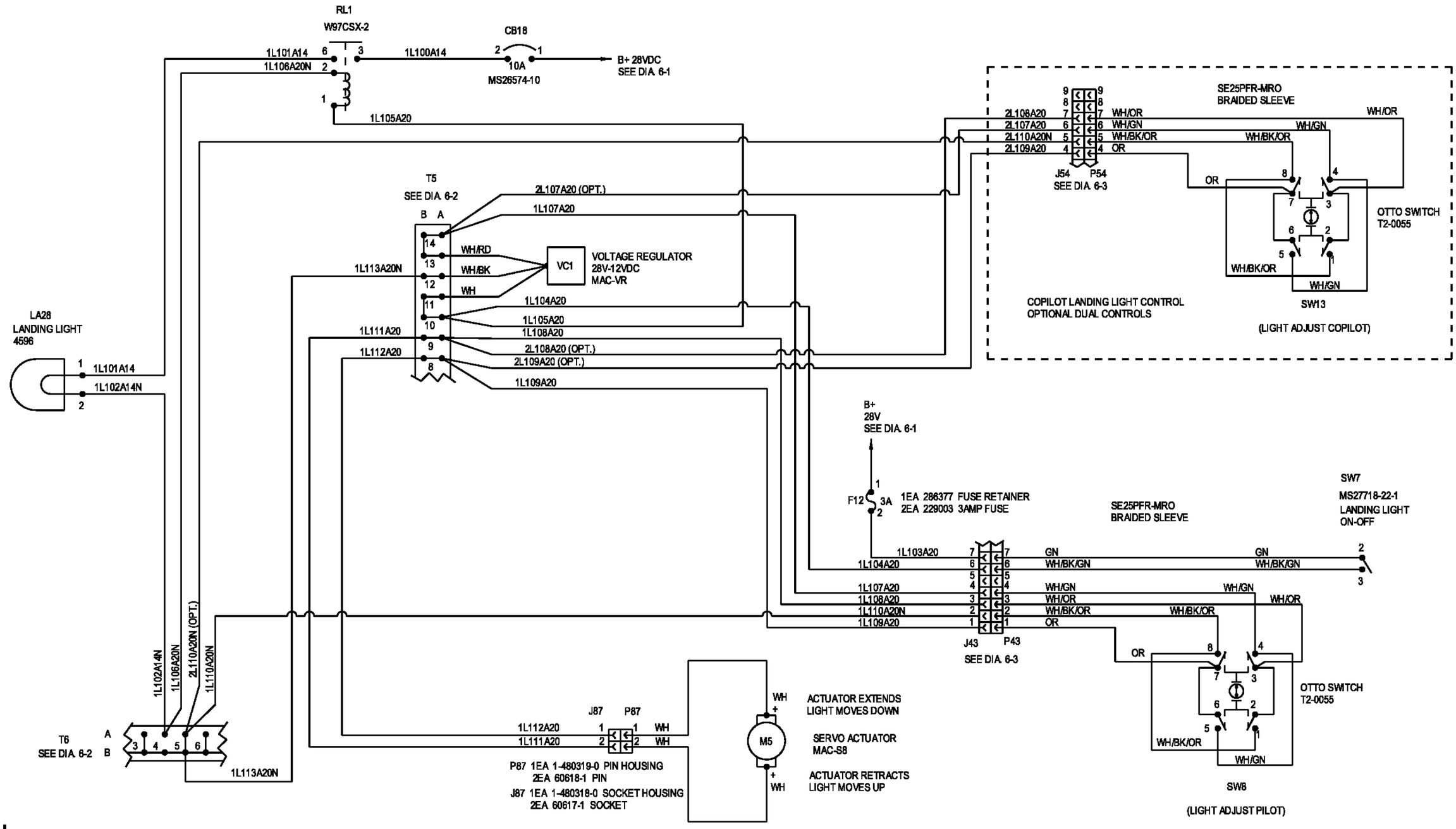
Diagram 6-18.1. Instrument Lighting, Sheet 3 of 3

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480B: All Serial Numbers except 5046, 5048-5135

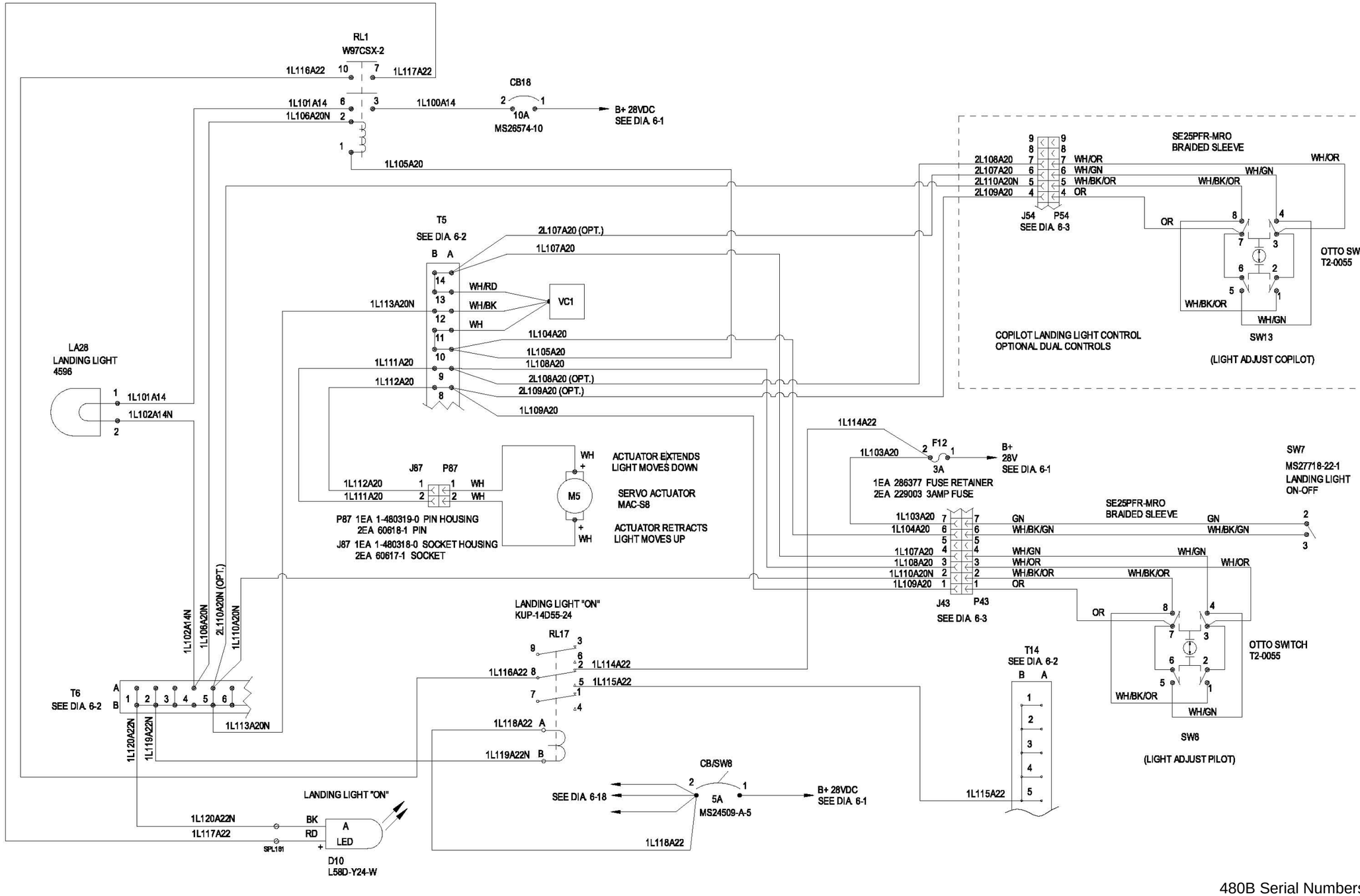
Diagram 6-19. Landing Light, Sheet 1 of 3
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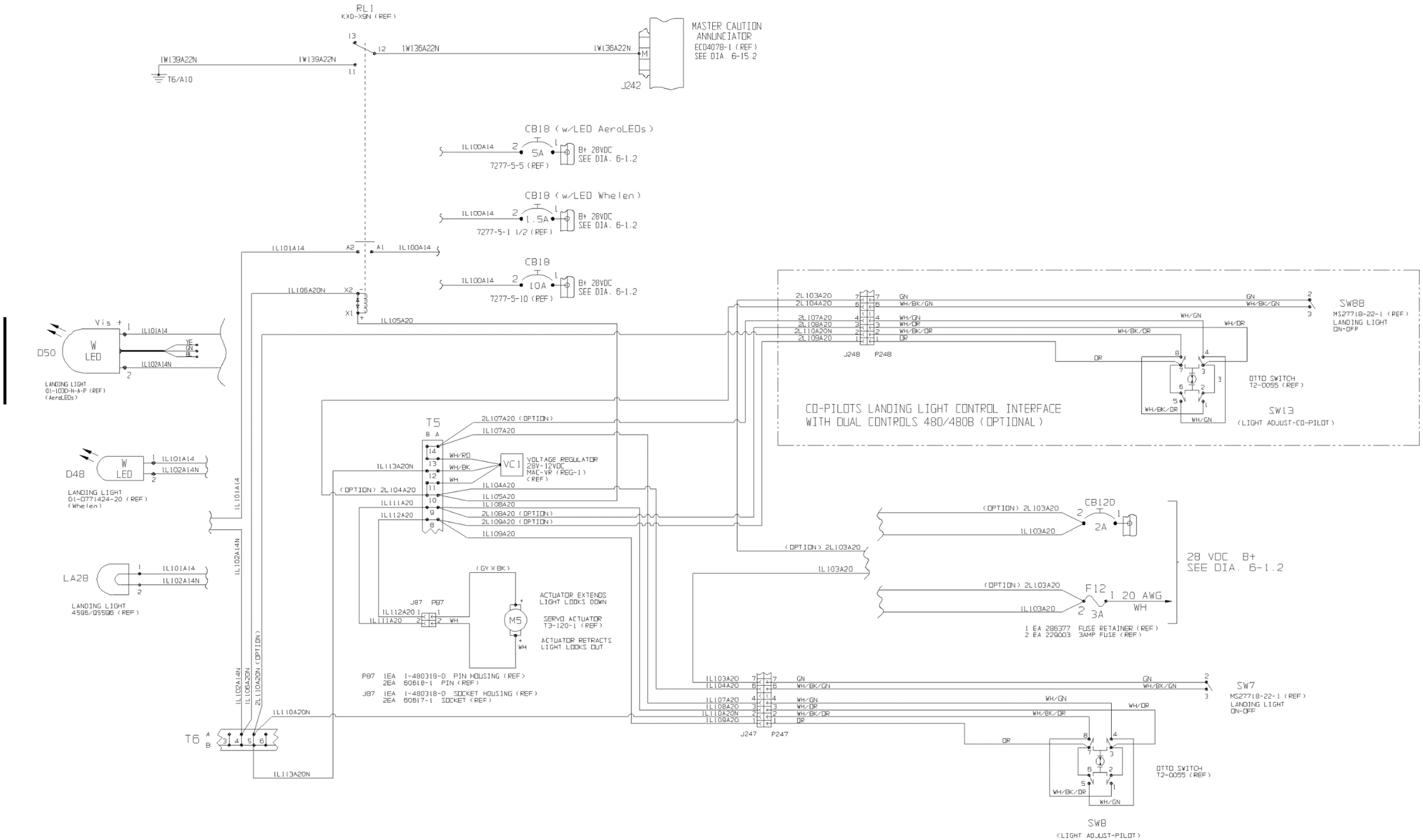
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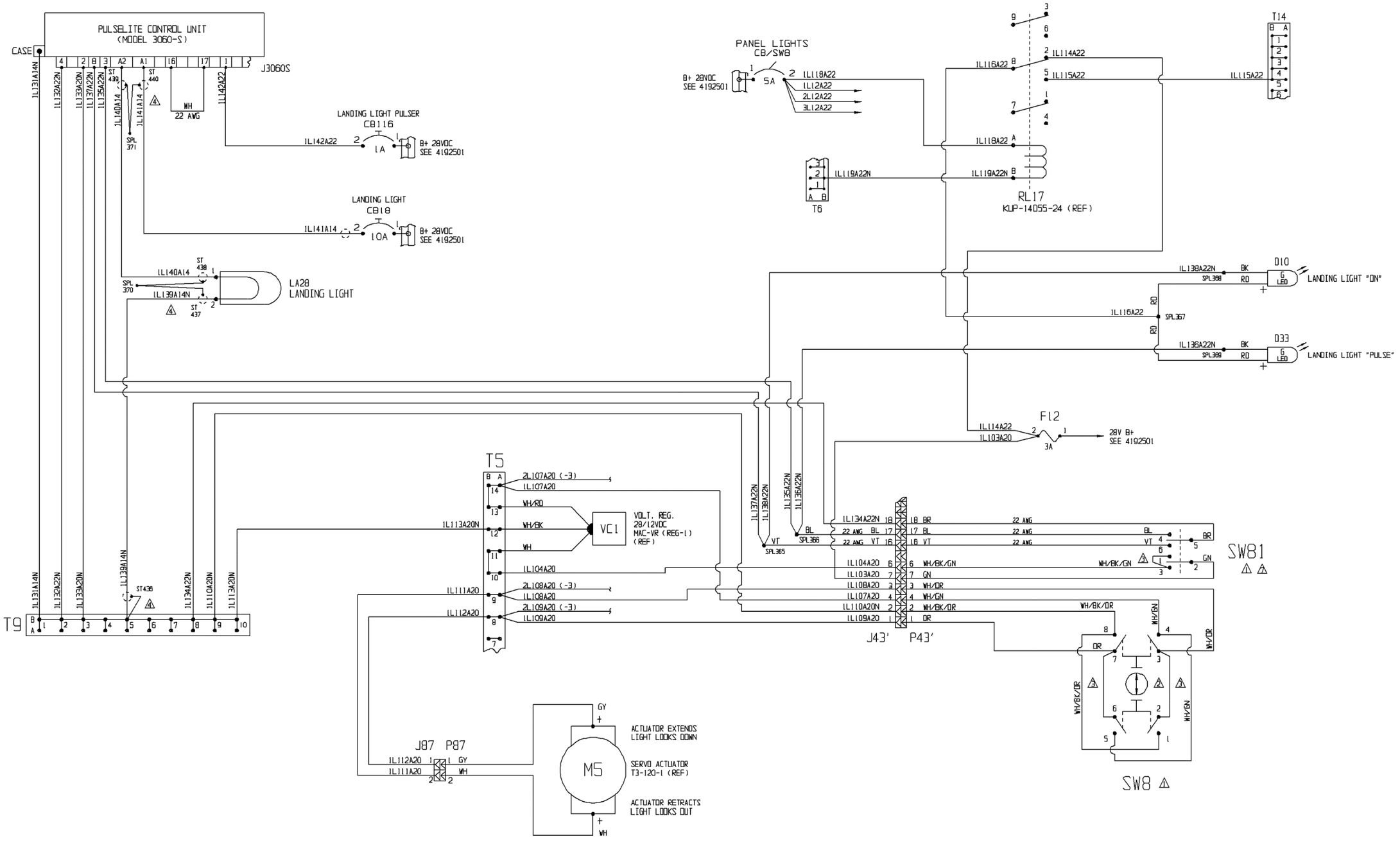
Diagram 6-19. Landing Light, Sheet 3 of 3

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480B Landing Light Option (S/N 5121 only)

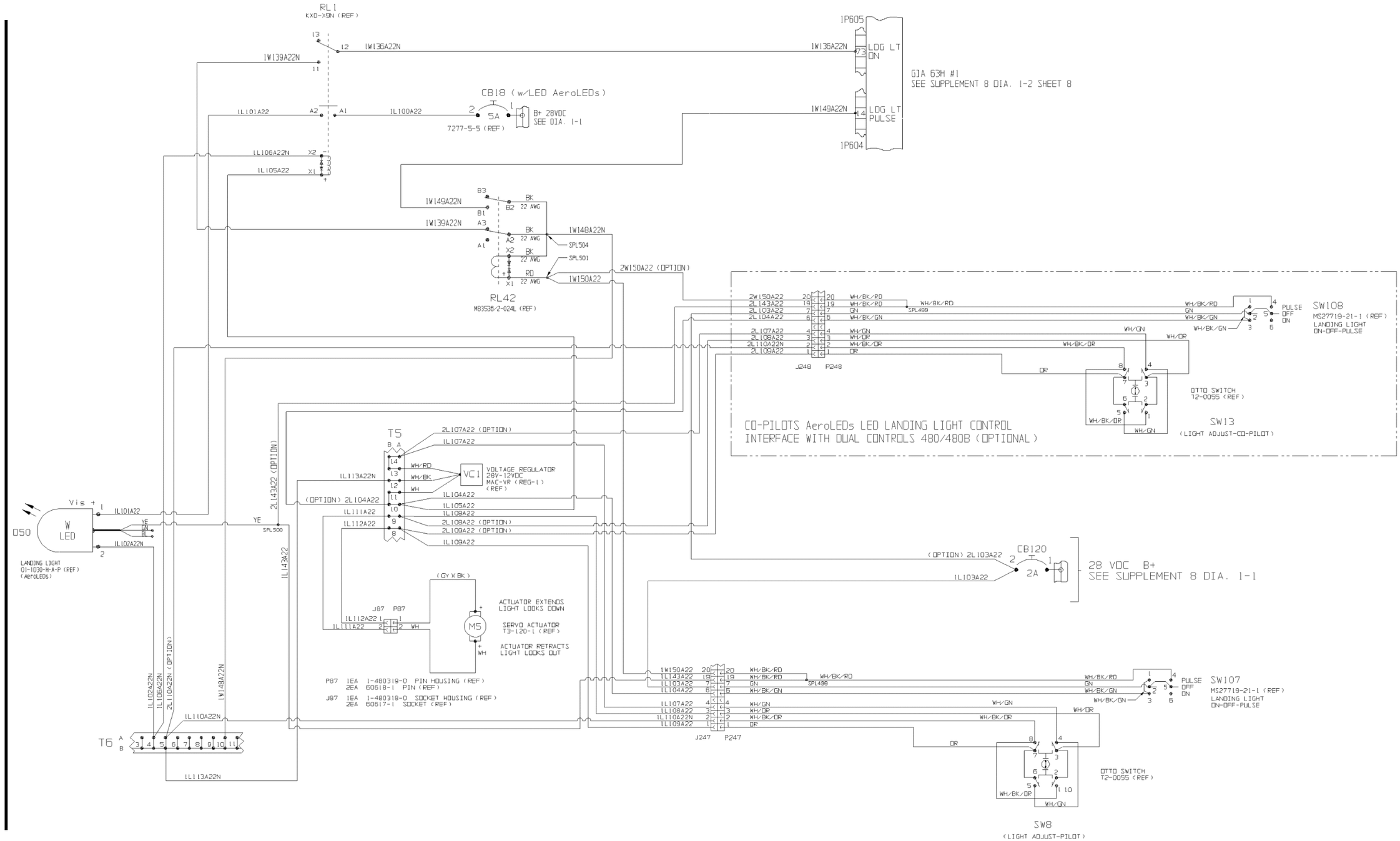
Diagram 6-19.1. Pulse Landing Light
Rev. 21, Apr 30/14
MM-6-108.5/MM-6-108.6 (Blank)

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480/B Pulse Landing Light Option (Aircraft equipped with G1000H Integrated Flight Deck)

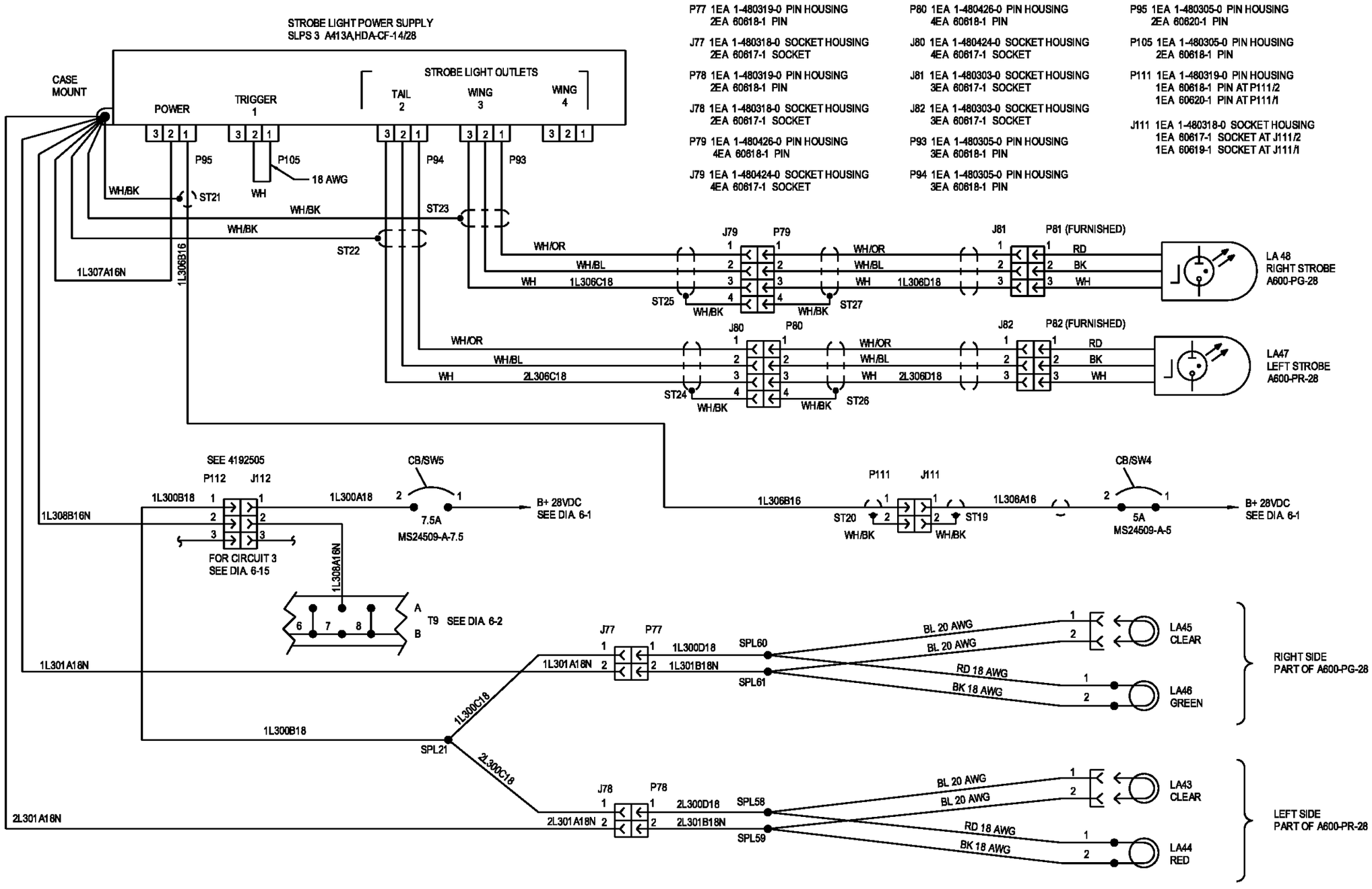
Diagram 6-19.2. Pulse Landing Light (LED)

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P77 1EA 1-480319-0 PIN HOUSING
2EA 60618-1 PIN

J77 1EA 1-480318-0 SOCKET HOUSING
2EA 60617-1 SOCKET

P78 1EA 1-480319-0 PIN HOUSING
2EA 60618-1 PIN

J78 1EA 1-480318-0 SOCKET HOUSING
2EA 60617-1 SOCKET

P79 1EA 1-480426-0 PIN HOUSING
4EA 60618-1 PIN

J79 1EA 1-480424-0 SOCKET HOUSING
4EA 60617-1 SOCKET

P80 1EA 1-480426-0 PIN HOUSING
4EA 60618-1 PIN

J80 1EA 1-480424-0 SOCKET HOUSING
4EA 60617-1 SOCKET

J81 1EA 1-480303-0 SOCKET HOUSING
3EA 60617-1 SOCKET

J82 1EA 1-480303-0 SOCKET HOUSING
3EA 60617-1 SOCKET

P93 1EA 1-480305-0 PIN HOUSING
3EA 60618-1 PIN

P94 1EA 1-480305-0 PIN HOUSING
3EA 60618-1 PIN

P95 1EA 1-480305-0 PIN HOUSING
2EA 60620-1 PIN

P105 1EA 1-480305-0 PIN HOUSING
2EA 60618-1 PIN

P111 1EA 1-480319-0 PIN HOUSING
1EA 60618-1 PIN AT P111/2
1EA 60620-1 PIN AT P111/1

J111 1EA 1-480318-0 SOCKET HOUSING
1EA 60617-1 SOCKET AT J111/2
1EA 60619-1 SOCKET AT J111/1

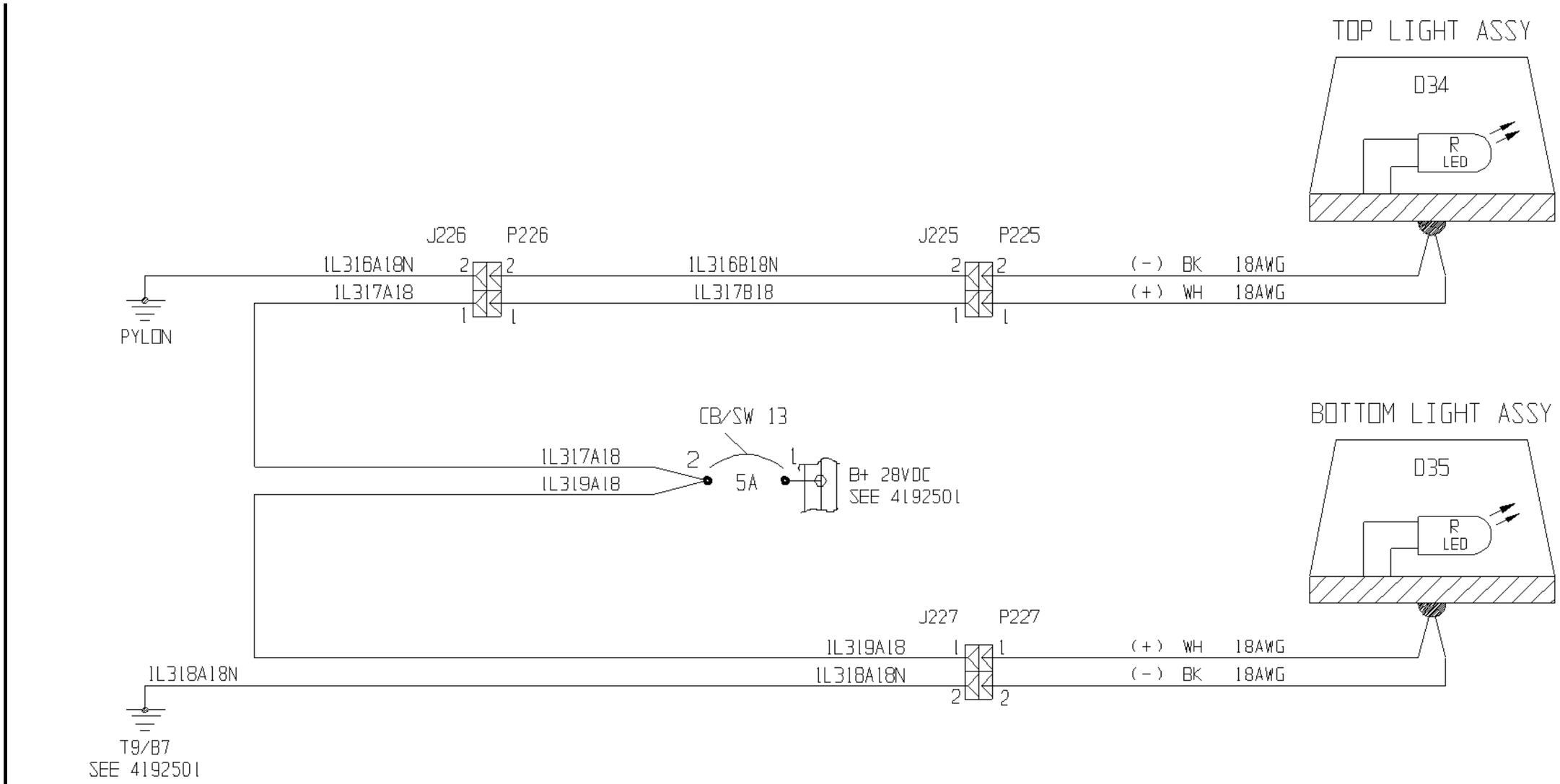
Diagram 6-20. Position/Navigation Lighting
Feb 9/01
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480B LED Anticollision Lights Option

Diagram 6-20.1. LED Anticollision Lights

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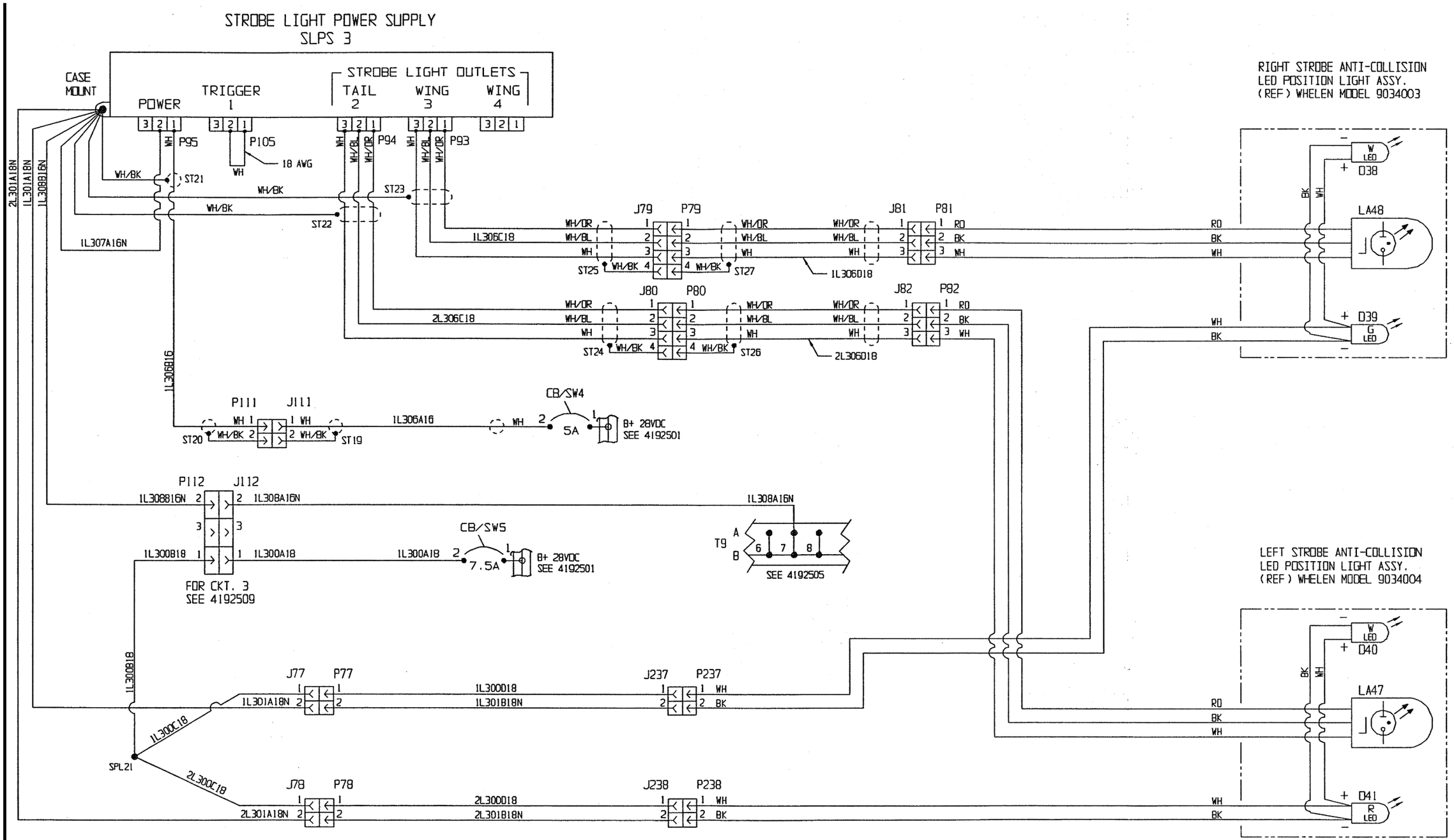


Diagram 6-20.2. LED Position and Strobe Light Assembly

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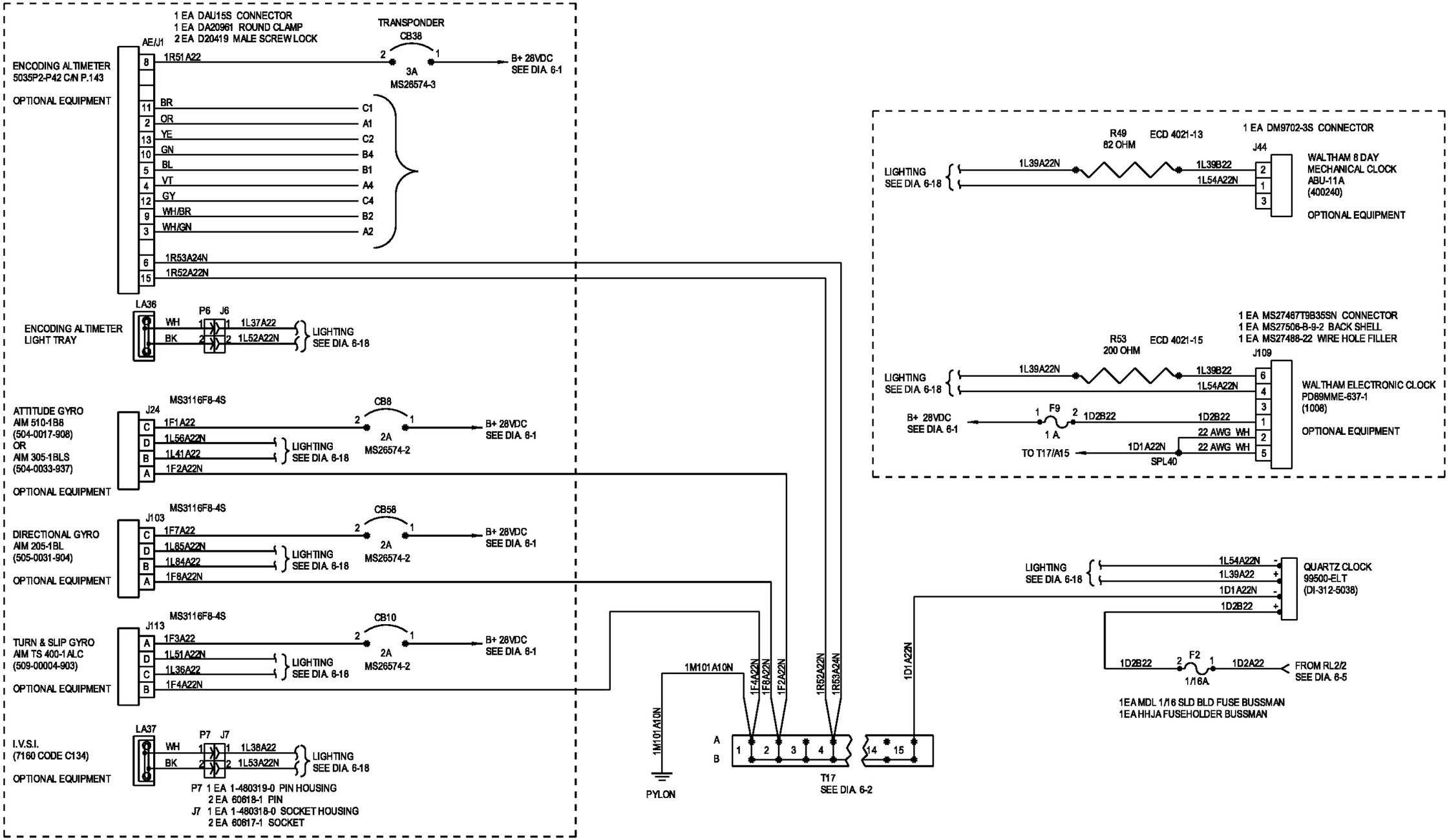


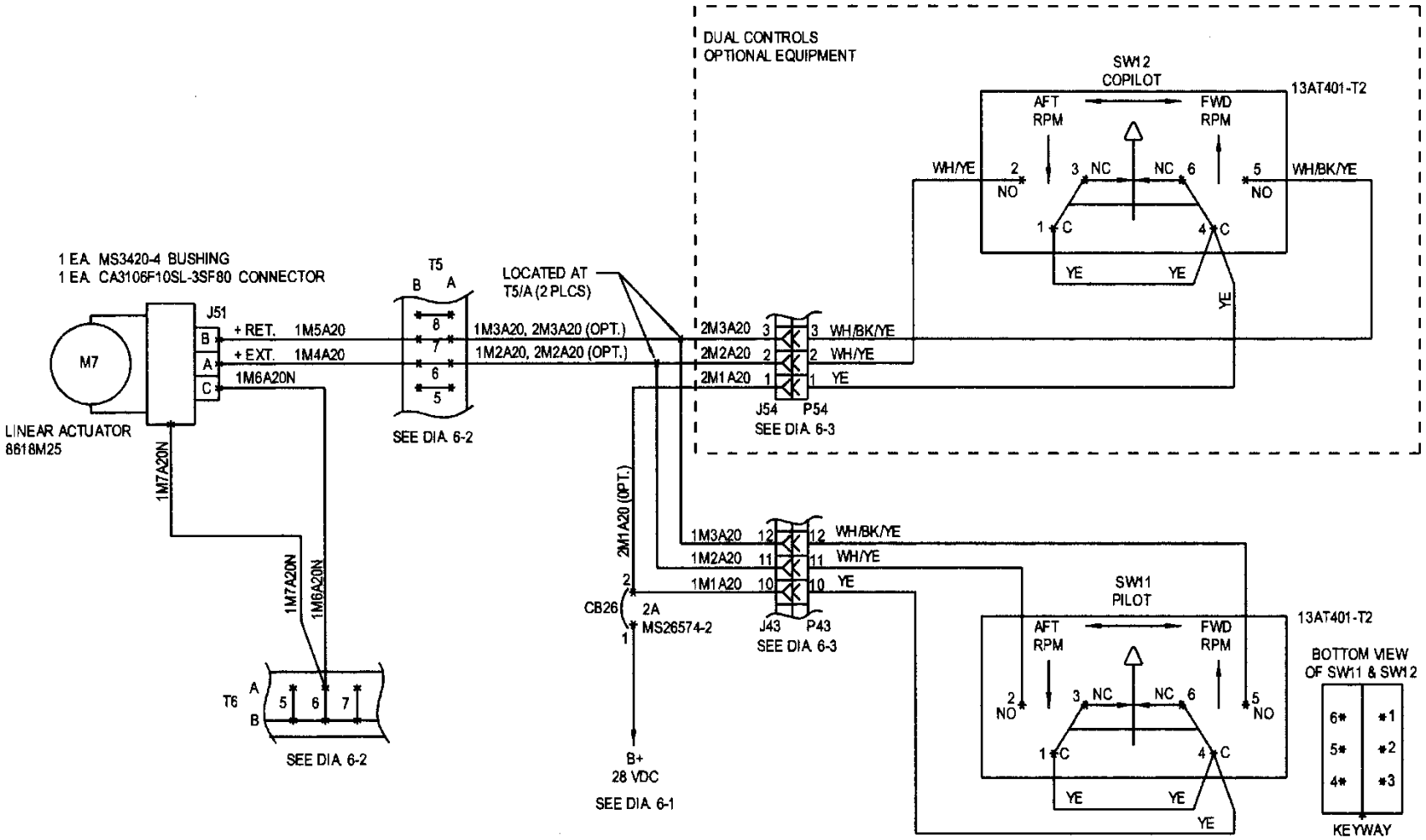
Diagram 6-21. Flight Instrument Interconnect

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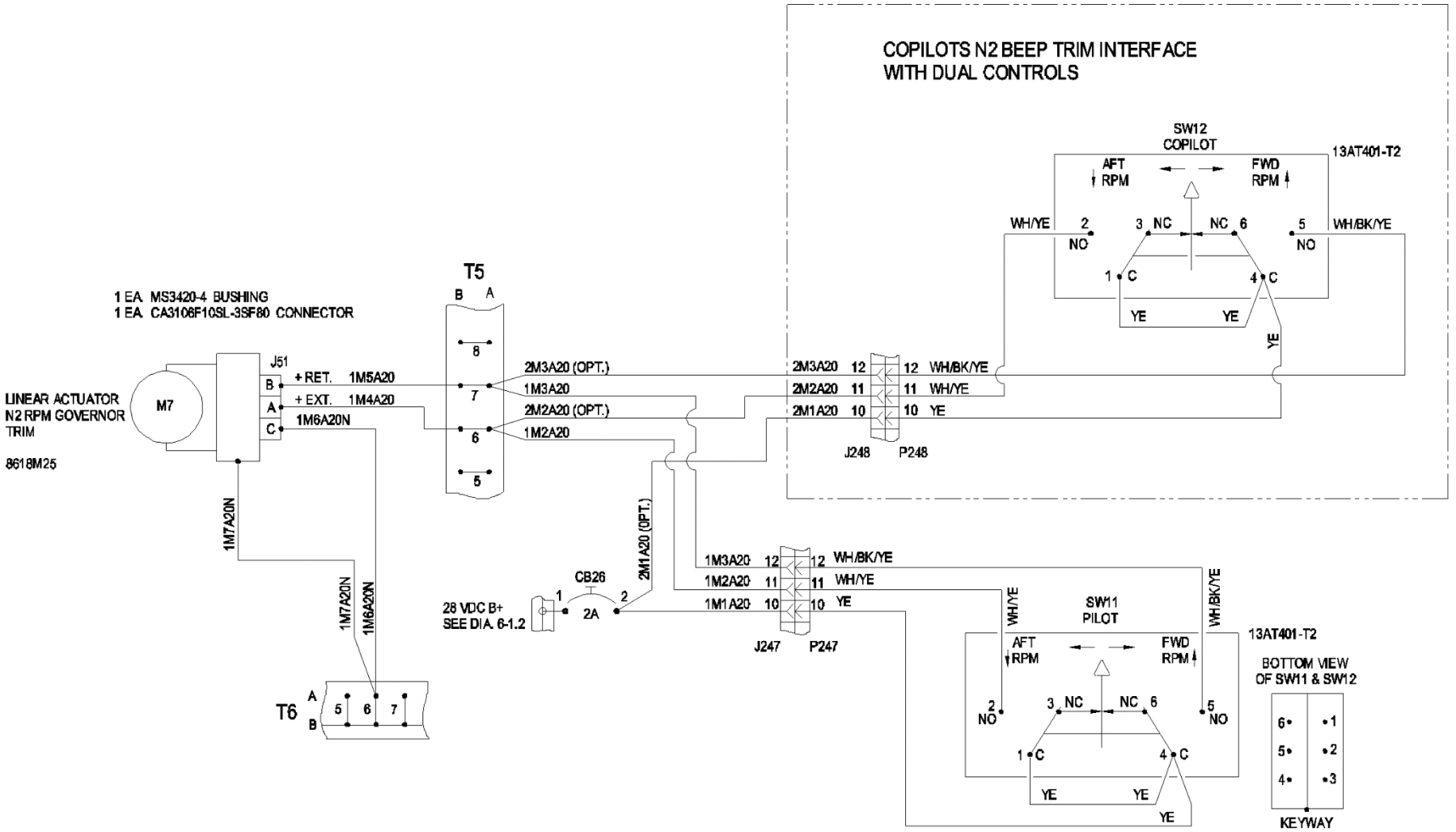


Sheet 1 of 2
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Diagram 6-22. N_2 Governor Control

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Sheet 2 of 2
480B Serial Numbers: 5136 and Subsequent

Diagram 6-22. N_2 Governor Control

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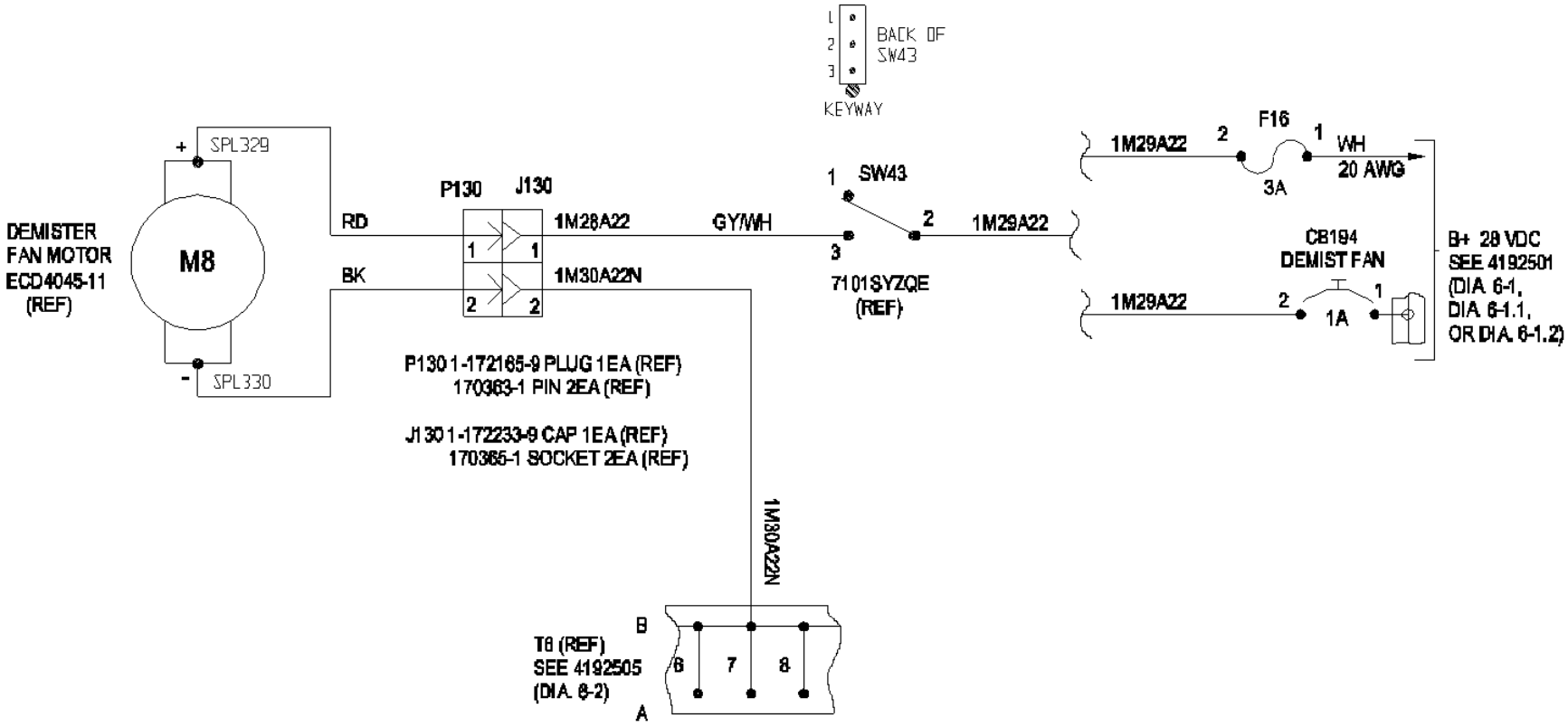
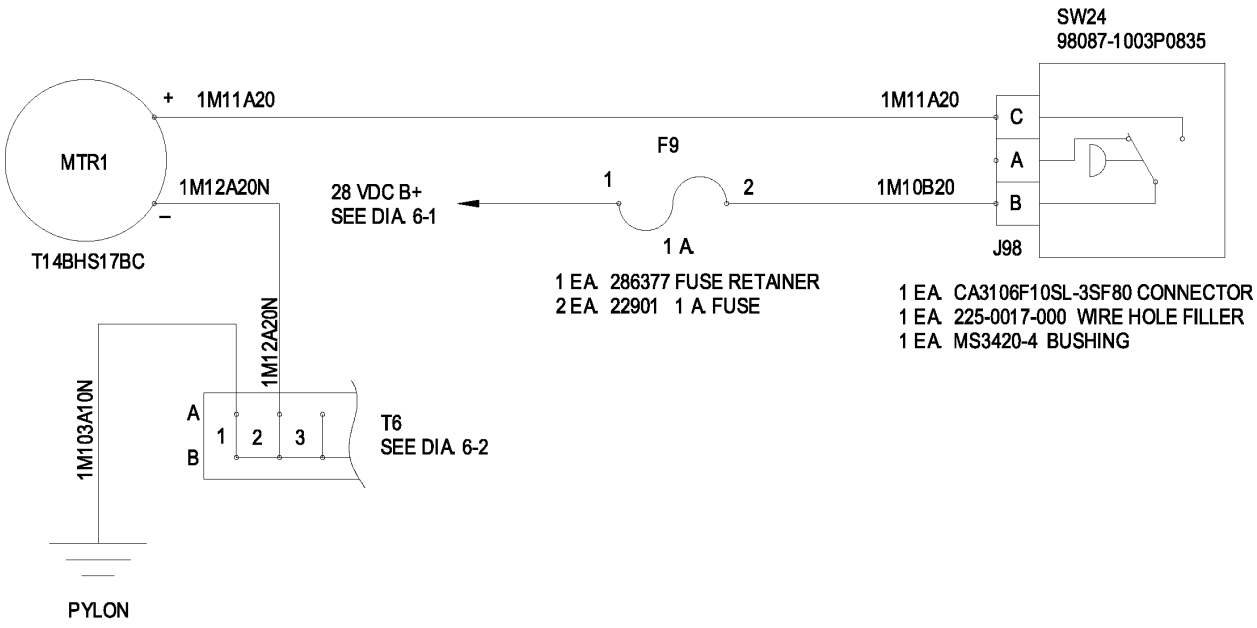


Diagram 6-23. Windshield Demister Fan

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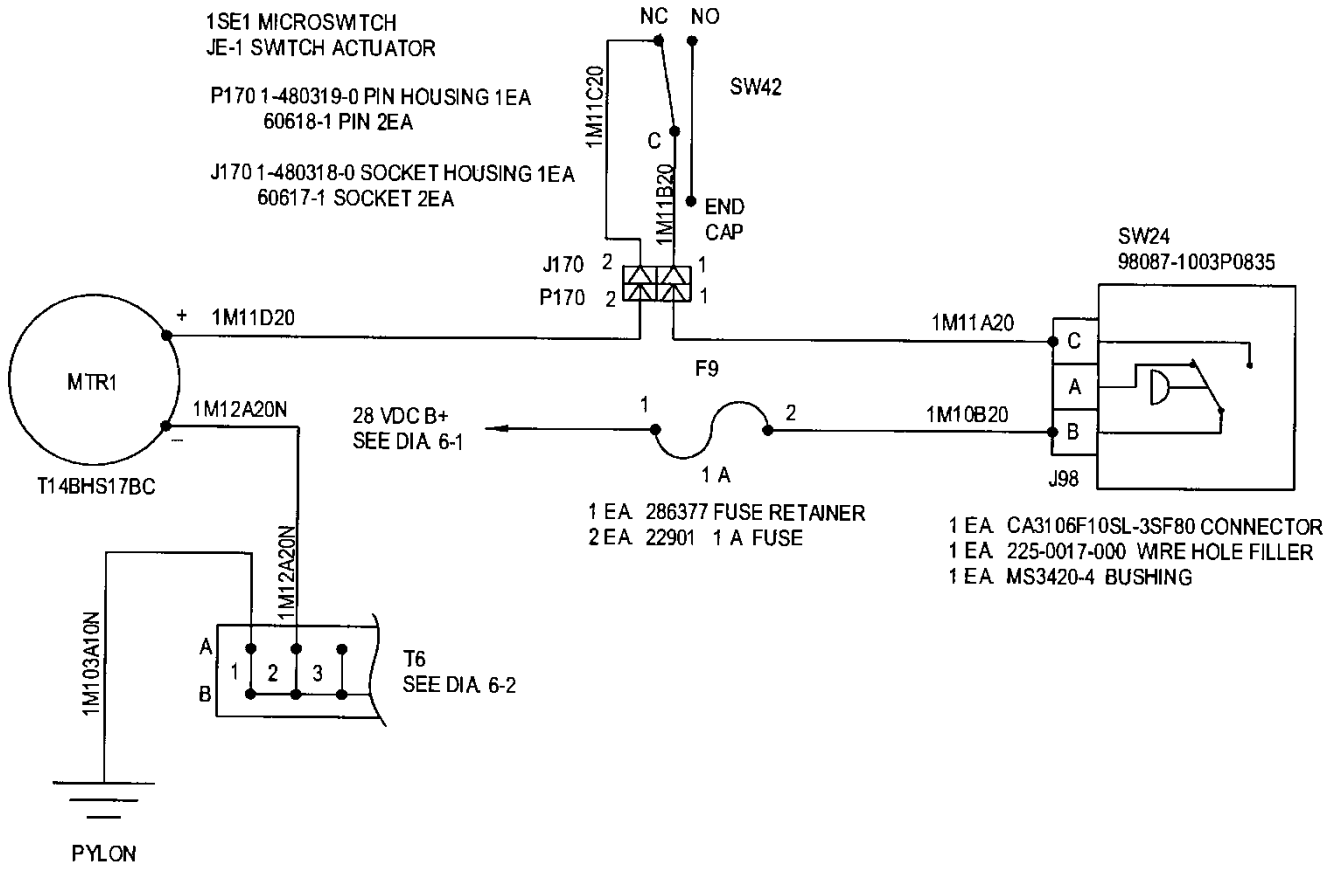
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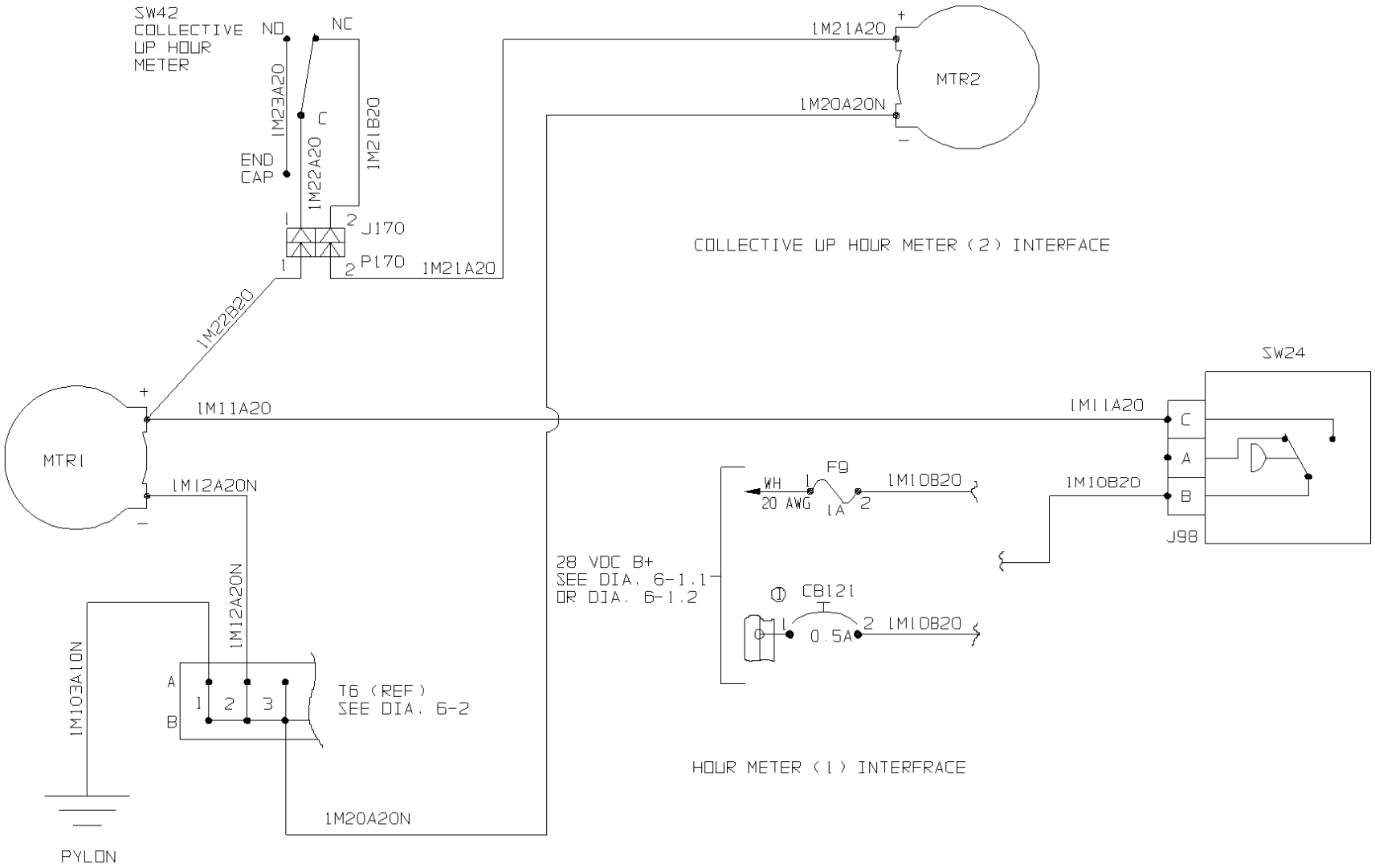
Diagram 6-24. Hour Meter

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480B Serial Numbers: 5046-5133

Diagram 6-24. Hour Meter



480B Serial Numbers: 5134 and Subsequent

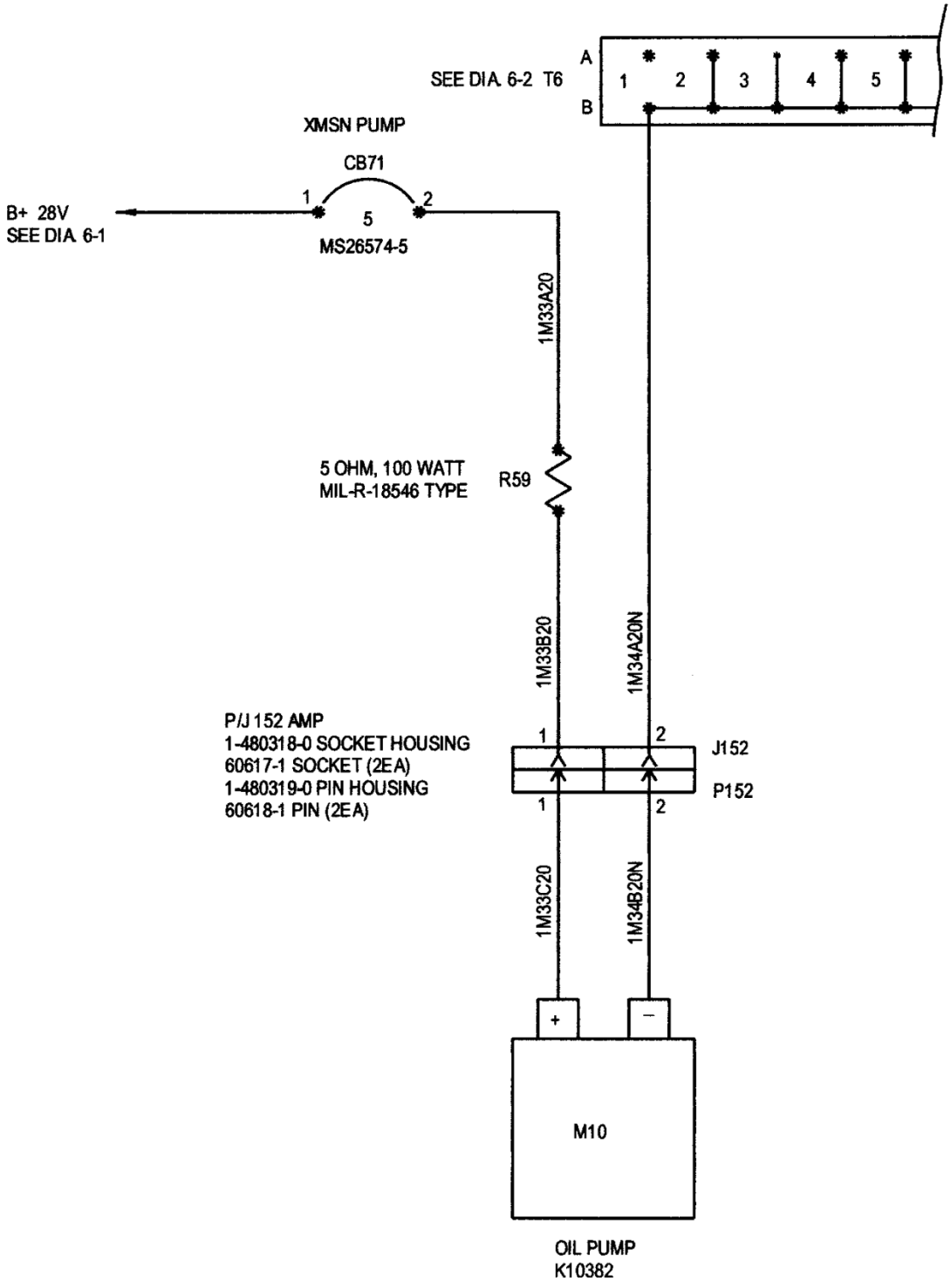
Diagram 6-24.1. Hour Meter

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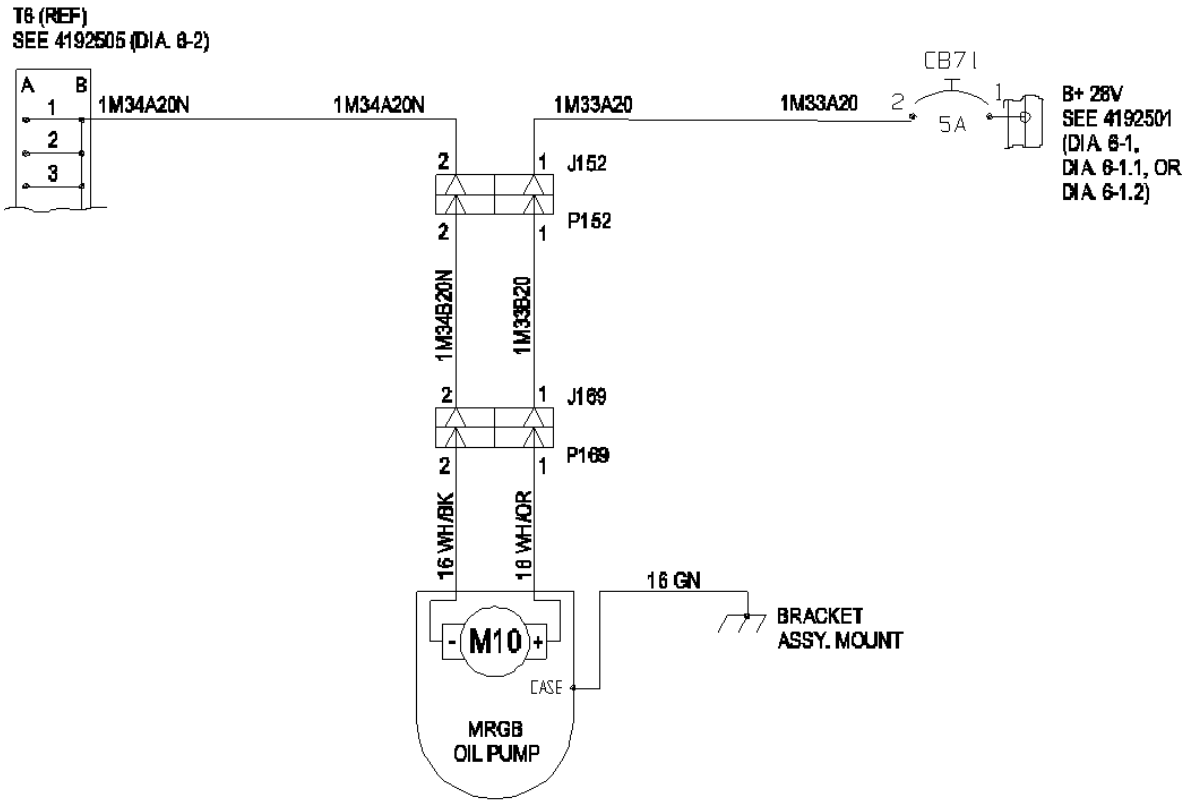
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Sheet 1 of 2

Diagram 6-25. M/R Transmission Filtration/Cooling System

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480/B S/N 5114 and subsequent

Sheet 2 of 2

Diagram 6-25. M/R Transmission Filtration/Cooling System

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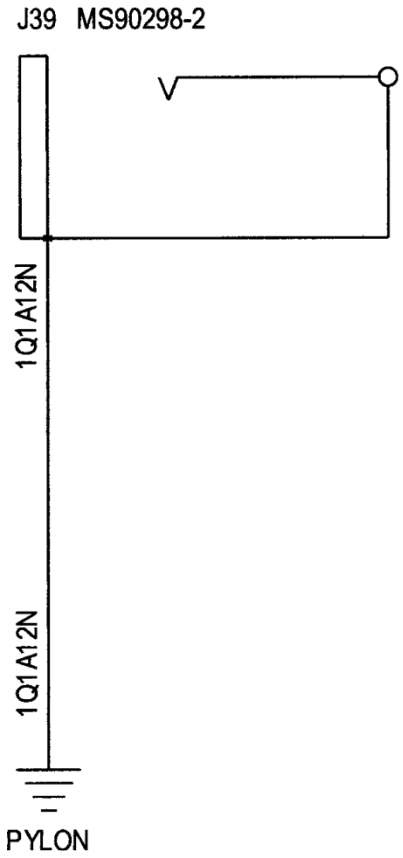


Diagram 6-26. Airframe Ground

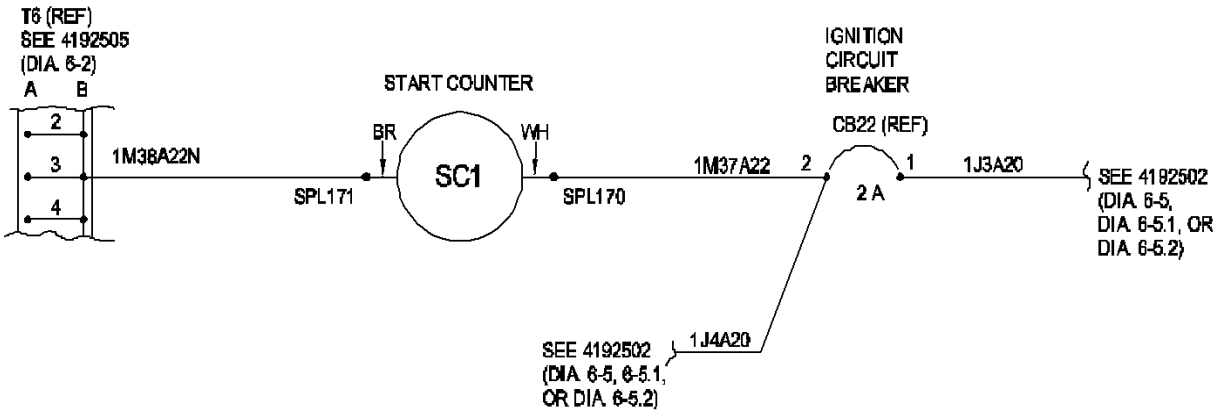
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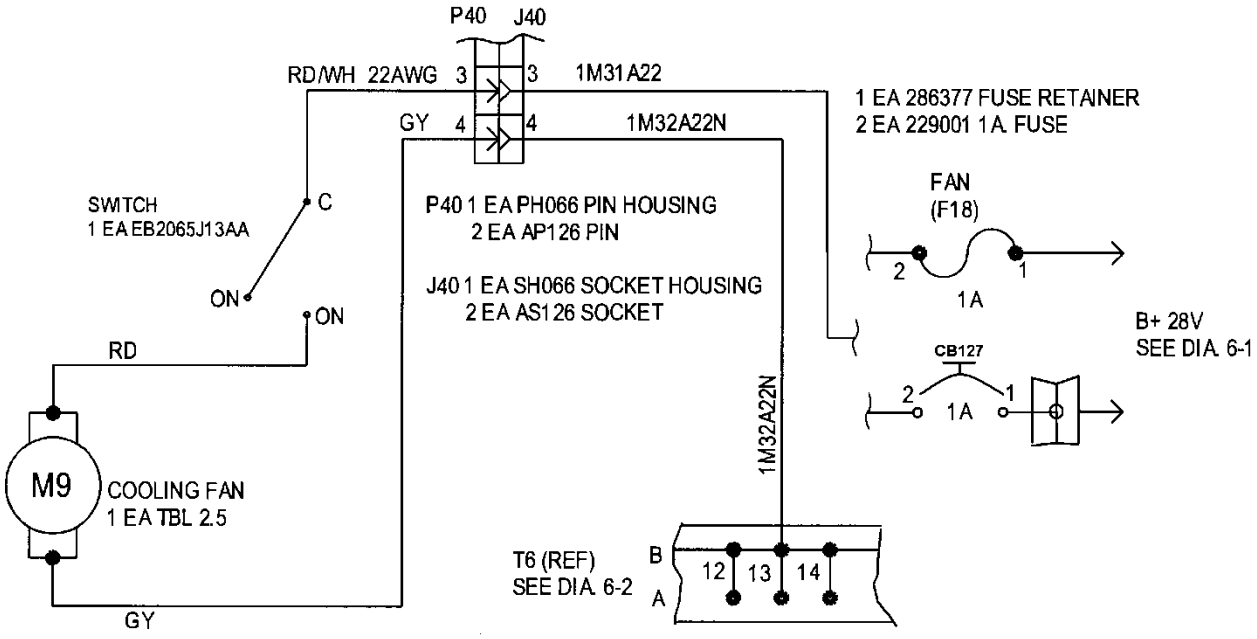
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480B Serial Numbers: 5048 and Subsequent

Diagram 6-27. Start Counter

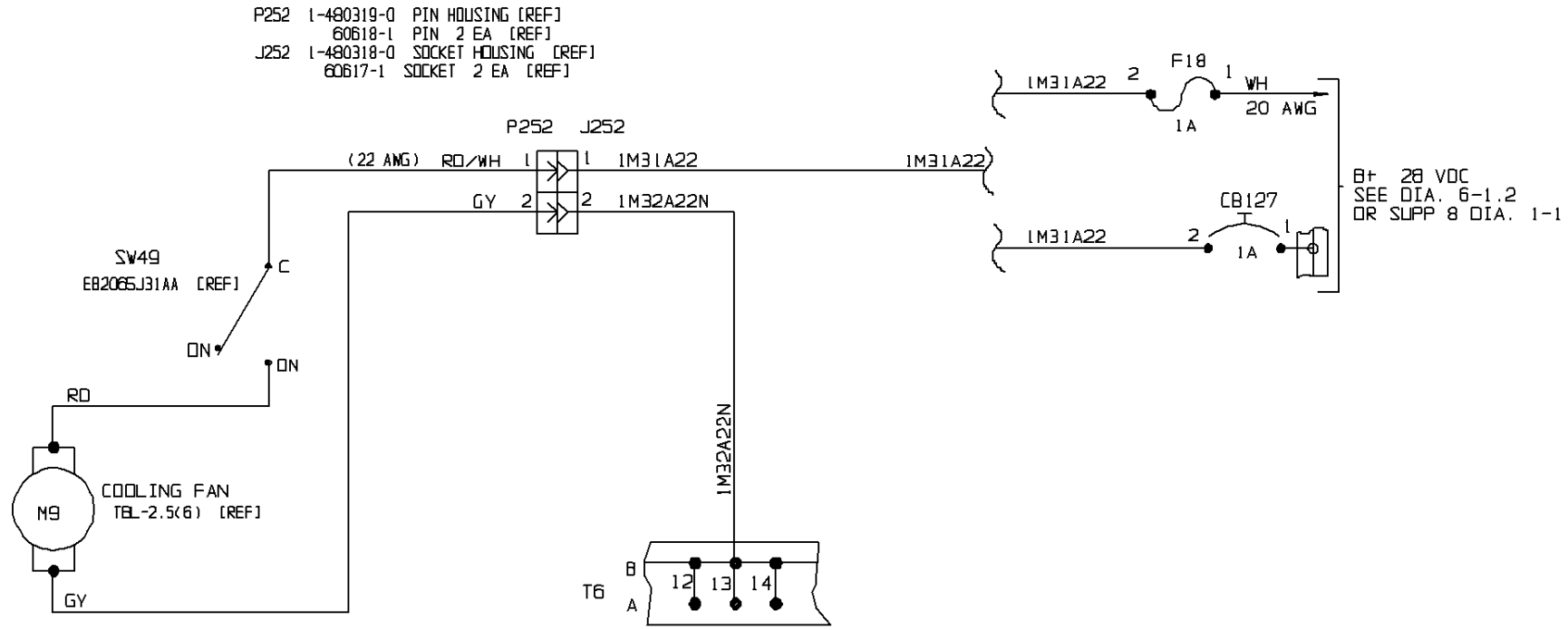
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Diagram 6-28. Overhead Cooling Fan

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Diagram 6-28. Overhead Cooling Fan

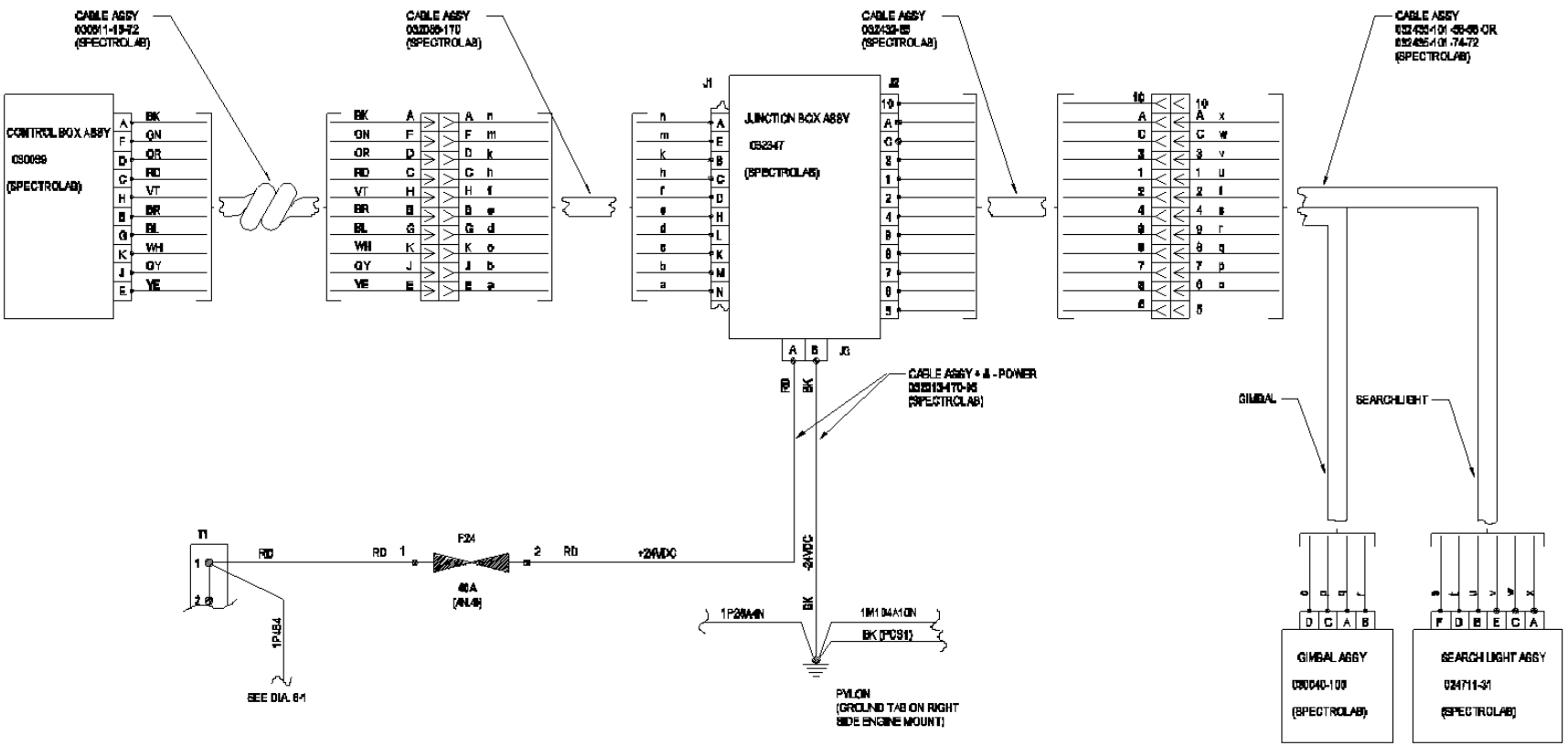


Diagram 6-29. SpectroLab SX-5 Starburst Searchlight Interface

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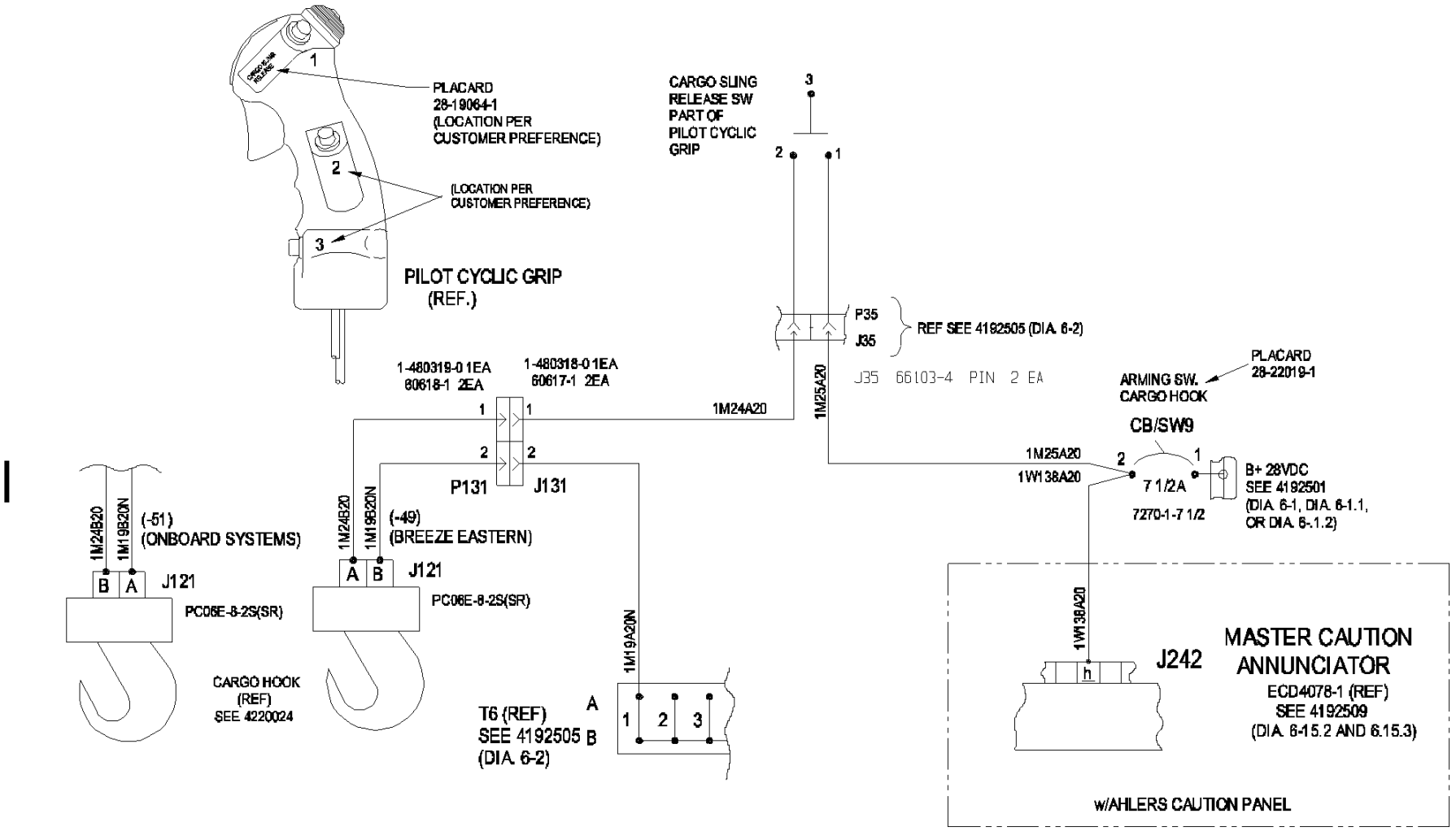
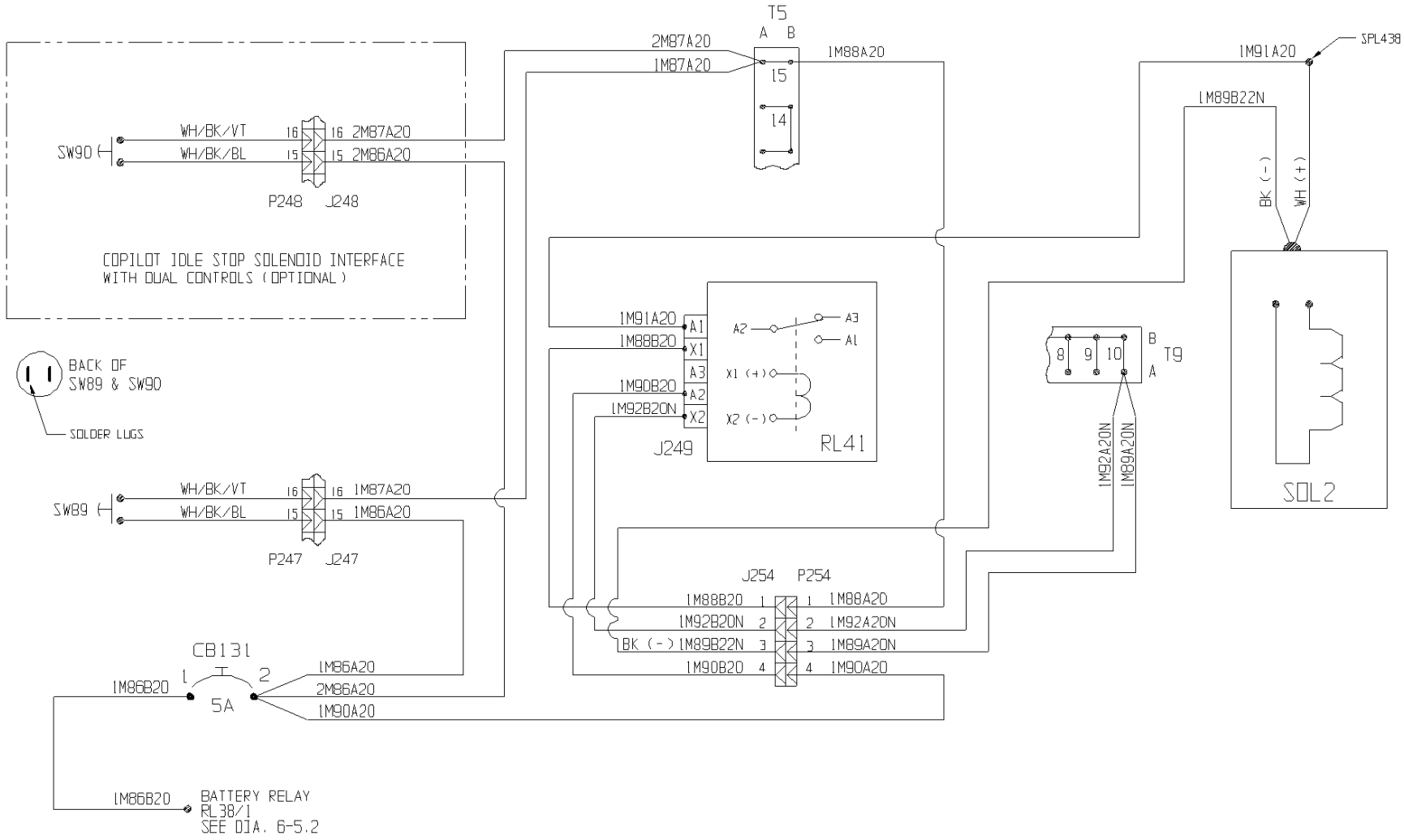


Diagram 6-30. Cargo Hook Sling Release

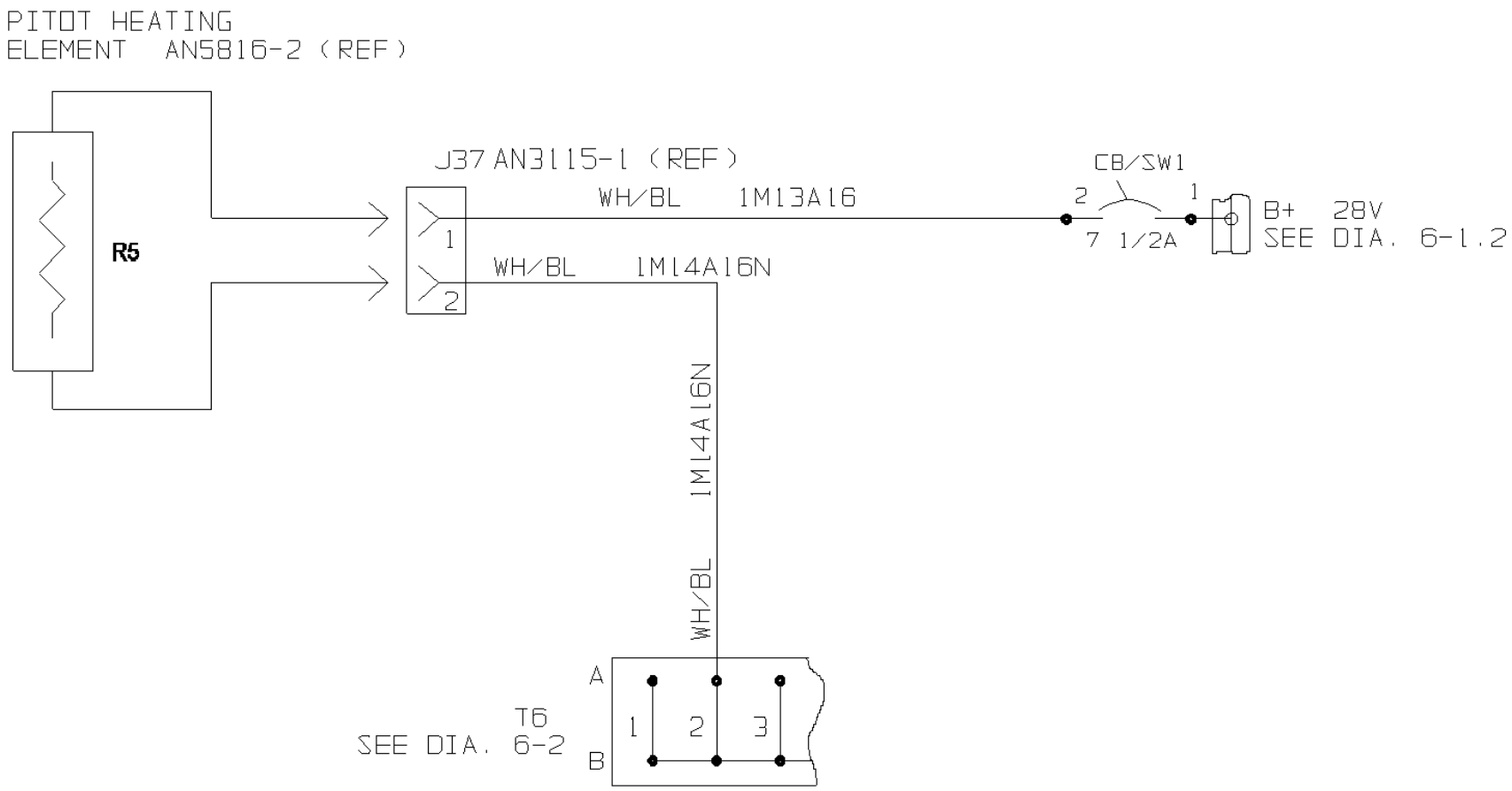


480B S/N 5136 and Subsequent

Diagram 6-31. Engine Idle Stop

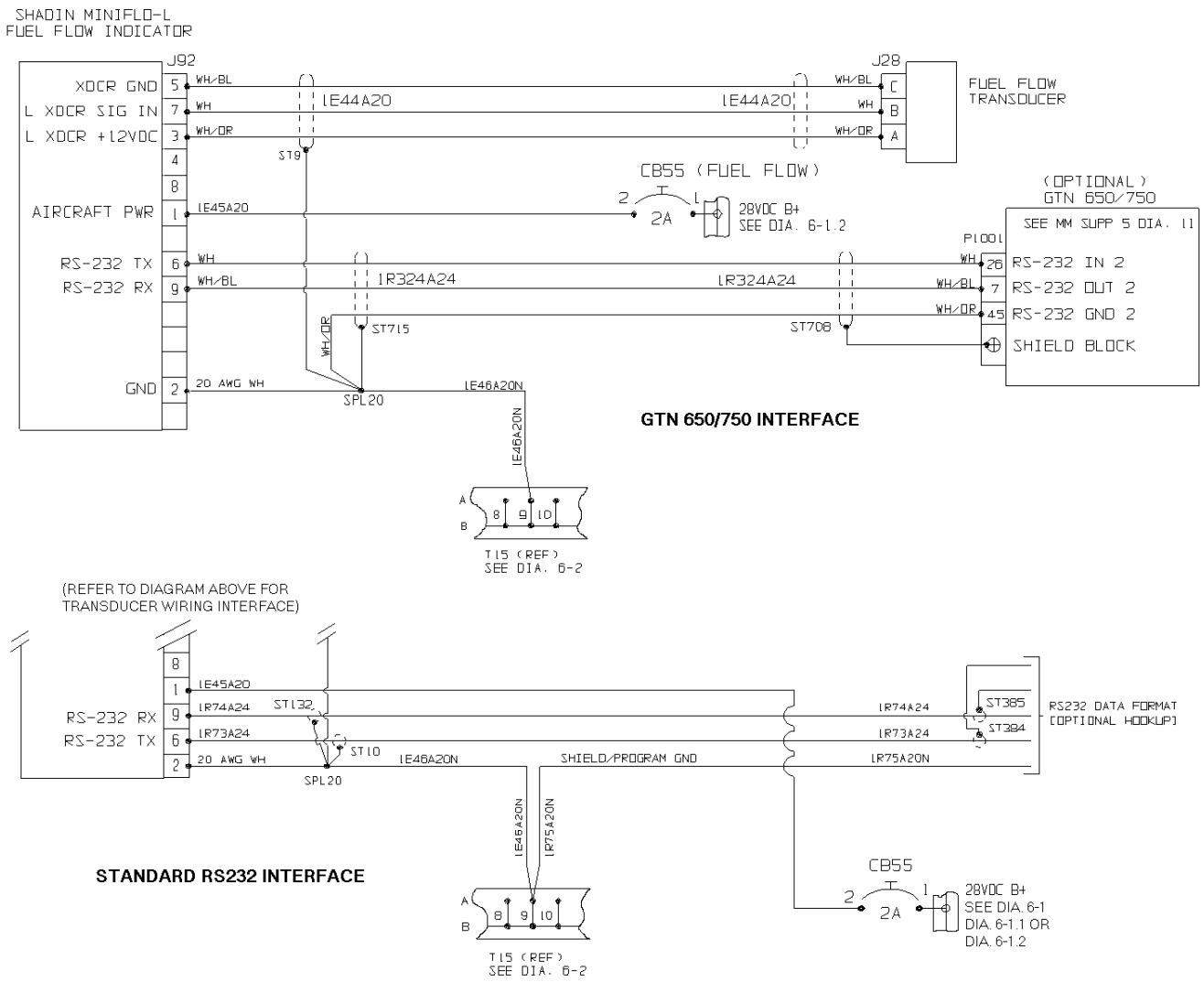
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TH-28/480 Series Option (All S/N)

Diagram 6-32. Heated Pitot System Interface

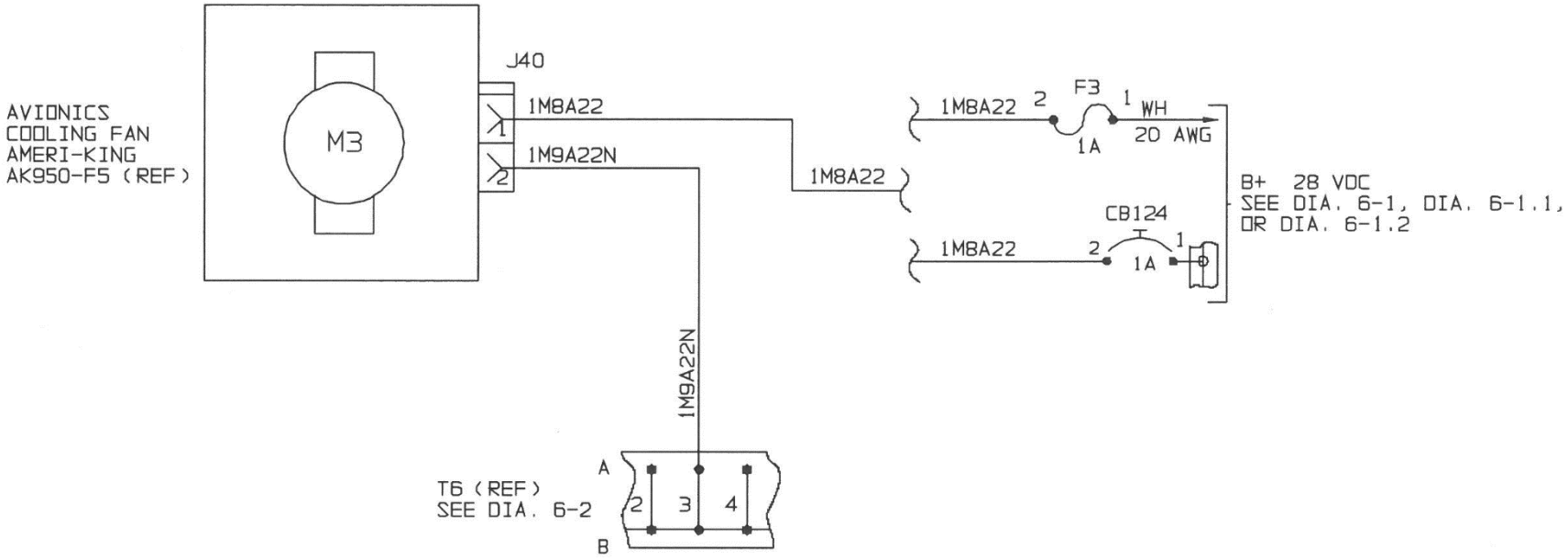


480/B Option (All S/N)

Diagram 6-33. Fuel Flow System

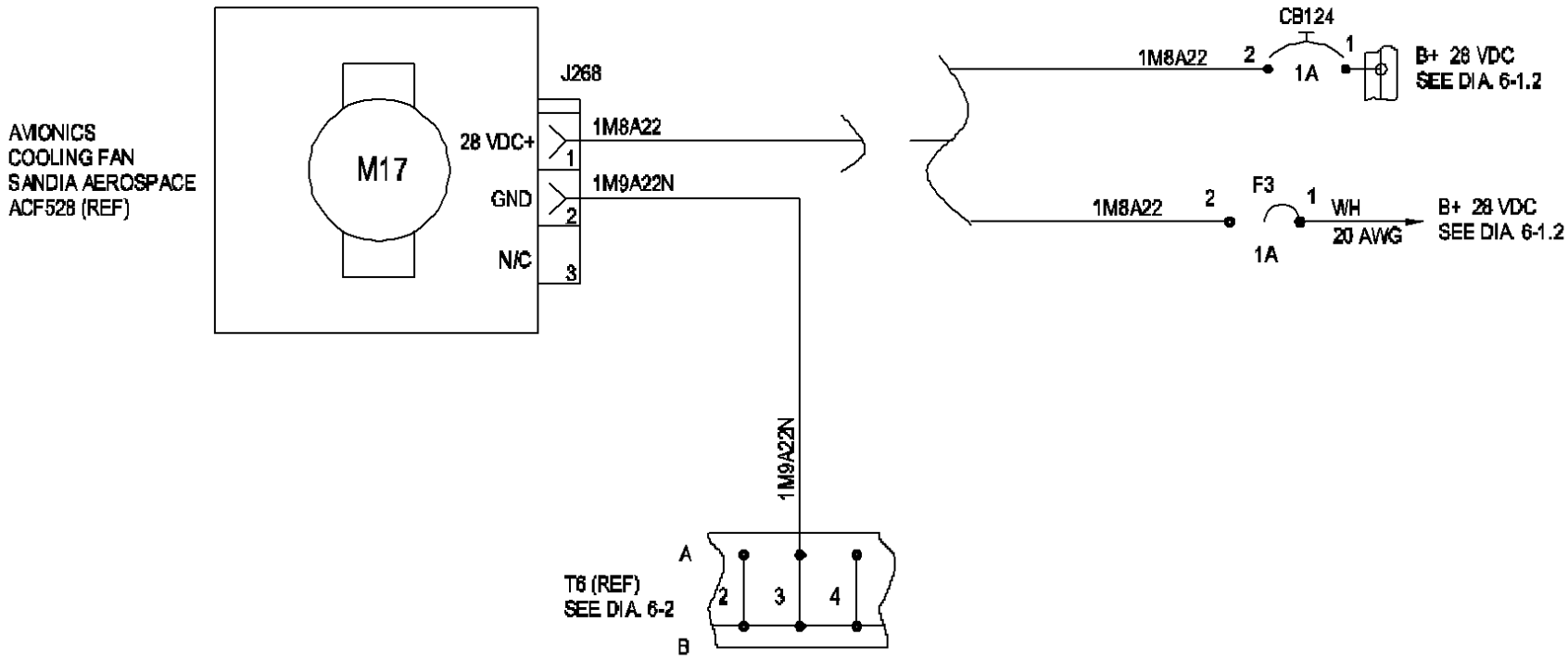
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480/B Option (S/N 5238 and prior)
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Diagram 6-34. Avionics Cooling Fan

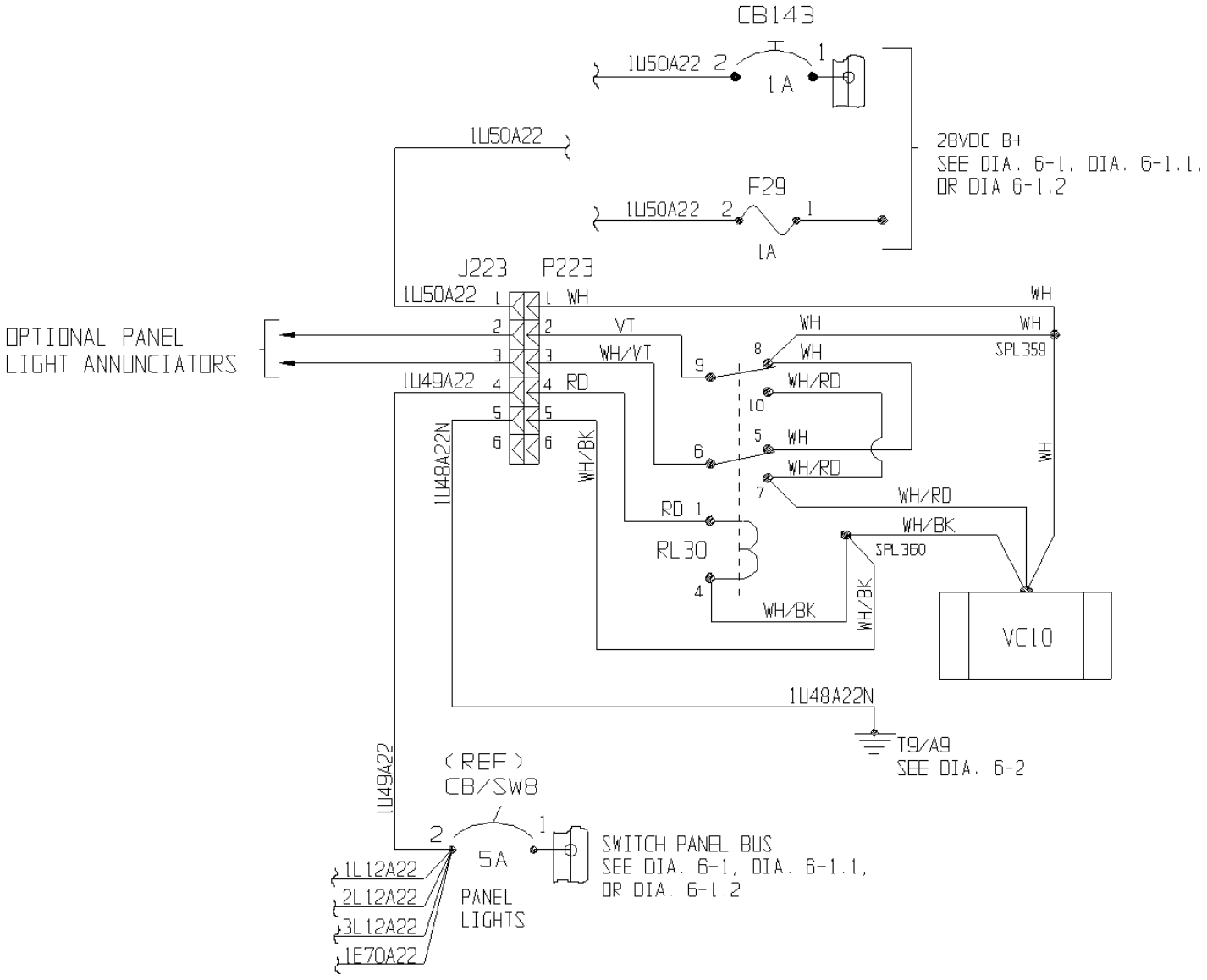


480/B Option (S/N 5239 and subsequent)
Sheet 2 of 2

Diagram 6-34. Avionics Cooling Fan

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480/B Option (All S/N)
Diagram 6-35. Day/Night Panel Annunciator Lamp Power

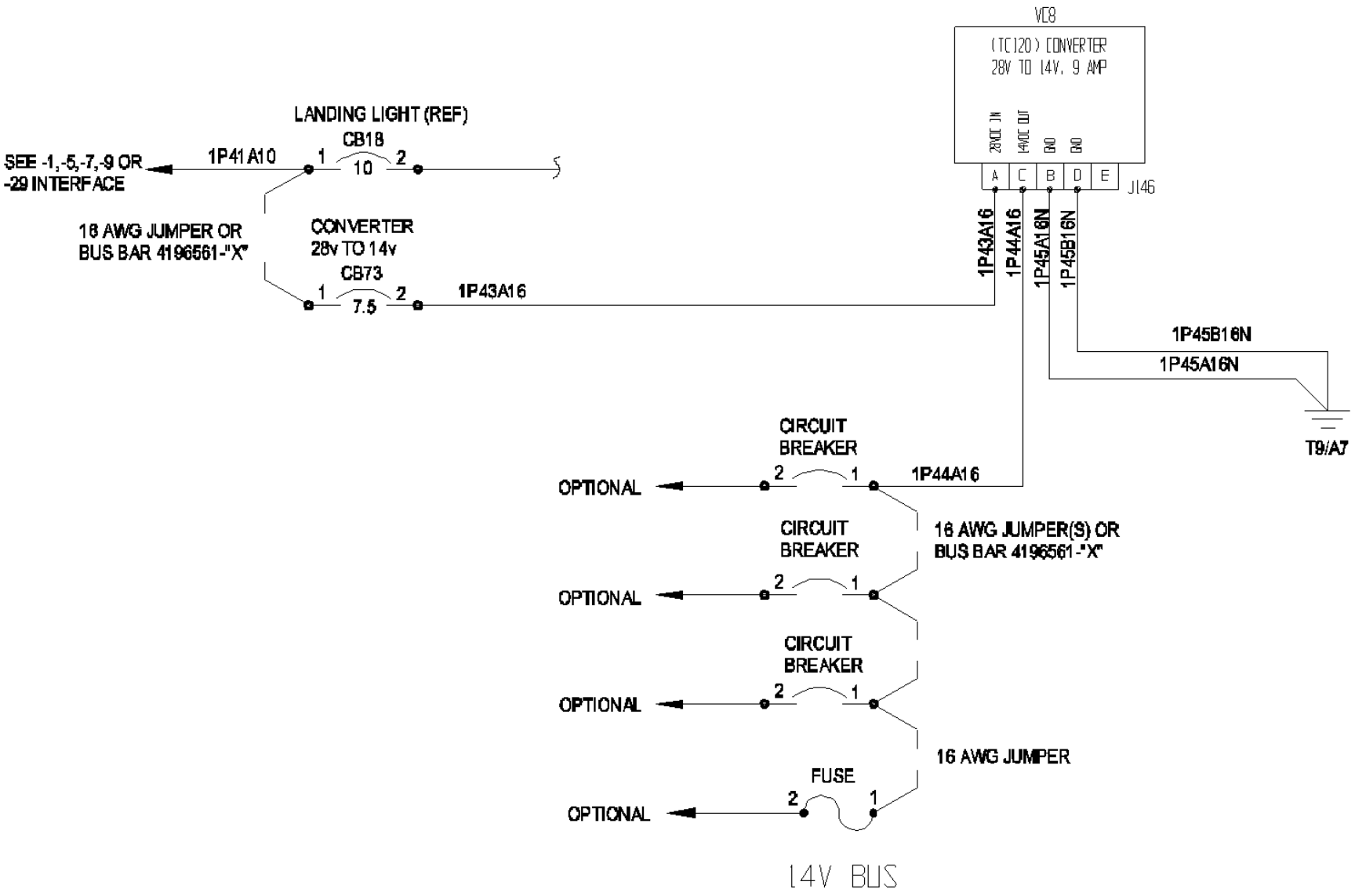


Diagram 6-36. 28V to 14V 9A Converter

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SECTION 7

INSTRUMENTS

7-1. Instrument Panel and Glareshield

7-2. Layout – Instrument Panel

A. See Figure 7-1 for the layouts of the instrument panels.

7-3. Access – Instrument Panel

A. TH-28: Gain access to the instrument panel as follows:

(1) Remove the cloth shroud from the instrument panel.

(2) Remove the ventilation outlets attached to the sides of the instrument panel.

(3) Disconnect the electrical connector for the glareshield lights and remove the glareshield.

(4) Release the turn lock fasteners on the instrument panel cover and remove the cover.

B. 480/B: Gain access to the back of the instrument panel as follows:

(1) Remove the glare shield.

(2) Disconnect the ventilation ducts from the outlets if the ram air ventilation system is installed.

(3) Remove the screws securing the instrument panel cover and remove the cover.

7-4. Removal – Instrument Panel

A. TH-28

(1) Disconnect the battery and remove all electrical power.

(2) Remove the cloth shroud, ventilation outlets, glareshield, and instrument panel cover.

(3) Disconnect all electrical connectors and hoses from the equipment and instruments installed in the panel.

(4) Remove the equipment and instruments installed in the panel.

NOTE

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Ensure all the wiring is identified and marked for reinstallation.

(5) Detach all terminal boards and the electrical control panel from the panel.

(6) Remove the screws securing the aft side of the panel to the pedestal and the hinge pin securing the front side of the panel.

(7) Remove the instrument panel.

B. 480/B:

(1) Disconnect the battery and remove all electrical power.

(2) Remove the glareshield and instrument panel cover.

(3) Disconnect all electrical connectors and hoses from the equipment and instruments installed in the panel.

(4) Remove the equipment and instruments installed in the panel.

NOTE

Ensure all the wiring is identified and marked for reinstallation.

(5) Detach all terminal boards and the electrical control panel from the panel.

(6) Remove the hardware securing the instrument panel to the center pedestal.

(7) Remove the instrument panel.

7-5. Inspection – Instrument Panel and Glareshield

A. Inspect the instrument panel and braces for cracks, scratches, warpage, and security of installation.

B. Inspect the placards and decals for legibility.

C. Inspect the rheostats and switches for missing and loose knobs.

D. Inspect the glareshield for cracks and security of installation.

7-6. Repair – Instrument Panel and Glareshield

A. Replace damaged or worn mounting hardware.

B. Replace warped instrument panel braces.

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C. Repair cracks I/A/W AC43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

D. Repair cracks in the glareshield less than two (2) inches in length by stop drilling and epoxying. Replace the glareshield if the crack is longer than two (2) inches.

E. Replace missing or illegible placards.

7-7. Installation – Instrument Panel

A. TH-28:

(1) Place the instrument panel into position and install the hinge pin and screws securing the panel to the pedestal.

(2) Attach the terminal boards and install the electrical control panel.

(3) Install the equipment and instruments into the panel.

(4) Connect the electrical connectors and hoses to the equipment and instruments in the panel.

(5) Install the panel cover, glareshield, ventilation outlets, and cloth shroud.

B. 480/B:

(1) Place the instrument panel into position and install the securing hardware.

(2) Attach the terminal boards and install the electrical control panel.

(3) Install the equipment and instruments into the panel.

(4) Connect the electrical connectors and hoses to the equipment and instruments in the panel.

(5) Install the panel cover and glareshield.

7-8. Instrument Maintenance

7-9. General Description – Instrument Maintenance

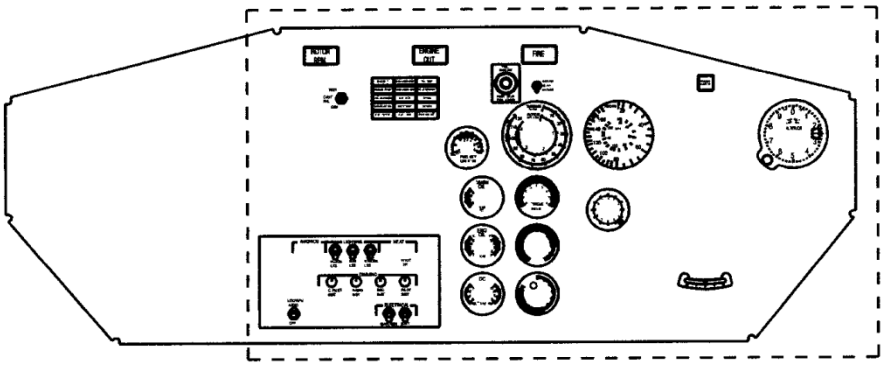
Instrument maintenance refers to the general maintenance procedures which are applicable to all instruments mounted in the instrument panel.

7-10. Cleaning – Instrument Maintenance

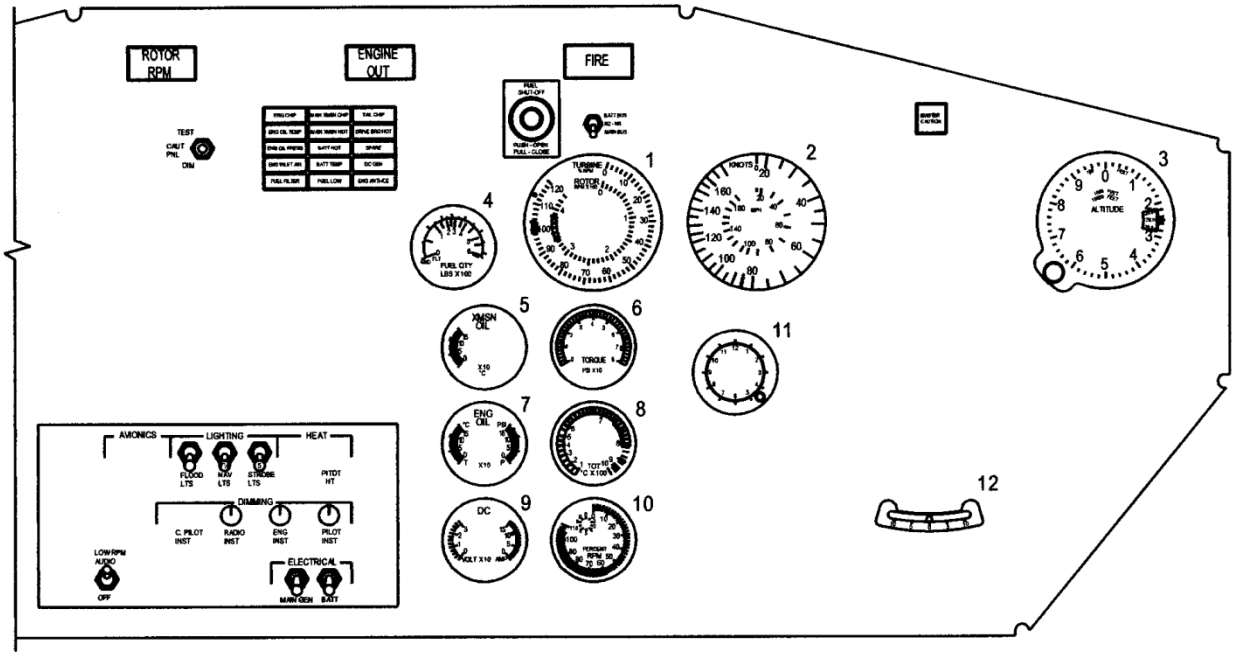
A. Clean the panel and instrument cover glasses with a suitable soft, lint-free cloth.

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SEE DETAIL A



DETAIL A

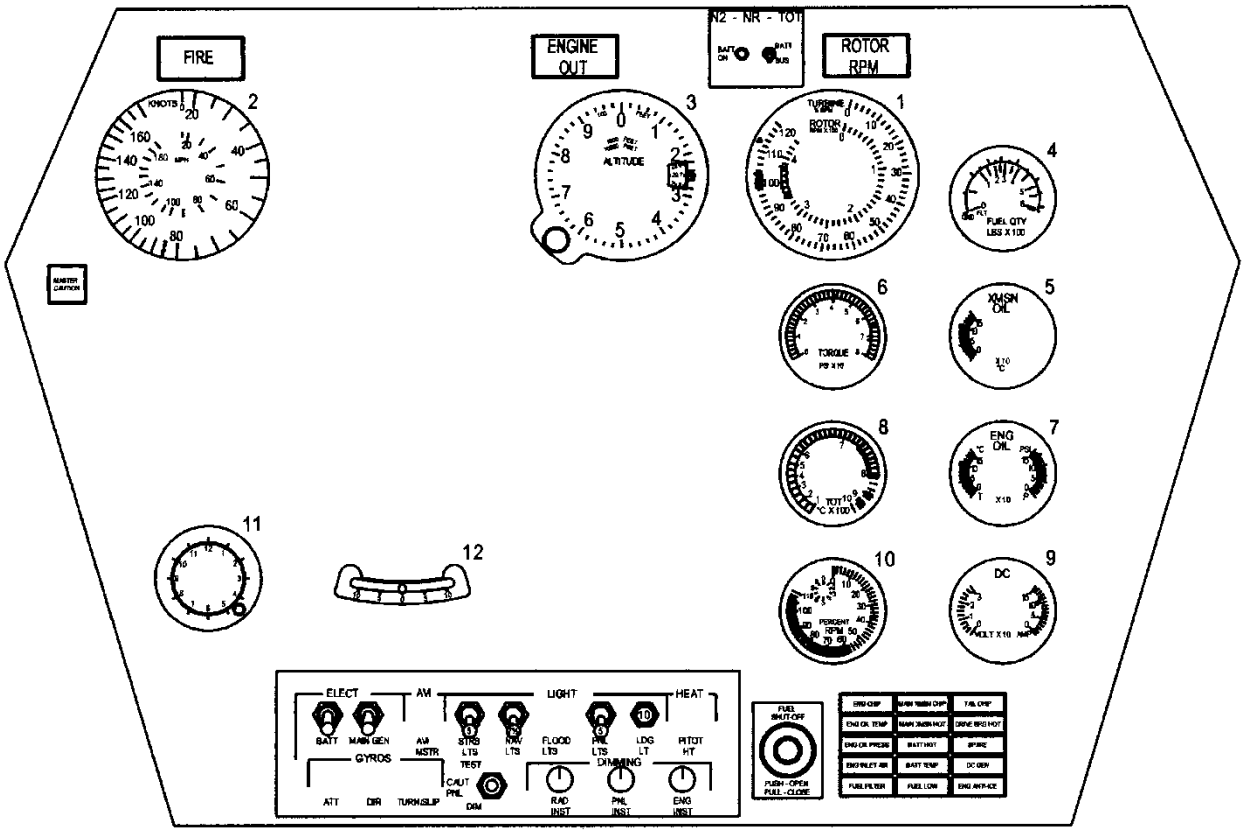
1. Rotor and Power Turbine Tachometer (Dual Tach)
2. Airspeed Indicator
3. Altimeter
4. Fuel Quantity Indicator
5. Transmission Temp. Indicator
6. Torque Indicator
7. Engine Oil Temp./Press. Indicator
8. TOT Indicator
9. Volt/Amp Indicator
10. Gas Producer Tachometer (N_1 Tach)
11. Clock
12. Inclinometer

TH-28 Standard Panel
Sheet 1 of 3

Figure 7-1. Instrument Panel Layout

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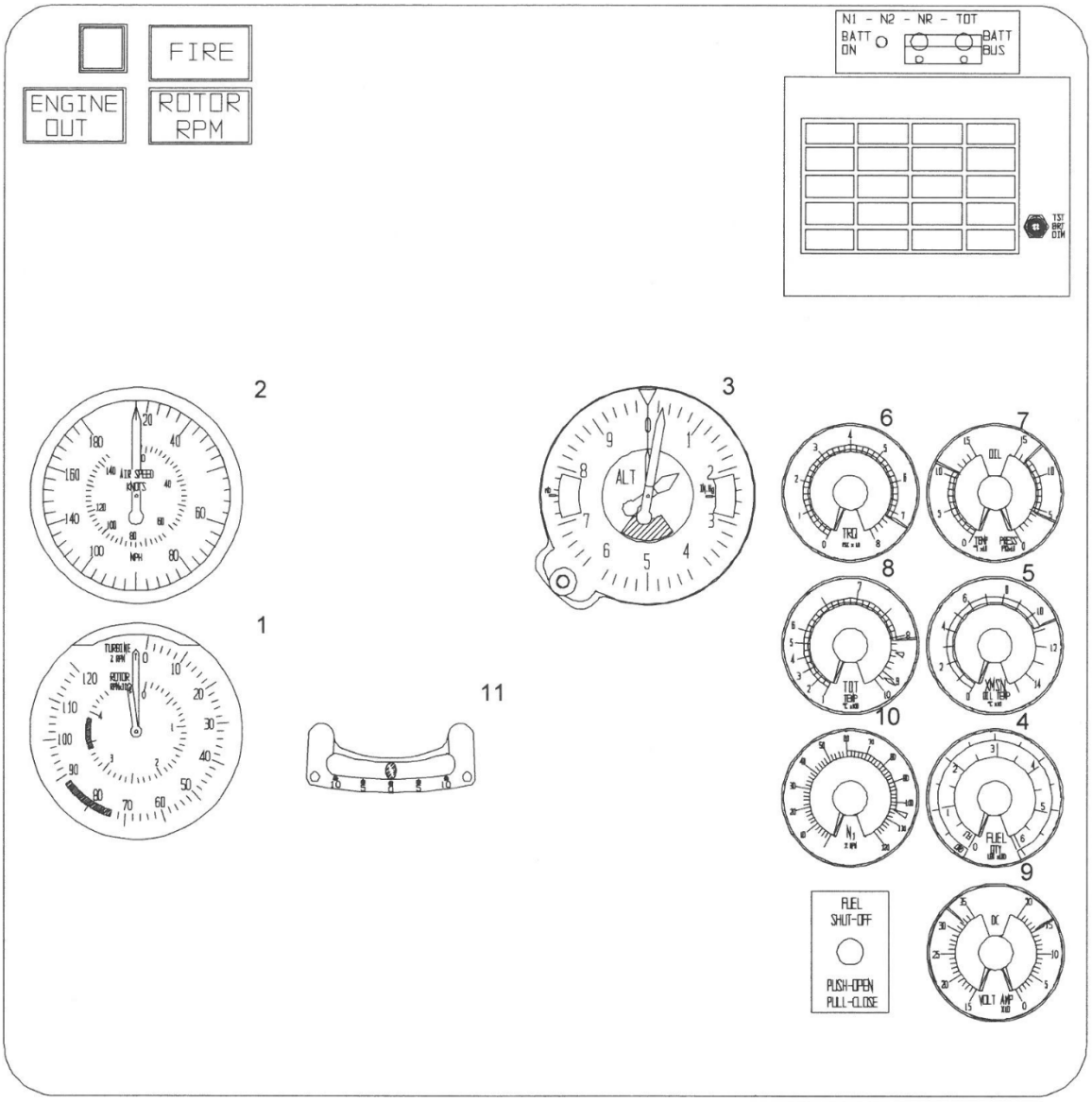


NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES.

1. Rotor and Power Turbine Tachometer (Dual Tach)
2. Airspeed Indicator
3. Altimeter
4. Fuel Quantity Indicator
5. Transmission Temp. Indicator
6. Torque Indicator
7. Engine Oil Temp./Press Indicator
8. TOT Indicator
9. Volt/Amp Indicator
10. Gas Producer Tachometer (N_1 Tach)
11. Clock
12. Inclinometer

480 Standard Panel
Sheet 2 of 3

Figure 7-1. Instrument Panel Layout



NOTE: INSTRUMENT PANEL LAYOUTS MAY VARY DEPENDING ON CUSTOMER PREFERENCES

1. Rotor and Power Turbine Tachometer (Dual Tach)
2. Airspeed Indicator
3. Altimeter
4. Fuel Quantity Indicator
5. Transmission Temp. Indicator
6. Torque Indicator
7. Engine Oil Temp./Press Indicator
8. TOT Indicator
9. Volt/Amp Indicator
10. Gas Producer Tachometer (N_1 Tach)
11. Inclinometer

480B Standard Panel
Sheet 3 of 3

Figure 7-1. Instrument Panel Layout

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7-11. Removal – Instrument Maintenance

A. Ensure all electrical power is "OFF".

B. Gain access to the back of the instrument panel (para. 7-3).

C. Disconnect the electrical connectors or hoses from the instrument.

D. Protect the ends of the electrical connectors, cap the open hoses, and cover the openings in the instruments.

E. Remove the mounting screws or loosen the mounting clamp screw. Remove the instrument.

7-12. Inspection – Instrument Maintenance

A. Inspect the instrument for loose, cracked, or broken cover glass.

B. Inspect for proper and secure mounting.

C. Inspect the range markings and placards for correct ranges and limits, completeness and legibility I/A/W the Rotorcraft Flight Manual (RMF).

D. Inspect for loose, missing, or improperly installed hardware.

NOTE

The inspection for proper operation consists of either a maintenance ground run or a maintenance test flight and comparing the instrument indications to the indications that should be found during normal operations. Do not use the testing information in the following paragraph unless the proper equipment and trained personnel are available.

E. Inspect the instrument for proper operation. The instruments and system components can be inspected for proper operation using the testing information that follows:

CAUTION

Refer to the electrical schematic diagrams for the proper electrical connections.

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(1) Gas Producer Tachometer (N_1 Tach):

SCALE ERROR

DIAL		RPM	MINIMUM RPM	MAXIMUM RPM
0	=	0	-1%	1%
10	=	420	399	441
20	=	840	819	861
40	=	1680	1659	1701
60	=	2520	2499	2541
70	=	2940	2919	2961
80	=	3360	3339	3381
90	=	3780	3759	3801
100	=	4200	4179	4221
110	=	4620	4599	4641

(2) Transmission Oil Temperature Indicator:

SCALE ERROR

°C		OHMS	MINIMUM OHMS	MAXIMUM OHMS
0	=	50.00	49.07	50.93
30	=	57.95	57.02	58.88
60	=	66.50	65.57	67.43
90	=	75.80	74.87	76.73
120	=	85.70	84.77	86.63
150	=	96.50	95.57	97.43

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(3) Engine Oil Pressure/Temperature Indicator:

SCALE ERROR

°C		OHMS	MINIMUM OHMS	MAXIMUM OHMS
0	=	90.38	89.34	91.40
30	=	100.91	99.83	102.02
60	=	112.28	111.11	113.49
90	=	124.55	123.29	125.81
120	=	137.78	136.46	139.13
150	=	151.91	150.53	153.32

PSI		MV	MINIMUM MV	MAXIMUM MV
0	=	0.0	-2.0	2.0
20	=	13.3	11.3	15.3
40	=	26.7	24.7	28.7
60	=	39.9	37.9	41.9
80	=	53.3	51.3	55.3
100	=	66.7	64.7	68.7
130	=	86.6	84.6	88.6
150	=	100.0	98.0	102.0

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(4) Torque Pressure Indicator:

SCALE ERROR

PSI		MV	MINIMUM MV	MAXIMUM MV
0	=	0.00	-1.46	1.46
20	=	13.33	11.87	14.79
40	=	26.67	25.21	28.13
60	=	40.00	38.54	41.46
80	=	53.33	51.87	54.79
100	=	66.67	65.21	68.13
110	=	73.33	71.87	74.79

(5) Engine Oil/Torque Pressure Transducer:

NOTE

10VDC Excitation Voltage

SCALE ERROR

PRESSURE		OUTPUT (MV)	MINIMUM MV	MAXIMUM MV
0	=	0.00	-2.0	2.0
30	=	20.0	18.0	22.0
60	=	40.0	38.0	42.0
90	=	60.0	58.0	62.0
120	=	80.0	78.0	82.0
150	=	100.0	98.0	102.0

(6) Airspeed Indicator:

Test the indicator following the instructions for performing a pitot/static system leak check (paragraph 7-68). Test the indicator at 10 knot intervals from 20 knots to 122 knots for TH-28s and 480s or 125 knots for 480Bs and 480s equipped with the Increased Rotor Speed and Torque Limit Modification Kit. Replace the indicator if the reading exceeds ±5 knots from the indicator in the pitot/static system tester.

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(7) Altimeter:

Test the altimeter following the instructions for performing a pitot/static system leak check (paragraph 7-68).

7-13. Repair – Instrument Maintenance

A. Replace any required decals which are missing or not clearly legible.

B. Replace any instrument if the cover glass is loose, cracked, broken, or when the instrument is found to be unserviceable.

7-14. Installation – Instrument Maintenance

A. Position the instrument into the panel. Install the mounting screws or tighten the screw of the mounting clamp.

B. Remove the protective caps or covers as necessary, and connect the electrical connectors and/or hoses to the instrument.

C. Check the instrument for operation.

NOTE

See Figure 7-1 for instrument location in the instrument panels. Optional equipment instruments are not shown.

7-15. Rotor and Power Turbine Tachometer (Dual Tach)

7-16. General Description – Dual Tach

The rotor and power turbine tachometer (Dual Tach) is powered by the aircraft 28-volt electrical system and driven by a tachometer generator for the power turbine section and a magnetic pick-up mounted in the main rotor transmission for the rotor section. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-17. Power Turbine Tachometer Generator

7-18. Description – Power Turbine Tachometer Generator

The power turbine tachometer generator is mounted on the N_2 tach pad on the left side of the engine accessory drive gearbox and is connected to the dual tach. Refer to paragraphs 13-129 through 13-132 for maintenance procedures.

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7-19. Rotor RPM Magnetic Pick-up

7-20. Description – Rotor RPM Magnetic Pick-up

The rotor rpm magnetic pick-up, located in the forward portion of the main rotor transmission, is used to generate pulses used to drive the rotor rpm portion of the dual tach.

7-21. Removal – Rotor RPM Magnetic Pick-up

A. Drain the oil from the main rotor transmission (para. 4-13).

B. Remove the upper plenum/air inlet assembly (para. 13-28).

C. Disconnect the magnetic pick-up electrical connector.

D. Remove the magnetic pick-up from the main rotor transmission. If replacing the magnetic pick-up, remove any shims installed on the pick-up.

7-22. Inspection – Rotor RPM Magnetic Pick-up

A. Inspect the magnetic pick-up for security of installation and condition and security of the electrical wires and connectors.

B. Using a multi-meter, check for 270-330 ohms across the leads.

7-23. Repair – Rotor RPM Magnetic Pick-up

A. Repair damaged wiring or electrical connectors.

B. Replace the magnetic pick-up if the ohm check is outside the 270-330 ohm range or if inspection of the system components and wiring isolates the problem to the magnetic pick-up.

7-24. Installation – Rotor RPM Magnetic Pick-up

A. Remove the inspection magnetic pick-up inspection plug located on the front of the main rotor transmission.

B. Turn the gearbox until a gear tooth is directly under the center of the magnetic pick-up installation hole.

C. Install the magnetic pick-up into the main rotor transmission (Figure 7-2).

(1) Insert a 0.030 feeler gauge through the access plug hole.

(2) Install any shims, P/N 28-16524-( ), from the old pick-up onto the replacement magnetic pick-up between the check nut and the top base of the magnetic pick-up.

(3) Replace the O-ring on the magnetic pick-up.

(4) Screw the magnetic pick-up in until it touches the feeler gauge.

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(5) Adjust the amount of shims (.002-.500 inch max.) as required to set the final clearance between the magnetic tip of the pick-up and the gear tooth to .030-.045 inch/.76-1.14 mm.

(6) Torque the magnetic pick-up to 60-65 in-lb/6.8-7.3 Nm.

D. Install the inspection plug.

(1) Replace the O-ring on the plug and reinstall the plug in the front of the transmission.

(2) Torque the plug and lockwire (.032) the magnetic pick-up to the plug.

E. Reconnect the electrical connector

F. Service the main rotor transmission (para. 4-12).

G. Install the upper plenum/air inlet assembly (para. 13-31).

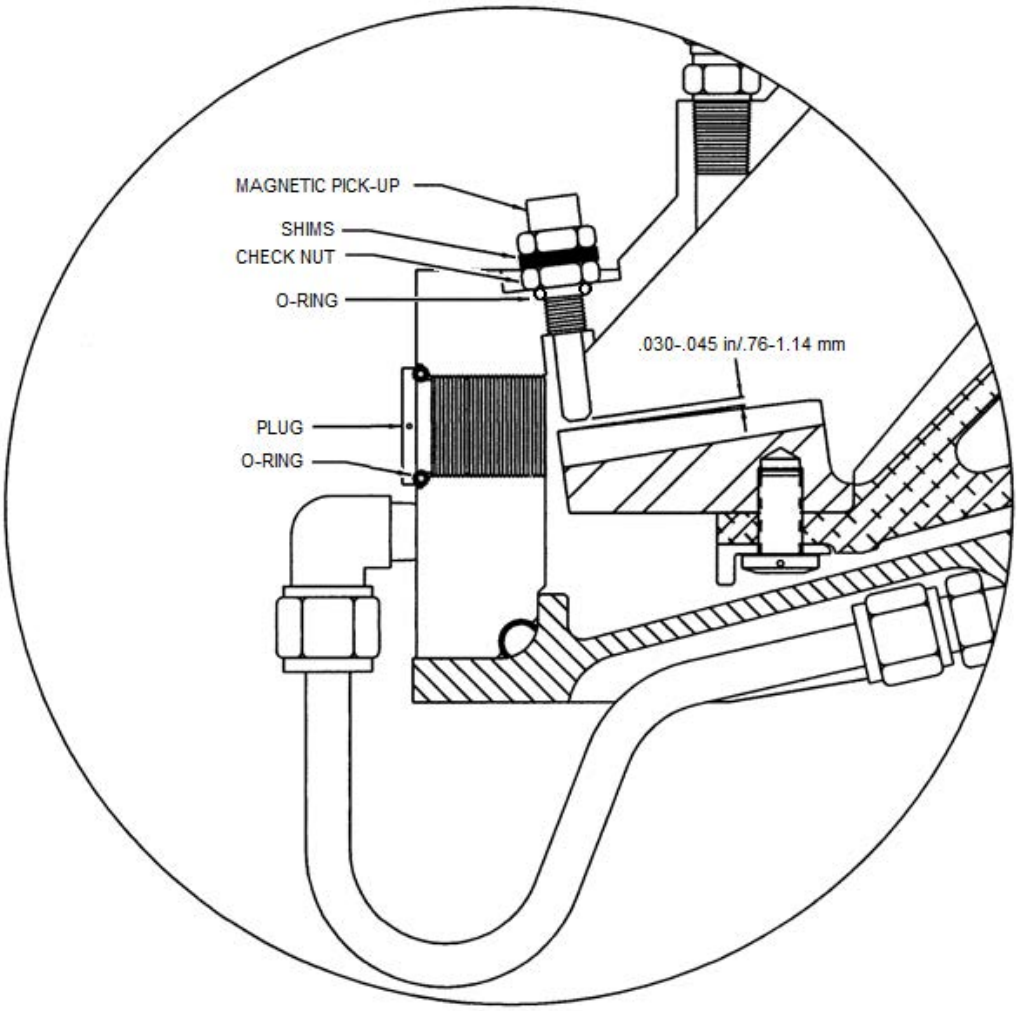


Figure 7-2. Magnetic Pick-up Installation

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7-25. Gas Producer Tachometer

7-26. General Description – Gas Producer Tachometer

The gas producer tachometer (N_1) provides an indication in percent rpm of the engine gas producer (N_1) section by connection to a tachometer generator mounted on the engine accessory gearbox. Two different type N_1 Tach systems are used in the TH-28/480. The "passive" system uses an indicator that is powered by the signal from the tachometer generator. The "active" system uses an indicator that is powered by the aircraft electrical system and uses a micro processor to convert the signal from the tachometer generator. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-27. Gas Producer Tachometer Generator

7-28. General Description – Gas Producer Tachometer Generator

The gas producer tachometer generator is mounted on the N_1 tach pad on the right side of the engine accessory drive gearbox and is connected to the N_1 tach. Refer to paragraphs 13-129 through 13-132 for maintenance procedures.

7-29. Engine Oil Temperature and Pressure Indicator

7-30. General Description – Engine Oil Temperature and Pressure Indicator

The engine oil temperature and pressure indicator is a dual indicator which uses a temperature bulb located in the engine oil reservoir for engine oil temperature indications and a pressure transducer connected to the engine oil pressure line on the engine. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-31. Engine Oil Temperature Bulb

7-32. General Description – Engine Oil Temperature Bulb

The engine oil temperature bulb, installed on the engine oil reservoir is a resistance type temperature bulb which monitors the engine oil temperature and transmits varying voltage signals to the engine oil temperature and pressure indicator.

7-33. Removal – Engine Oil Temperature Bulb

A. Drain the engine oil reservoir (para. 4-8).

B. Remove the lockwire and disconnect the electrical connector.

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CAUTION

Use a backing wrench when removing the temperature bulb to prevent from damaging the engine oil reservoir.

C. Remove the lockwire and remove the temperature bulb from the engine oil reservoir.

D. Remove the gasket from the temperature bulb.

7-34. Inspection – Engine Oil Temperature Bulb

A. Inspect the temperature bulb for cracks, leaks, security, and proper installation.

B. Inspect the electrical connector for damaged or bent pins and cracked inserts

7-35. Repair – Engine Oil Temperature Bulb

A. Repair damaged electrical connectors.

B. Replace the gasket.

C. Replace the temperature bulb if cracked or damaged.

7-36. Installation – Engine Oil Temperature Bulb

A. Lubricate the gasket and bulb threads with MIL-PRF-23699 and install the gasket onto the temperature bulb.

CAUTION

Use a backing wrench when installing the temperature bulb to prevent from damaging the engine oil reservoir.

B. Install the temperature bulb into the engine oil reservoir and lockwire using .032 wire.

C. Connect the electrical connector and lockwire with 0.020 lockwire.

D. Service the engine oil reservoir (para. 4-7).

7-37. Engine Oil Pressure Transducer

7-38. General Description – Engine Oil Pressure Transducer

The engine oil pressure transducer, located on the right side of the pylon assembly just aft of the engine, monitors engine oil pressure and transmits voltage signals to the engine oil temperature and pressure indicator.

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7-39. Removal – Engine Oil Pressure Transducer

A. Open the right side engine access panel.

B. Disconnect the electrical connector and the oil pressure line from the engine oil pressure transducer. Cap, plug, and cover the open line, port, electrical connections.

C. Loosen the hardware securing the transducer in the mounting clamps and remove the transducer.

7-40. Inspection – Engine Oil Pressure Transducer

A. Inspect the transducer for cracks, security, and the mounting clamps do not cover the static ports in the middle area of the transducer.

B. Inspect the oil line for leaks and proper operation.

C. Inspect the electrical connector for damaged or bent pins and cracked inserts.

7-41. Repair – Engine Oil Pressure Transducer

A. Repair damaged electrical connectors.

B. Tighten loose oil line fittings.

C. Replace defective or damaged oil lines.

D. Replace the pressure transducer if cracked or damaged.

E. Reinstall a improperly mounted pressure transducer.

7-42. Installation – Engine Oil Pressure Transducer

A. Install the pressure transducer into the mounting clamps and position so the static ports are not obstructed by the clamps. Tighten the securing hardware.

B. Remove the caps, plugs, and covers. Reconnect the oil pressure line and the electrical connector.

7-43. Turbine Outlet Temperature (TOT) Indicator

7-44. General Description – Turbine Outlet Temperature (TOT) Indicator

The turbine outlet temperature (TOT) indicator indicates the turbine outlet temperature in degrees Celsius (℃). Two different type TOT indicator systems are used in the TH-28/480. The "passive" indicator system operates on electrical potential from the engine thermocouple harness via a thermocouple lead spool resistor. The "active" indicator system is powered by the aircraft electrical system and converts the electrical potential from the engine thermocouple

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with out the use of the thermocouple lead resistor spool. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-45. Calibration Check – Turbine Outlet Temperature (TOT) Indicator

CAUTION

When removing the "passive" TOT indicator, place a short piece of wire across the terminal posts. This will ground the terminals and prevent violent needle movements and damage by static electricity. Do not replace the washers on the instrument terminal posts, as they are of special material. Replacing them with standard washers will cause a faulty TOT indication.

A. Remove the TOT indicator from the aircraft.

B. Check the calibration of the indicator using a suitable temperature indicating system analyzer (example: Barfield Turbine Temperature Test Set).

C. Repair or replace the indicator if not within the following calibration:

NOTE

Tap the indicator slightly after each reading. The difference in reading after tapping shall be considered friction error.

TEST POINTS °C	SCALE ERROR ± °C	FRICTION ERROR ± °C
0	40	30
100	35	30
200	30	30
300	25	30
400	20	30
500	20	30
600	10	30
700	5	30
750	5	30
800	10	30
900	20	30
1000	30	30

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7-46. Thermocouple Lead Spool Resistor

7-47. General Description – Thermocouple Lead Spool Resistor

The thermocouple lead spool resistor, located on the longitudinal pylon tube on the left side of the pylon assembly, provides a means of adjusting the resistance within the "passive" TOT system to calibrate the TOT thermocouple leads.

7-48. Removal – Thermocouple Lead Spool Resistor

A. Open the left side engine access panel.

B. Remove the cover.

C. Remove the alumel lead to the resistor spool.

D. Unsolder the resistor spool lead and remove the spool.

7-49. Inspection – Thermocouple Lead Spool Resistor

A. Inspect the resistor for loose connections, corrosion, broken wires, broken terminals, and damage to the cover and cover fasteners.

7-50. Repair – Thermocouple Lead Spool Resistor

A. Tighten loose connections.

B. Replace or repair a damaged cover.

C. Replace the spool resistor if the wires are broken or corroded.

D. Replace the resistor spool if the circuit resistance is less than 7.95 ohms.

7-51. Installation – Thermocouple Lead Spool Resistor

NOTE

New spool resistors have only one end of the winding soldered to a terminal. The other end is free to permit adjustment.

A. Position the resistor spool in place, solder the lead to the spool terminal and attach the alumel lead to the resistor lug.

B. Scrape off the insulation at the free end of the wire. Touch the bare wire to the terminal and check the circuit resistance:

(1) If the circuit resistance is 7.95 to 8.05 ohms, solder the bare wire to the terminal.

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(2) If the circuit resistance exceeds 8.05 ohms, unwind a turn or two of wire at a time and scrape off the insulation. Touch the bare wire to the terminal and check the circuit resistance. When a resistance of 7.95 to 8.05 ohms is indicated, cut the wire and solder to the terminal.

(3) If the circuit resistance is less than 7.95 ohms, replace the spool resistor and repeat steps 1 and 2.

C. Install the cover.

7-52. TOT Thermocouple Lead Resistance

NOTE

The following calibration/adjustment only applies to aircraft with the "passive" TOT indication system installed.

7-53. Calibration/Adjustment – TOT Thermocouple Lead Resistance

A. Remove the TOT indicator.

B. Connect the TOT thermocouple leads to a suitable temperature indicating system analyzer (example: Barfield Turbine Temperature Test Set).

C. Following the analyzer instructions, check that the thermocouple lead resistance is between 7.95 and 8.05 ohms:

(1) If the circuit resistance is 7.95 to 8.05 ohms, the thermocouple leads are within calibration limits.

(2) If the circuit resistance in not between 7.95 to 8.05 ohms, refer to paragraph 7-51.

D. When the thermocouple leads are within calibration limits, remove the analyzer and reinstall the TOT indicator.

7-54. Torque Pressure Indicator

7-55. General Description – Torque Pressure Indicator

The torque pressure indicator indicates engine output shaft torque pressure in psi by means of the torque pressure transducer. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

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7-56. Torque Pressure Transducer

7-57. General Description – Torque Pressure Transducer

The torque pressure transducer, located on the left side of the pylon assembly just aft of the engine, monitors torque oil pressure and transmits voltage signals to the torque pressure indicator.

7-58. Removal – Torque Pressure Transducer

A. Open the left side engine access panel.

B. Disconnect the electrical connector and the oil pressure line from the torque pressure transducer. Cap, plug, and cover the open line, port, electrical connections.

C. Loosen the hardware securing the transducer in the mounting clamps and remove the transducer.

7-59. Inspection – Torque Pressure Transducer

A. Inspect the transducer for cracks, security, and the mounting clamps do not cover the static ports in the middle area of the transducer.

B. Inspect the oil line for leaks and proper operation.

C. Inspect the electrical connector for damaged or bent pins and cracked inserts.

7-60. Repair – Torque Pressure Transducer

A. Repair damage electrical connectors.

B. Tighten loose oil line fittings.

C. Replace defective or damaged oil lines.

D. Replace the pressure transducer if cracked or damaged.

E. Reinstall a improperly mounted pressure transducer.

7-61. Installation – Torque Pressure Transducer

A. Install the pressure transducer into the mounting clamps and position so the static ports are not obstructed by the clamps. Tighten the securing hardware.

B. Remove the caps, plugs, and covers. Reconnect the oil pressure line and the electrical connector.

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7-62. Pitot-Static System

7-63. General Description – Pitot-Static System

NOTE

Aircraft are equipped with either a standard pitot tube or an optional heated pitot tube.

The pitot-static system consists of the pitot tube, two static ports, and the pitot and static lines and tubing necessary to connect to the airspeed indicators, altimeters, vertical speed indicator, and the blind encoder. The standard pitot tube, located under the nose of the aircraft, has a drain hole located in the bottom of the pitot tube. The cotter pin installed in the drain hole helps to drain water from the tube. Do not inadvertently remove the cotter pin. The optional heated pitot tube is located on the nose of the aircraft. The static ports, located just forward of both cabin doors, are bonded to the cabin shell and have pressure gates installed above and below the ports. Refer to Figure 7-3 for the typical pitot-static system schematic line installation.

7-64. Removal – Pitot-Static System

A. Remove the pitot-static lines and fittings as follows:

(1) Gain access to the back of the instrument panel (para. 7-3).

(2) Disconnect the pitot and static lines from the indicators. Cap the openings in the indicators.

(3) Disconnect the applicable fittings and remove the cable ties and connector rings securing the lines.

(4) Remove the pitot and static lines.

NOTE

Aircraft are equipped with either a standard pitot tube or an optional heated pitot tube. Maintenance procedures for the heated pitot are the same as for the standard pitot except where noted in the following steps.

B. Remove the pitot tube as follows:

(1) Remove the floor cover to access the pitot line and the pitot tube connections.

(2) Disconnect the flexible tube connecting the pitot tube to the pitot lines in the aircraft. Cap the open lines.

CAUTION

For aircraft with the optional heated pitot tube, the pressure air line extension tube may have a 15° bend to facilitate connection to the pitot lines. It may be necessary to straighten the extension tube prior to removing the pitot tube.

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(3) Standard pitot tube: Remove the screws securing the pitot tube into its mount. Remove the pitot tube from the aircraft.

(4) Heated pitot tube: If required, manually straighten the pressure air line extension tube.

(5) Heated pitot tube: Remove the screws securing the pitot tube into its mount. Remove the pitot tube from the pitot mount and disconnect the electrical connector. Remove the pitot tube from the aircraft.

NOTE

Do not remove the static ports unless required.

C. Remove the static ports as follows:

(1) Disconnect the static lines connected to the ports. Cap the open lines.

(2) Carefully separate the static ports from the cabin shell.

7-65. Inspection – Pitot-Static System

A. Pitot-Static Lines and Fittings:

(1) Inspect the lines and fittings for leaks, chafing, or other visible damage.

(2) Inspect the system for improperly installed fittings, cable ties and connector rings.

B. Pitot Tube:

NOTE

The cotter pin installed in the drain hole in the pitot tube helps to drain water from the tube. Do not inadvertently remove the cotter pin.

(1) Inspect the pitot tube for clogged or obstructed inlet opening, and clogged drain hole on the bottom of the tube.

(2) Inspect the pitot tube for cracks or damage.

(3) Inspect the drain hole and cotter pin for excessive wear.

C. Static Ports:

(1) Inspect the static ports to ensure that they are clean and free of foreign matter that may obstruct airflow.

(2) Inspect for security of installation and damage.

(3) Inspect the static pressure gates for damage and security of installation.

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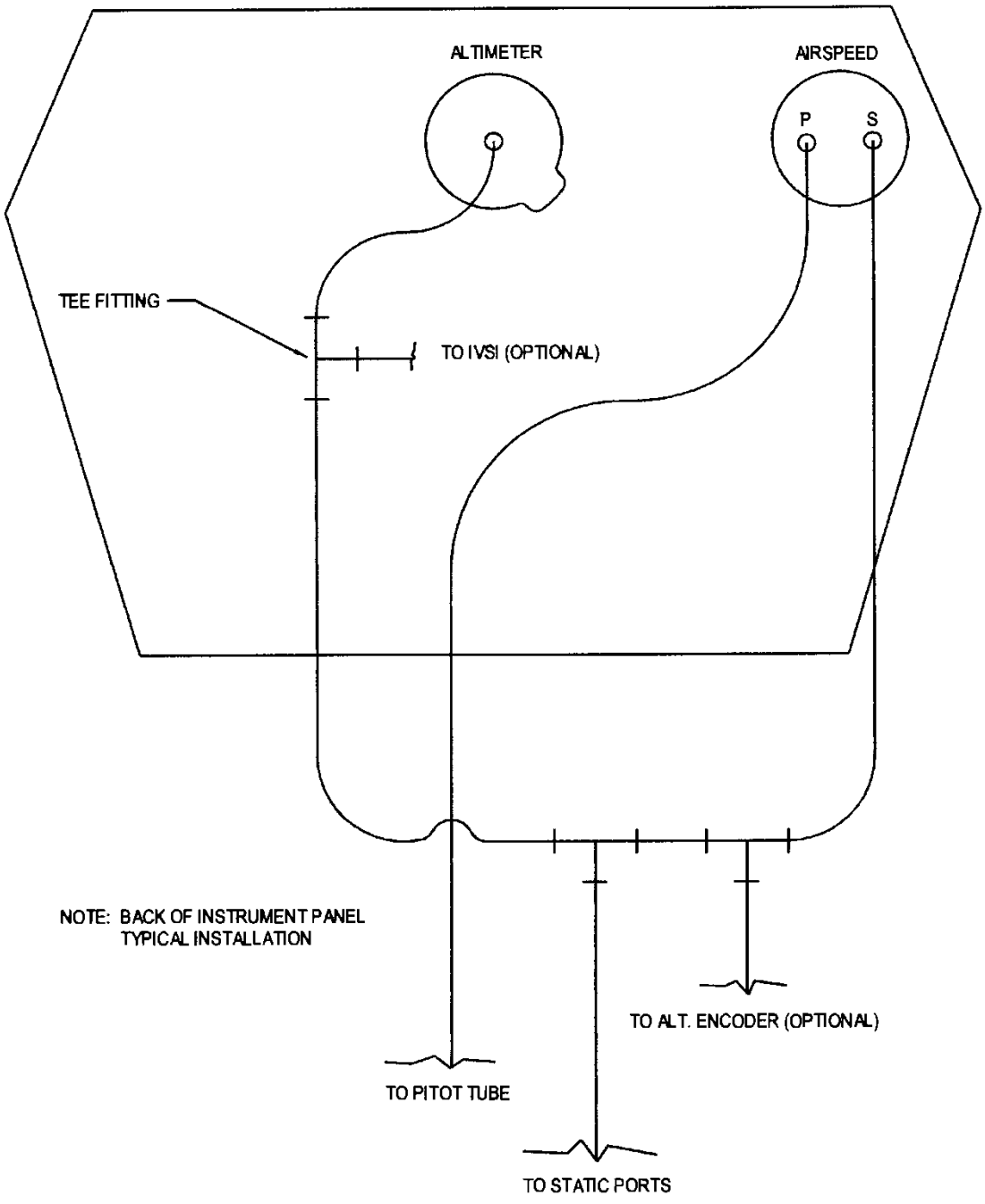


Figure 7-3. 480/480B Pitot/Static Line Schematic – Standard Equipment

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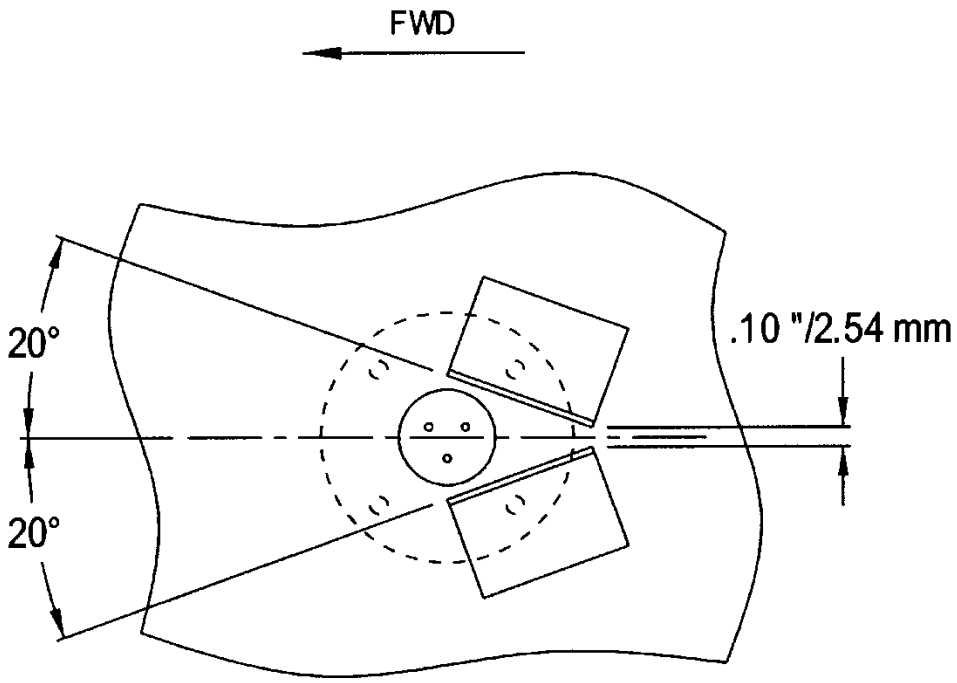


Figure 7-4. Pressure Gate Installation

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7-66. Repair – Pitot Static System

A. Pitot-Static Lines and Fittings:

(1) Replace defective or damaged lines or fittings.

(2) Tighten or properly install fittings, cable ties, and connector rings.

B. Pitot Tube:

(1) Clear the pitot tube if the inlet opening is clogged or obstructed, or the drain hole is clogged.

(2) Replace the pitot tube if cracked or damaged to the extent that it would restrict impact air pressure.

(3) Replace the cotter pin if worn or the pitot tube if the drain hole is excessively worn.

C. Static Ports:

(1) Replace static ports that are clogged or damaged.

(2) Bond the static port into the cabin shell if not secure.

(3) Replace damaged or missing pressure gates.

7-67. Installation – Pitot-Static System

A. Pitot-Static Lines and Fittings:

(1) Route the lines and fittings into place and connect.

(2) Secure the lines with connector rings and cable ties.

(3) Perform a pitot-static system leak check (para. 7-68,A & B)

NOTE

Aircraft are equipped with either a standard pitot tube or an optional heated pitot tube. Maintenance procedures for the heated pitot are the same as for the standard pitot except where noted in the following steps.

B. Pitot Tube:

(1) Standard pitot tube: Install the pitot tube in the mount and install the mounting screws.

(2) Heated pitot tube: Connect the electrical connector. Install the pitot tube in the mount and install the mounting screws.

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CAUTION

Use caution when bending the pitot extension tube to avoid creases.

(2) Heated pitot tube: If required, manually form a bend in the pressure air line extension tube as required to facilitate connection to the pitot lines. Typically, the bend is approximately 15° down, approximately four inches from the end of the tube.

(4) Connect the flexible tube connecting the pitot tube to the pitot lines in the aircraft and secure with a cable tie.

(5) Reinstall the access cover.

C. Static Ports:

NOTE

Follow the mixing instructions when using the Magnacryl #506.

(1) If required, install the static ports onto the cabin shell using structural adhesive (Magnacryl #506).

(2) Connect the static lines to the static ports. If the fittings were removed from the static ports, use a sealant (Lock-Tite Brand #56931) on the fitting threads installed in the static ports.

(3) If required, install the static pressure gates onto the cabin shell I/A/W Figure 7-4 using structural adhesive (Magnacryl #506).

7-68. Leak Check – Pitot-Static System

CAUTION

Do not operate the rate of climb indicator (IVSI) over 6000 feet per minute.

CAUTION

Do not apply suction to the pitot lines. Do not apply pressure to the static lines.

NOTE

Before starting any tests, make sure all connections are secure.

NOTE

Follow the operating instructions for the pitot-static tester used to perform the pitot-static leak check.

A Pitot System Leak Check:

(1) Disconnect the pitot line from the pitot tube and connect the pressure line from the tester to the pitot line.

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(2) Following the instructions for the pitot-static tester, slowly apply pressure to the pitot system until the airspeed indicators read 120 knots and turn "OFF" the pressure.

(3) Gently tap the airspeed indicators to remove friction effects. If the indicators drop more than 5 knots in one minute, a leak is present. Slowly release the pressure until the tester airspeed indicator reads zero.

(4) Determine the source of the leak and repair as necessary. Repeat the above steps until the airspeed drop is less than 5 knots or less per minute.

(5) Remove the pressure hose from the pitot line and reconnect the pitot line to the pitot tube. Secure the line with a cable tie.

B. Static System Leak Check:

(1) Disconnect the static line from the static port on the right side of the cabin shell. Connect the suction/vacuum hose to the static line. Cover the static port on the left side of the cabin shell with tape (3M Brand #06303). Disconnect the pitot line from the pitot tube and connect the pressure line from the tester to the pitot line.

(2) Adjust the aircraft and tester altimeter barometric scales to read 29.92. Gently tap the altimeters and check to see if the aircraft altimeters read within ± 70 feet of the tester altimeter.

(3) If the aircraft altimeter(s) are more than ± 70 feet different from the tester altimeter, replace the aircraft altimeter(s) with serviceable unit(s) and repeat step 2.

(4) Following the operating instructions for the pitot-static tester, slowly apply suction/vacuum to the static system until the aircraft altimeters read 1000 feet above the reading established in step 2. Turn "OFF" the suction/vacuum.

(5) Gently tap both aircraft altimeters until the rate of climb indicator (IVSI) stabilizes at zero. After stabilization, the altimeters should not drop more than 100 feet in one minute. Slowly release the suction/vacuum until the rate of climb (IVSI) stabilizes at zero. Repair any faults if necessary and repeat step 4 and 5 until the altitude drop is 100 feet or less.

(6) Remove the tape from the static port on the left side of the cabin shell. Disconnect the suction/vacuum hose from the static line and reconnect the line to the static port. Remove the pressure hose from the pitot line and reconnect the pitot line to the pitot tube. Secure the line with a cable tie.

7-69. Airspeed Indicator

7-70. General Description – Airspeed Indicator

The airspeed indicator is a standard pitot-static instrument. The dual-scale indicator provides airspeed indication in knots and miles per hour by measuring the differences between

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impact air pressure from the pitot tube and atmospheric pressure from the static pressure ports. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

NOTE

A pitot-static system leak check (para. 7-68) is required any time the pitot-static is opened and closed.

NOTE

When installing fittings into instruments, use sealant (Lock-Tite #56931) on the threads installed into the instrument.

7-71. Barometric Altimeter

7-72. General Description – Barometric Altimeter

The barometric altimeter furnishes direct readings of the aircraft height in feet above sea level. The altimeter is connected through lines to the static ports to sense atmospheric pressure. An external adjustment knob is provided to make compensation for variations of prevailing barometric pressure. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

NOTE

A pitot-static system leak check (para. 7-68) is required any time the pitot-static is opened and closed.

NOTE

When installing fittings into instruments, use sealant (Lock-Tite #56931) on the threads installed into the instrument.

7-73. Instantaneous Vertical Velocity Indicator (IVSI) (Optional Equipment)

7-74. General Description – Instantaneous Vertical Velocity Indicator (IVSI)

The instantaneous vertical velocity indicator (IVSI) is connected to the static air system to sense the rate of atmospheric pressure change. The indicator registers ascent or descent in feet per minute. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

NOTE

A pitot-static system leak check (para. 7-68) is required any time the pitot-static is opened and closed.

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NOTE

When installing fittings into instruments, use sealant (Lock-Tite #56931) on the threads installed into the instrument.

7-75. Attitude Indicator (Optional Equipment)

7-76. General Description – Attitude Indicator

The attitude indicator displays the flight attitude of the aircraft relative to the earth. Pitch attitude is indicated by motion of the sphere with respect to the miniature airplane and can be zeroed by positioning the miniature airplane relative to the sphere using the adjusting knob. Roll attitude is indicated by the motion of the roll pointer with respect to the fixed roll scale located at the top of the display. The attitude indicator contains a "PULL TO CAGE" knob used to cage and release the self-contained gyro. The power "OFF" flag is energized (remains out of view) by a tap on the power supply. Any interruption of the indicator power will indicate a failure and the flag will be exposed. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-77. Turn and Slip Indicator (Optional Equipment)

7-78. General Description – Turn and Slip Indicator

The turn and slip indicator is controlled by an electrically actuated gyro. This instrument has a needle (turn indicator) and a ball (slip indicator). Although the needle and ball are combined in one instrument and are normally read and interpreted together, each has its own specific function, and operates independently of the other. The ball indicates when the aircraft is in directional balance, either in a turn or in straight and level flight. If the aircraft is yawing or slipping, the ball will be off center. The needle indicates in which direction and at what rate the aircraft is turning. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-79. Inclinometer

7-80. General Description - Inclinometer

The inclinometer performs the same function as the slip portion of the turn and slip indicator. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-81. Clock

7-82. General Description – Clock

The clock is an electrically powered unit and has a sweep-second pointer. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

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7-83. Fuel Quantity System

7-84. General Description – Fuel Quantity System

The fuel quantity system is a capacitance type quantity indicating system and consists of a fuel quantity indicator and a fuel quantity transmitter (probe). For 480B aircraft S/N 5198 and subsequent, the fuel quantity system also includes a signal converter. For some early aircraft (TH-28 S/N 3006 and 480 S/N 5001-5010), the fuel quantity system includes a signal conditioner.

7-85. Calibration – Fuel Quantity System

NOTES

Service the fuel cells with the type of fuel that will normally be used in the aircraft.

The “standard” fuel system pertains to the P/N 4122054 fuel bladder, which is filled with open cell foam, and is applicable to aircraft S/N 5013 and subsequent. Prior to S/N 5013, aircraft were manufactured with P/N 4122009 fuel bladders (Aerazur). Aircraft S/N 5256 and subsequent are manufactured with the CRFS (P/N 4122100-1) fuel bladders, which are open cavity fuel bladders.

P/N 4122054 fuel cells that are being serviced for the very first time or have been defueled for longer than a 24 hour period will lose approximately 1 gallon/ 3.785 l of fuel capacity when the aircraft is reserviced after the initial servicing during the calibration procedure due to the open cell foam installed in the fuel cells. This fuel can be drained from the cells after defueling the aircraft and letting the aircraft stand for a 24 hour period. This fuel is considered unusable fuel.

Refer to Table 4-2 for fuel system capacities.

Ensure that the density for the type of fuel that will normally be used in the aircraft is used to determine the fuel weight for full fuel.

For CRFS, if the bladders are replacements and have not been previously filled with fuel, it is necessary to completely fill the tanks to fully expand the bladder within the fuel cell structure before proceeding with calibration.

A. Fuel Quantity Transmitter, P/N ECD4092-1 and P/N ECD4092-3

NOTE

ECD4092-1 is applicable to aircraft equipped with the standard fuel system (P/N 4122052). ECD4092-3 is applicable to aircraft equipped with the CRFS (P/N 4122100-1).

(1) Completely defuel (para. 4-5).

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(2) Remove the fuel quantity transmitter cover if not already removed.

NOTE

(P/N 4122100-1 CRFS): It is necessary to install Tool T-4122100-1 to secure the fuel quantity transmitter to the fuel cell cover. See Figure 10-2.1, Item 84.

(3) P/N 4122100-1 CRFS: If not already installed, install Tool T-4122100-1 to secure the fuel quantity transmitter to the fuel cell cover.

(4) Position the aircraft 6° nose down (longitudinally).

(5) Service fuel system with fuel volume that represents an empty tank (unusable fuel). Use a graduated cylinder and wait 10 minutes after servicing.

a. P/N 4122052 standard system: 0.7 gallon (US)/2.65 l.

b. P/N 4122100-1 CRFS: 0.75 gallon (US)/2.84 l.

NOTE

If the optional external fuel filter is installed (P/N 4122052 standard system only), include an additional 0.2 gallon (US)/0.76 l of unusable fuel.

(6) Apply 28 VDC power to the aircraft. Ensure FUEL QTY and CAUT PNL circuit breakers are set.

(7) Set the Zero Fuel (“Empty”) indication as follows. (Remove the screw to access the adjustment potentiometer; retain for reinstallation.)

a. Push and hold the push button switch. The LED should be off. If not, turn the potentiometer CCW until LED extinguishes. NOTE: If the empty adjustment is rotated too far in the CCW position, the LED will illuminate. In the case of over adjusting, rotate potentiometer CW until the LED extinguishes.

b. While holding the switch down, adjust the potentiometer CW until the LED just illuminates. Release the switch and the LED will extinguish. The “Empty” has been reset.

(8) Remove aircraft power.

(9) Service the fuel system with the amount of fuel that represents a full tank and wait 10 minutes.

(10) Apply aircraft power.

(11) Set the “Full” Fuel indication as follows.

a. Push and hold the push button switch. The LED may momentarily blink but must remain off. If not, turn the potentiometer CW until LED extinguishes.

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b. While holding the switch down, adjust the potentiometer CCW until the LED just illuminates. Release the switch and the LED will extinguish. The “Full” has been reset.

(12) Reinstall the sealing screws over the empty and full adjustment potentiometers.

(13) Perform bonding check using a milliohm meter. (Clean bonding and grounding surface thoroughly before performing bonding check.)

a. Check the resistance from the mounting flange of the fuel level transmitter to the aircraft ground. Resistance shall be 2.5 milliohms or less.

b. Check the resistance from the converter case to aircraft ground. Resistance shall be 2.5 milliohms or less.

(14) Install the fuel quantity probe cover:

a. P/N 4122052 standard system: Install cover in accordance with para. 10-51.1, H, or para. 10-51.2, G, as applicable.

b. P/N 4122100-1 CRFS: Remove Tool T-4122100-1 and install cover in accordance with para. 10-51.4, I.

(15) Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

B. Fuel Quantity Probe, P/N ECD4037

(1) Completely defuel the aircraft (para. 4-5).

(2) Level the aircraft (para. 4-67).

(3) Supply external 28 VDC electrical power to the aircraft.

(4) Ensure FUEL QTY and CAUT PNL circuit breakers are set.

NOTE

Steps (5) through (7) only apply to fuel quantity indicator, P/N ECD4038-5, manufactured by Horizon Aerospace/Ultra Electronics.

(5) Place BATT switch to ON.

(6) Verify the fuel quantity indicator passes self-tests (red LED illuminates, needle swings full scale, red LED changes to green and needle drops to “0”).

(7) Place BATT switch to OFF.

NOTE

If the optional fuel filter is installed, service the fuel system with 0.9 gallons/ 3.41 l of fuel.

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(8) Service fuel system with 0.7 gallons/2.65 l of fuel from a graduated cylinder and wait 10 minutes.

(9) Place BATT switch to ON.

(10) Connect multimeter to yellow (+) and black (-) leads of the fuel probe.

(11) P/N ECD4038-5 (Horizon indicator): Set the Zero Fuel indication as follows:

a. Adjust low potentiometer on fuel probe to read + 0.33 VDC on the multimeter.

b. Verify the fuel quantity indicator reads 0 ± 0 lbs and log the result.

(12) P/N ECD4038-5 (Ahlers indicator): Set the Zero Fuel indication as follows:

a. Adjust low potentiometer on fuel probe until the fuel quantity indicator reads 0 ± 0 lbs.

b. Verify the voltage reading on the multimeter is between +.251 and +.437 VDC. Log the result.

(13) Remove power, place BATT switch to OFF.

(14) Remove the fuel quantity probe from the fuel tank.

(15) Install fuel probe extension cable between the fuel probe the aircraft's fuel probe connector.

(16) Dip fuel probe in full fuel calibration PVC standpipe cylinder; ensure the black plastic portion of the probe is making contact with the fuel.

(17) Place BATT switch to ON.

(18) P/N ECD4038-5 (Horizon indicator): Set the Full Fuel indication as follows:

a. Set full potentiometer on fuel probe to read +4.98 VDC on the multimeter.

b. Verify fuel quantity reads 605 lbs and log result.

(19) P/N ECD4038-5 (Ahlers indicator): Set the Full Fuel indication as follows:

a. Adjust full potentiometer on fuel probe until fuel quantity indicator reads 605 lbs.

b. Verify voltage reading on the multimeter is between +4.925 and +5.111 VDC. Log the result.

(20) Place BATT switch to OFF.

(21) Remove extension cable. Apply a torque stripe on the potentiometer screws and reinstall the fuel quantity probe.

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(22) Install the fuel quantity probe cover.

(23) Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

C. Fuel Quantity Probe (P/N 020-986-001) (TH-28 S/N 3006 and 480 S/N 5001-5010)

(1) Completely defuel the aircraft (para. 4-5).

(2) Level the aircraft (para. 4-67).

NOTE

If the optional fuel filter is installed: service the standard fuel system with 0.9 gallons/3.41 l of fuel; service the Aerazur fuel bladder system with 0.5 gallons/1.9 l of fuel.

(3) Service standard fuel system equipped aircraft with 0.7 gallons/2.65 l of fuel. Service Aerazur bladder equipped aircraft with 0.3 gallons/1.14 l of fuel (para. 4-4).

(4) Remove the left side keel access panel or the fuel quantity probe cover as applicable to gain access to the signal conditioner.

(5) Supply external 28 VDC electrical power to the aircraft.

(6) Adjust the "EMPTY" pot in the signal conditioner until the fuel quantity indicator reads "0".

(7) Turn the electrical power "OFF" and completely service the fuel cells.

(8) Turn the electrical power "ON" and adjust the "FULL" pot in the signal conditioner until the fuel quantity indicator reads the correct weight of the fuel in the fuel cells.

(9) Turn the electrical power "OFF" and defuel the aircraft.

(10) Repeat the calibration procedure until the "0" and "FULL" indications on the fuel quantity gauge do not change when the fuel level is at the "0" and "FULL" levels.

(11) Install a sealant on the "EMPTY" and "FULL" adjustment screws after the fuel system has been calibrated.

(12) Install the left side keel access panel or the cover for the fuel quantity probe as applicable.

(13) Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

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7-86. Fuel Quantity Indicator

7-87. General Description – Fuel Quantity Indicator

The fuel quantity indicator provides readings of the fuel supply in the tanks. For 480B S/N 5198 and subsequent, the indicator is connected to a capacitance type probe via a signal converter. For TH-28 S/N 3006 and 480 S/N 5010 and prior, the indicator is connected to a capacitance type probe via a signal conditioner. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-88. Fuel Quantity Signal Conditioner

7-89. General Description – Fuel Quantity Signal Conditioner

NOTE

The signal conditioner is incorporated with the fuel quantity probe installed in TH-28 S/N 3006 and 480 S/N 5001-5010.

The fuel quantity signal conditioner, located in the left side of the keel assembly below the cockpit floor, adjusts the fuel quantity system for the "EMPTY" and "FULL" signals used to calibrate the fuel quantity system.

7-90. Removal – Fuel Quantity Signal Conditioner

A. Remove the left side keel access panel.

B. Disconnect the electrical connector from the signal conditioner.

C. Remove the mounting hardware and remove the signal conditioner.

7-91. Inspection – Fuel Quantity Signal Conditioner

A. Inspect the signal conditioner for cracks, corrosion, damage, and security of installation.

B. Inspect the electrical connector for bent pins, damaged inserts and broken wiring.

7-92. Repair – Fuel Quantity Signal Conditioner

A. Replace damaged connectors, pins or wiring.

B. Replace the signal conditioner if damaged or inoperative.

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7-93. Installation – Fuel Quantity Signal Conditioner

A. Place the signal conditioner into position and install the mounting hardware.

B. Connect the electrical connector.

C. Calibrate the fuel quantity system (para. 7-85) if the signal conditioner was replaced or if it is suspected that the fuel quantity system is out of calibration.

D. Install the keel access panel.

7-93.1. Fuel Quantity Signal Converter

7-93.2. General Description – Fuel Quantity Signal Converter

NOTE

The signal conditioner is incorporated with the fuel quantity transmitter installed in 480B S/N 5198 and subsequent.

The fuel quantity signal converter, located in the instrument panel mounted to the side gusset, converts the frequency output from the fuel transmitter to a VDC signal as required by the fuel indicator, P/N ECD4038-5 (Ahlers).

7-93.3. Removal – Fuel Quantity Signal Converter

A. Access the back of the instrument panel (para. 7-3).

B. Disconnect the electrical connector from the signal converter.

C. Remove the mounting hardware and remove the signal converter.

7-93.4. Inspection – Fuel Quantity Signal Converter

A. Inspect the signal converter for cracks, corrosion, damage, and security of installation.

B. Inspect the electrical connector for bent pins, damaged inserts and broken wiring.

7-93.5. Repair – Fuel Quantity Signal Converter

A. Replace damaged connectors, pins or wiring.

B. Replace the signal converter if damaged or inoperative.

7-93.6. Installation – Fuel Quantity Signal Converter

A. Place the signal converter into position and install the mounting hardware.

B. Connect the electrical connector.

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C. Calibrate the fuel quantity system (para. 7-85) if the signal converter was replaced or if it is suspected that the fuel quantity system is out of calibration.

D. Reinstall the instrument panel cover, glare shield, and ventilation ducts, if required.

7-94. Fuel Quantity Transmitter (Probe)

7-95. General Description – Fuel Quantity Transmitter

NOTE

For 480B aircraft S/N 5198 and subsequent, the fuel quantity system includes a signal converter. For some early aircraft (TH-28 S/N 3006 and 480 S/N 5001-5010), the fuel quantity system includes a signal conditioner.

The fuel quantity transmitter, located in the right fuel cell, is a capacitance type probe. Depending on the fuel quantity system configuration, the fuel quantity transmitter sends a signal directly to the fuel quantity indicator or via either a fuel quantity signal converter or a signal conditioner, as noted above. Refer to paragraphs 10-48 through 10-51.4 for maintenance procedures.

7-96. Fuel Flow Display Unit (Optional Equipment)

7-97. General Description – Fuel Flow Display Unit

The fuel flow display unit along with a fuel flow transducer make up the fuel flow system. The display unit displays fuel quantity in pounds, instantaneous fuel flow in pounds per hour, instantaneous endurance in terms of hours and minutes of flight time available at the current fuel flow, and fuel consumed in pounds. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-98. Fuel Flow Transducer

7-99. General Description – Fuel Flow Transducer

The fuel flow transducer is located on the bottom forward portion of the pylon assembly in the engine "hot section".

7-100. Removal – Fuel Flow Transducer

A. Remove the bottom engine access panel.

B. Disconnect the fuel lines from the transducer.

C. Disconnect the electrical connector from the transducer.

D. Remove the mounting hardware and remove the transducer.

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7-101. Inspection – Fuel Flow Transducer

A. Inspect the transducer for cracks and security.

B. Inspect the fuel lines for leaks.

C. Inspect the electrical connector for damaged or bent pins and cracked inserts.

7-102. Repair – Fuel Flow Transducer

A. Repair damage electrical connectors.

B. Tighten loose fuel lines.

C. Replace defective or damaged fuel lines.

D. Replace the fuel flow transducer if cracked or damaged.

7-103. Installation – Fuel Flow Transducer

A. Install the transducer onto the mounting bracket and install the mounting hardware.

B. Connect the electrical connector and safety with .020 wire.

C. Connect the fuel lines.

D. Install the bottom engine access panel.

7-104. Transmission Oil Temperature Indicator

7-105. General Description – Transmission Oil Temperature Indicator

The transmission oil temperature indicator indicates transmission oil temperature in degrees Celsius by mains of an electrical resistance type temperature bulb. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-106. Transmission Oil Temperature Bulb

7-107. General Description – Transmission Oil Temperature Bulb

The transmission oil temperature bulb, located on the left front bottom on the main rotor transmission, is a electrical resistance type bulb.

7-108. Removal – Transmission Oil Temperature Bulb

A. Open the left side engine access panel.

B. Remove the temperature bulb by pushing up and rotating a quarter turn counter-clockwise and pulling the bulb from the bayonet mount.

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7-109. Inspection – Transmission Oil Temperature Bulb

A. Inspect the temperature bulb for cracks, security, and proper installation.

B. Inspect the electrical connector for damaged or bent pins and cracked inserts.

7-110. Repair – Transmission Oil Temperature Bulb

A. Repair damaged electrical connectors.

B. Replace the temperature bulb if cracked or damaged.

7-111. Installation – Transmission Oil Temperature Bulb

A. Insert the bulb into the bayonet mount and push up, turn the bulb a quarter turn clockwise and release the bulb.

B. Ensure the bulb is secure in the mount and close the engine access panel.

7-112. Dual Volt/Ammeter

7-113. General Description – Dual Volt/Ammeter

The dual volt/ammeter indicates the voltage of the main generator and the battery and the current draw of the electrical system. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-114. Hour Meter

7-115. General Description – Hour Meter

The hour meter, located on right side (TH-28) or left side (480/B) of the center pedestal, indicates total time of the aircraft with the engine running. On 480B S/N 5046 and subsequent, the hour meter is also connected to a collective microswitch (SW42). Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

7-116. Hour Meter Pressure Switch

7-117. General Description – Hour Meter Pressure Switch

The pressure switch, located in-line with the engine oil pressure transducer, is used to provide power to the hour meter only when the engine is running.

7-118. Removal – Hour Meter Pressure Switch

A. Open the right side engine access panel.

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B. Disconnect the electrical connector and the oil pressure line from the pressure switch. Cap, plug, and cover the open line, port, electrical connections.

7-119. Inspection – Hour Meter Pressure Switch

A. Inspect the pressure switch for cracks and security.

B. Inspect the oil line for leaks and proper operation.

C. Inspect the electrical connector for damaged or bent pins and cracked inserts.

7-120. Repair – Hour Meter Pressure Switch

A. Repair damaged electrical connectors.

B. Tighten loose oil line fittings.

C. Replace defective or damaged oil lines.

D. Replace the pressure switch if cracked or damaged.

7-121. Installation – Hour Meter Pressure Switch

A. Remove the caps, plugs, and covers. Reconnect the oil pressure lines and the electrical connector.

7-121.1. Hour Meter Microswitch

Refer to paragraphs 6-181 through 6-184 for maintenance procedures.

7-122. Free Air Temperature Gauge

7-123. General Description – Free Air Temperature Gauge

The free air temperature gage is a bimetallic, probe type thermometer mounted on the top of the cabin shell. The probe portion is exposed to outside temperature through a rubber grommet mounted on the outside of the cabin shell. The gage is calibrated in degrees Celsius.

7-124. Removal – Free Air Temperature Gauge

A. Unscrew and remove the sun shield, dished washer, and one case washer from the outer end of the thermometer.

B. Remove the thermometer and other case washer from inside the cockpit.

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7-125. Inspection – Free Air Temperature Gauge

A. Inspect the assembly for corrosion.

B. Inspect for discoloration.

C. Inspect for a leaking seal.

D. Check for proper temperature indication.

7-126. Repair – Free Air Temperature Gauge

A. Replace the thermometer is any of the above conditions are found.

7-127. Installation – Free Air Temperature Gage

A. Install one case washer and the thermometer into the mounting hole in the cabin shell.

B. Install the other case washer, dished washer and sun shield onto the probe.

7-128. Magnetic Compass

7-129. General Description – Magnetic Compass

The magnetic compass is provided for navigational use. This instrument is to be used with the compass correction card which is located adjacent to the compass. Refer to paragraphs 7-10 through 7-14 for maintenance procedures.

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7-130. Consumable Materials List

ITEMS	DESCRIPTION	PART NUMBER
Accelerator	Accelerator, Magnacryl Brand	Accelerator #7
Adhesive	Acrylic Adhesive, Magnacryl Brand[1]	506
Cable Ties	Cable Ties, Panduit Brand	SST1.5I-MP
Connector Rings	Connector Rings, Panduit Brand	CR2-M
Lockwire	Lockwire, .020"	MS20995C20
Tape	Adhesive Tape, 3M Brand	06303
Thread sealant	Thread sealant, Loctite Brand	56931

[1] Trade names Versilok 506 or Hughson 506 are identical to Magnacryl 506.

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SECTION 8

STRUCTURES

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SECTION 8

STRUCTURES

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SECTION 8

STRUCTURES

8-1. Cabin Section

8-2. Description – Cabin Section

The cabin section, which forms the cockpit/passenger compartment, consists of a cabin shell, cockpit bulkhead, and cockpit floor. The cabin shell is an all composite shell with reinforcing where necessary to add structural stiffness and is mounted to the cockpit bulkhead and the cockpit floor. The pitot tube, static air ports, windshields and windows, and cockpit doors are mounted on the cabin shell. Two access panels on the bottom of the cabin shell allow for access to the keel assembly and the aircraft systems installed below the cockpit floor. The cockpit bulkhead and cockpit floor are made of a honeycomb composite material that is self-extinguishing. The cockpit bulkhead is mounted to the pylon and supports the passenger seats, the cabin shell, and is the forward portion of the fuel cell support structure. The cockpit floor is mounted to the keel assembly and supports the cabin shell, pilot and copilot/passenger seats, and the collective control system.

8-3. Inspection – Cabin Section

A. Inspect the cabin shell for obvious damage, cracks, and the condition and security of the hardware securing the cabin shell to the cockpit bulkhead and cockpit floor.

B. Inspect the cockpit bulkhead and cockpit floor for obvious damage, loose inserts, and the condition and security of the hardware securing the bulkhead to the pylon and the cockpit floor to the keel structure.

8-4. Repair – Cabin Section

NOTE

Refer to the appropriate section of the TH-28/480 Maintenance Manual for removal procedures of components/systems that may be required to be removed to allow for repair of the cabin section.

A. Replace damaged or missing hardware.

B. Repair damage to the cabin shell, cockpit bulkhead, or the cockpit floor I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

8-5. Keel Assembly

8-6. Description – Keel Assembly

The keel assembly consists of two longitudinal beams with transverse bulkheads and is attached to the pylon. The keel assembly supports the cockpit floor, the cyclic and tail rotor control systems, the instrument panel, and the forward crosstube of the landing gear.

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8-7. Inspection – Keel Assembly

A. Inspect the keel assembly for corrosion, cracks, deformation, evidence of working rivets, and damaged or loose/missing hardware.

B. Inspect the keel to pylon attachments for corrosion, damage, proper security of and damage to the attachment hardware.

8-8. Repair – Keel Assembly

NOTE

Refer to the appropriate section of the TH-28/480 Maintenance Manual for removal procedures of components/systems that may be required to be removed to allow for repair of the keel assembly.

A. Replace damaged or missing hardware.

B. Repair damage to the keel assembly I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

8-9. Pylon Assembly

8-10. Description – Pylon Assembly

The pylon assembly is a welded steel tubular truss structure that forms the supporting structure for the cabin section, keel assembly, fuel cells, transmission, engine, aft crosstube of the landing gear, and the tailcone.

8-11. Inspection – Pylon Assembly

A. Inspect the pylon assembly for bends, corrosion, cracks, dents, condition of the epoxy primer finish, and security of all weldments.

B. Inspect the pylon grounding tabs for corrosion, condition, and free of paint under grounding hardware. (See also para. 6-13 and 6-14.)

8-12. Repair – Pylon Assembly

NOTE

Do not apply paint to the pylon grounding tabs under the mounting hardware.

A. Remove minor surface corrosion and paint the area using MIL-PRF-23377 primer or equivalent. Repair limit ≤ 10% wall thickness (e.g., .0035” for a .035” thick wall).

B. Touch up areas of the epoxy primer finish using MIL-PRF-23377 primer or equivalent.

C. Repair damage to the pylon assembly I/A/W AC 43.13-1B. Contact Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

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8-13. Access Panels, Covers, and Cowlings

8-14. Removal – Access Panels, Covers, and Cowlings

Remove the following access panels, covers, and cowlings using the procedures listed for each panel, cover, or cowling. Refer to Figure 8-1 for access panel locations.

A. Forward Landing Gear Leg Panel(s):

(1) Remove the screws securing the access panel(s) to the keel access panels and remove the panel(s).

B. Keel Access Panel(s):

CAUTION

Support the keel access panel(s) during the removal process to prevent from damaging the antenna leads before they are disconnected.

(1) Remove the forward landing gear leg panel(s).

(2) Remove the screws securing the panel(s) to the cabin and the outboard screws securing the forward landing gear leg panel(s) to the keel access panel(s).

(3) Disconnect the ground wire from the antenna ground plane and disconnect the antenna lead from the antenna.

(4) Remove the panel(s).

C. Engine Access Panel(s):

(1) Unlock the turn lock fasteners at the bottom edge of the access panel(s).

WARNING

The pneumatic springs have approximately 25 pounds/11.4 kg of pressure. Use extreme caution when removing the pneumatic springs.

(2) If installed, disconnect and remove the pneumatic spring door opener.

(3) Remove the hinge pin securing the access panel hinge half to the hinge half installed on the airframe and remove the panel(s).

D. Bottom Engine Access Panel:

(1) Disconnect the engine and the engine fire pan drain lines.

(2) Remove the screws securing the access panel to the left and right side cowlings, the cabin shell, and the bottom edge of the left and right side engine fire curtain.

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(3) Slide the access panel to one side and pull the opposite edge of the panel from under the side cowling and remove the panel.

E. Fuel Cell Cover(s):

NOTE

Procedures for removing the covers are the same for both sides except as noted in the instructions.

(1) Defuel the aircraft (para. 4-5).

(2) Remove the upper plenum/air inlet (para. 13-28).

(3) Remove the air deflector from the top of the cabin.

NOTE

CRFS: Removal of hardware that secures the filler port includes removal of the fuel cap assembly, frangible ring, and flange plate.

(4) Remove the hardware securing the filler port to the fuel cell cover on the left side fuel cell.

NOTE

CRFS: Removal of hardware that secures the fuel quantity transmitter cover is the removal of the frangible cover.

NOTE

TH-28 S/N 3007 and subsequent and 480 S/N 5011 and subsequent have a fuel quantity probe cover and gasket installed on the right fuel cell cover.

(5) Remove the hardware securing the cell to the cover (Aerazur fuel bladder system), the fuel quantity probe cover, and the fuel cell cover to the cell structure.

CAUTION

All or a portion of the fuel cell covers and possibly the filler port assembly are sealed with sealant to prevent fuel leaks. A putty knife or other suitable tool may be required to separate the cover from the cell structure and the filler port. Use extreme caution to prevent from damaging the cover, fuel cell, fuel cell structure, or injuring yourself while removing the cell cover. (NOTE: Sealant is not used to seal the fuel filler port for the CRFS fuel cell.)

(6) Remove the fuel cell cover.

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F. Baggage Compartment Access Door:

(1) Unlock the access door.

CAUTION

Support the baggage compartment access door while removing the hinge hardware.

(2) Remove the pins securing the door hinge halves.

(3) Remove the access door.

G. Transfer Duct Access Panel:

(1) Open the left side engine access panel.

(2) Remove the baggage compartment access door.

(3) Unlock the turn lock fasteners securing the panel and remove the panel.

H. Oil Cooler Access Panel:

(1) Oil Cooler Access Panel:

(2) Unlock the turn lock fasteners securing the panel and remove the panel.

I. Step Access Panel:

(1) Open the right side engine access panel.

(2) Unlock the turn lock fasteners securing the panel to the step assembly and remove the panel.

J. Upper Plenum/Air Inlet Access Panel:

(1) Remove the hardware securing the access panel to the upper plenum/air inlet and remove the panel.

K. Tail Rotor Drive Shaft Covers:

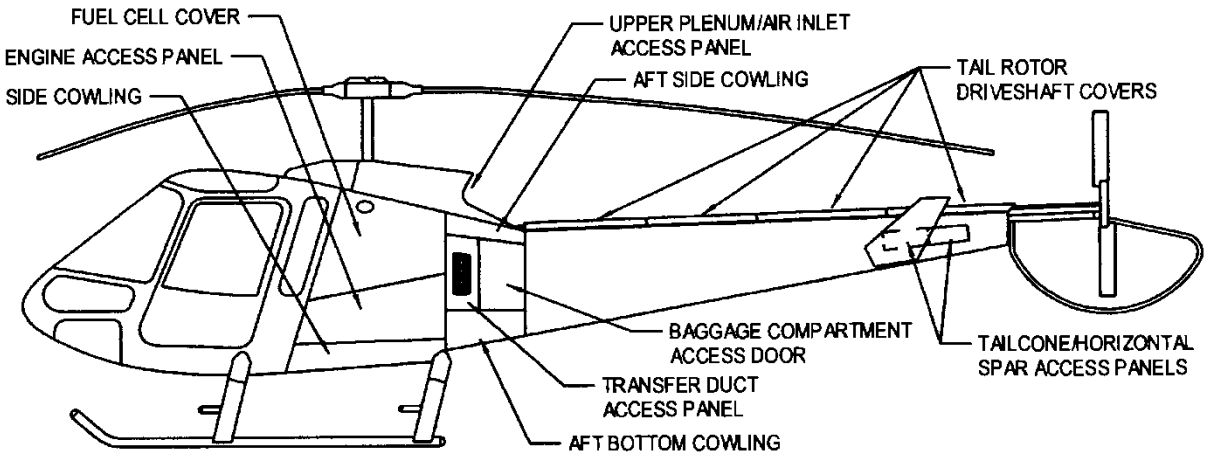
(1) Unlock the turn lock fasteners securing the forward three (3) covers.

(2) Remove the hinge pins securing the cover hinge halves to the halves mounted on the tailcone and remove the covers.

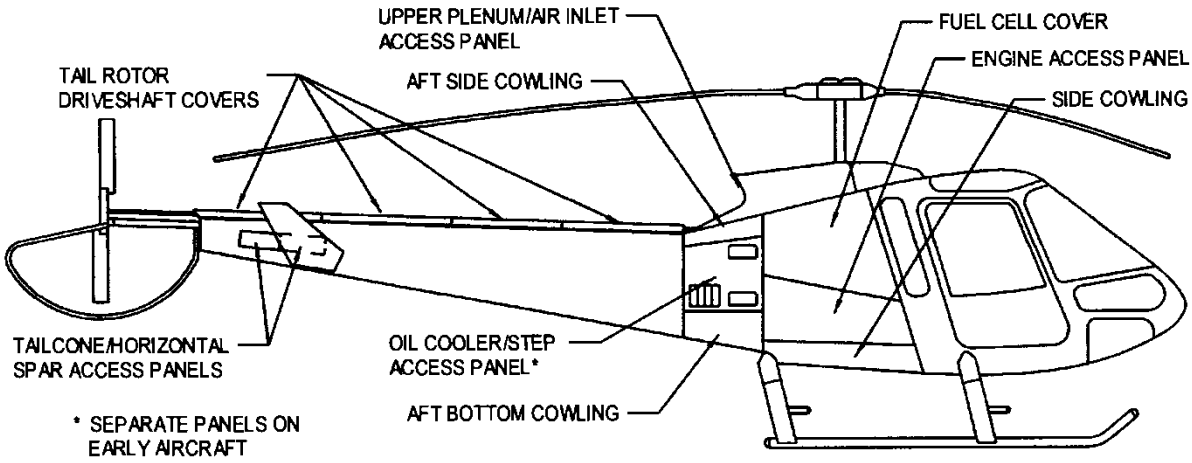
(3) Unlock the turn lock fasteners securing the forward end of the aft cover and remove the hardware securing the aft end of the cover and remove the cover.

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LEFT VIEW



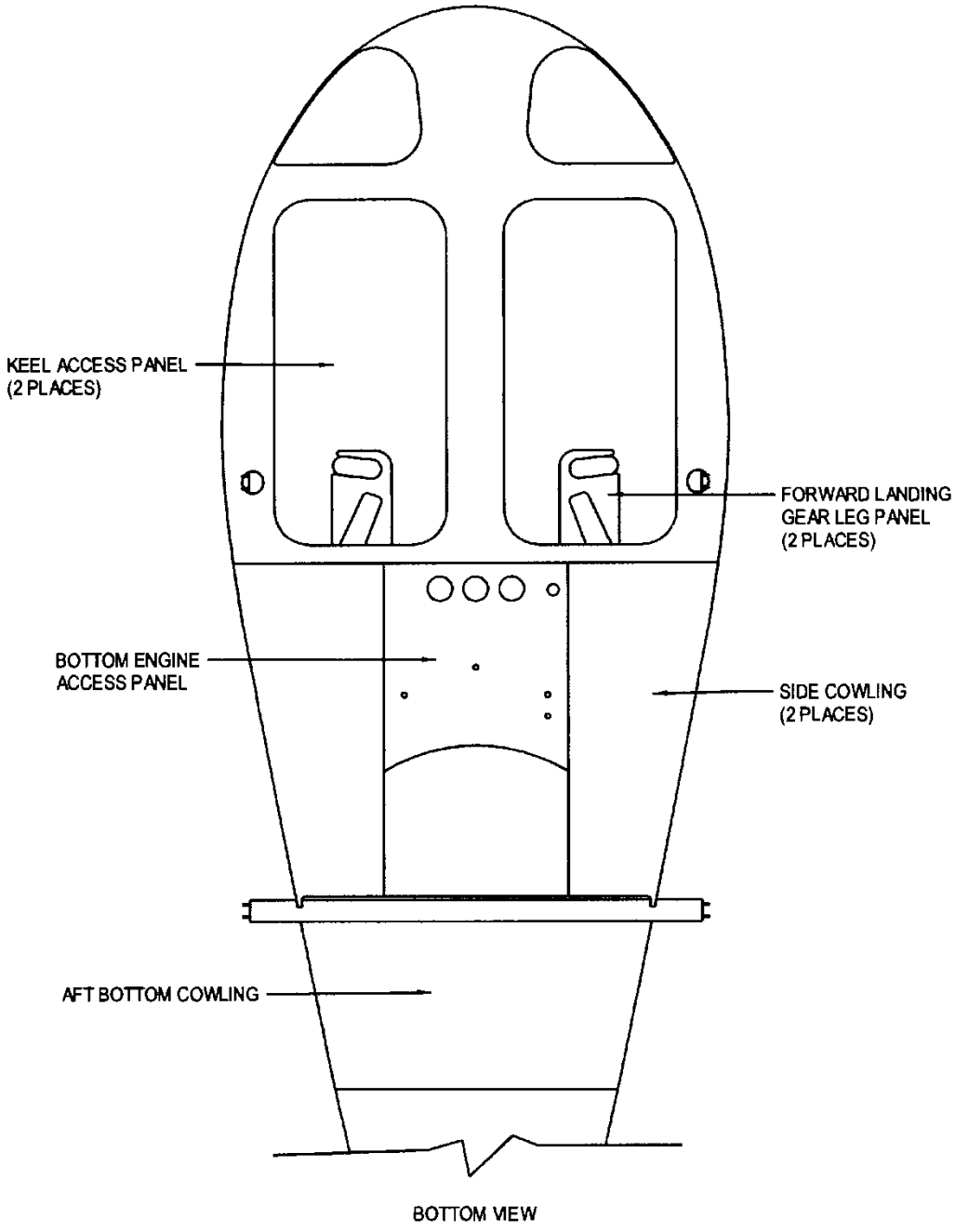
RIGHT VIEW

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Figure 8-1. Access Panel Locations

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Sheet 2 of 2

Figure 8-1. Access Panel Locations

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L. Tailcone/Horizontal Spar Access Panels:

NOTE

Removal procedures are the same for the panels on both sides of the tailcone.

(1) Remove the hardware securing the aft panel to the tailcone and remove the panel.

(2) Remove the horizontal stabilizer assembly (para. 8-97).

(3) Remove the hardware securing forward panel to the tailcone and remove the panel.

M. Side Cowlings:

(1) Unlock the turn lock fasteners securing the engine access panel to the side cowling.

(2) Remove the hardware securing the cowling to the cabin, bottom access panel, engine fire curtain, and the forward and aft mounting tabs.

(3) Remove the cowling.

N. Aft Side Cowlings:

NOTE

Removal procedures are the same for removing the cowlings on both sides of the aircraft except as noted in the instructions.

(1) Remove the oil cooler and step access panels if removing the right aft side cowling or remove the transfer duct access panel and open the baggage compartment door if removing the left aft side cowling.

(2) Unlock the turn lock fasteners securing the aft side cowlings and remove the cowlings.

O. Aft Bottom Cowling:

(1) Remove the oil cooler, step, and transfer duct access panels and open the baggage compartment door.

(2) Remove the hardware securing the aft bottom cowling to the aircraft and remove the cowling.

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P. Air Exit Duct:

NOTE

The air exit duct consists of five sheet metal parts: two mounting brackets, two side panels, and one bottom panel.

CAUTION

Account for all the hardware removed from the air exit duct to prevent from damaging the lower pulley assembly and drive belt from FOD damage.

(1) Remove the aft side cowlings.

(2) Remove the hardware securing the side panels to the mounting brackets and the bottom panel and remove the side panels.

(3) Remove the hardware securing the mounting brackets to the cowl ring and the tailcone and remove the mounting brackets.

(4) Remove the hardware securing the bottom panel to the pylon assembly and remove the bottom panel.

Q. Engine Fire Curtain:

NOTE

The engine fire curtain consists of four panels: an aft panel, two side panels, and a top forward panel.

(1) Aft Panel;

a. Remove the eductor and the exhaust stacks.

b. Disconnect the compressor bleed valve discharge duct from the panel.

c. Remove the hardware securing the panel to the side panels, side cowlings, engine fire pan, and the cowling support bracket.

d. Remove the panel.

(2) Side Panels;

a. Remove the bottom engine access panel.

b. Remove the droop compensation system (para. 13-110).

c. Remove the hardware securing the side panels to the engine fire pan, aft panel, side cowlings, and forward panel.

d. Remove the side panels.

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(3) Forward Panel;

a. Remove the bottom engine access panel.

b. Remove the hardware securing the forward panel to the engine fire pan, side panels, and the aft side of the cockpit bulkhead.

c. Remove the forward panel.

R. Collective Control Cover:

(1) Remove the pilot and copilot/passenger seats.

(2) Remove the hardware securing the covers and remove the covers.

8-15. Inspection – Access Panels, Covers, and Cowlings

A. Inspect all access panels, covers, and cowlings for corrosion, cracks, dents, fraying, holes, tears, and proper operation and security of the securing fasteners and hardware.

B. Inspect all mounting tabs, brackets, supports and the cowling ring for corrosion, cracks, dents, holes, tears, and proper operation and security of the securing fasteners and hardware.

8-16. Repair – Access Panels, Covers, and Cowlings

A. Replace all damaged hardware and fasteners.

B. Repair damage to the access panels, covers, and cowlings I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

CAUTION

Ensure repairs to the fuel cell covers will not cause damage to the fuel cells when the covers are reinstalled and the aircraft is returned to service.

NOTE

To maintain electrical bonding for ECD4092-1 fuel quantity transmitter (S/N 5198 and subsequent), the skin surface in contact with the conductive gasket and the flanged cup assembly must be free of paint or contamination.

NOTE

Step C below only applies to the right hand fuel cell cover of aircraft having an EMI/RFI shielding coating applied at the time of manufacture (S/N 5134, 5136 through 5197).

C. If required, clean the unpainted skin surface of the right hand fuel cell cover where the skin contacts the fuel cell structure flange and apply Kopr-Shield #CP8-TB along the edge. Remove excess after installation. This area must be free of sealant.

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8-16.1. Repair – Fire Curtain (Figure 8-1.1)

NOTES

All openings or gaps in the firewall curtain in excess of 1/32 in/0.8 mm are to be repaired. Small gaps such as around pylon tubes or stitching gaps may be sealed with high temperature sealant (CP25WB+, or equivalent).

Fire curtains having tears or holes should be replaced if the repair area is inaccessible.

High temperature thread may be substituted with .020-inch stainless steel safety wire.

A. Areas of worn fabric around pylon tubes:

(1) Using isopropyl alcohol (or equivalent), clean both sides of the damaged area where the patch is to be applied.

(2) Cut a patch of the firewall material to overlap 0.75-1.0 in/19-25 mm of the damaged area.

(3) Blanket stitch (Figure 8-1.1a) the patch to the damaged area using high temperature thread, or equivalent.

(4) Seal stitching gaps and gaps around the pylon tubes, etc. with high temperature sealant (CP25WB+, or equivalent).

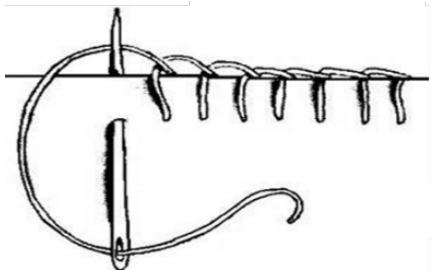


Figure 8-1.1a. Blanket Stitch

B. Straight-line cuts or tears in the fabric material between 1-3 in/25-76 mm in length:

(1) Using isopropyl alcohol (or equivalent), clean both sides of the damaged area where the patch is to be applied.

(2) Repair the damaged area with a baseball stitch (Figure 8-1.1b), using high temperature thread, or equivalent.

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(3) Apply high temperature sealant (CP25WB+, or equivalent) to the stitching on both sides of the damaged area.

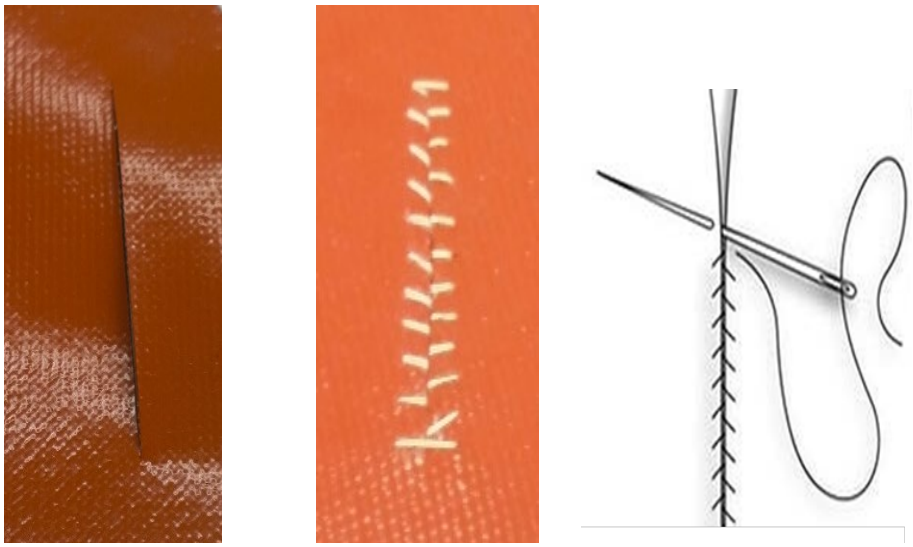


Figure 8-1.1b. Baseball Stitch

C. Cuts or tears in the fabric material greater than 3 in/76 mm in length:

(1) Using isopropyl alcohol (or equivalent), clean both sides of the damaged area where the patch is to be applied.

(2) Repair the damaged area with a baseball stitch, using high temperature thread, or equivalent.

(3) Cut a strip of the firewall material to overlap 0.75-1.0 in/19-25 mm of the damaged area

(4) Apply a light coat of high temperature sealant (CP25WB+, or equivalent) to one side of the patch.

(5) Apply the patch (sealant-coated side) to the exterior side of the damaged area.

(6) Blanket stitch around the edge of the patch using high temperature thread, or equivalent (Figure 8-1.1a).

(7) Coat both the exterior and interior patch edges with high temperature sealant (CP25WB+, or equivalent).

D. Holes in the fabric material up to 3 in/76 mm in diameter (Figure 8-1.1c):

(1) Using isopropyl alcohol (or equivalent), clean both sides of the damaged area where the patch is to be applied.

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(2) Cut a patch of fire curtain material allowing 0.75-1.0 in/19-25 mm overlap around the circumference of the hole.

(3) Coat one side of the patch with high temperature sealant (CP25WB+, or equivalent).

(4) Place the patch on the outside of the damaged fabric away from the engine.

(5) Blanket stitch around the edge of the patch using high temperature thread, or equivalent (Figure 8-1.1c).

(6) Coat both the exterior and interior patch edges with high temperature sealant (CP25WB+, or equivalent) (Figure 8-1.1c).

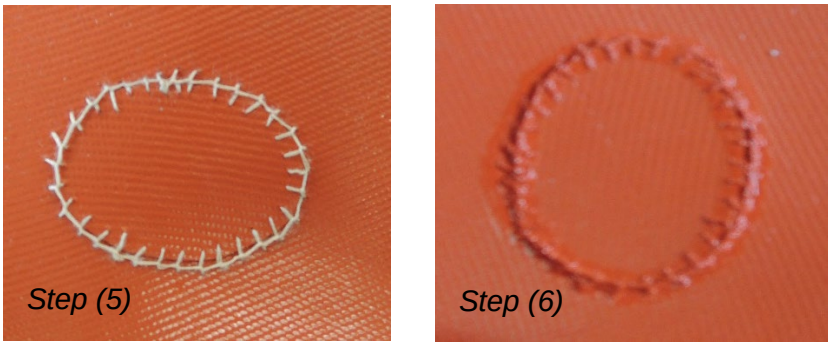


Figure 8-1.1c. Hole Repair; Blanket Stitch (left), Sealed Patch Edge (right)

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8-17. Installation – Access Panels, Covers, and Cowlings

Install the following access panels, covers, and cowlings using the procedures listed for each panel, cover, or cowling.

A. Forward Landing Gear Leg Panel(s):

(1) Install by reversing the removal instructions.

B. Keel Access Panel(s):

CAUTION

Support the keel access panel(s) during the installation process to prevent from damaging the antenna leads before the panels are installed.

(1) Install by reversing the removal instructions.

C. Engine Access Panel(s):

(1) Install by reversing the removal instructions.

D. Bottom Access Panel:

(1) Install by reversing the removal instructions.

E. Fuel Cell Cover(s):

NOTE

Procedures for installing the covers are the same for both sides except as noted in the instructions.

CAUTION

Use extreme caution to prevent from damaging the cover, fuel cell, fuel cell structure, or injuring yourself while removing the old sealant.

(1) Remove the old sealant from the fuel cell covers, the fuel cell support structures, and possibly the fuel filler port if the left side cover is removed.

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NOTE

Do not install the sealant for the fuel cell covers until all troubleshooting, adjusting, and/or repairs have been made to the fuel cells, the fuel quantity system, or the low fuel warning system.

NOTE

Follow the mixing instructions on the sealant container or the sealant may not properly cure.

(2) Using a sealant meeting AMS-S-8802 Type II Class B, apply a bead on all interfacing fuel cell support structures – cowl ring, cabin structure, fuel shelf structure. Ensure the sealant is on the inboard side of the hardware used to secure the cell covers and apply more sealant in areas where needed to ensure proper sealing (lower forward corner for example).

(3) Place the cover in position and install the hardware along the bottom edge of the cover.

NOTE

If equipped with the CRFS, proceed to step (6).

NOTE

Step (4) below only applies to TH-28s and 480s equipped with the Aerazur fuel bladder system.

CAUTION

Do not over inflate the fuel cells to prevent from damaging the fuel cell structure or the fuel cells.

(4) Install the hardware securing the fuel cells to the covers. Inflating the fuel cells might be required to perform this task. To inflate the fuel cells, ensure the fuel shutoff valve is "OFF", the sump drain and low point drain valves are closed, and that the fuel filler port is installed or the port in the fuel cell is taped over. Using filtered, dry, low pressure compressed air, inflate the fuel cells via the overboard vent line. Remove the air source after installing the hardware.

NOTE

Early model TH-28/480s may have had sealant installed between the fuel cell and the fuel cell cover at the filler port and may also have had sealant between the filler port assembly and the fuel cell cover. If your aircraft has had sealant installed in these areas, the sealant does not need to be installed when reinstalling the cover provided the old sealant is removed and the filler port area seals when reassembled.

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NOTE

Proceed to step (6) if installing the right side fuel cell cover.

(5) Remove the filler port cap if installed in the filler port assembly. Install a gasket between the fuel cell and the fuel cell cover. Install another gasket onto the filler port assembly flange and position the filler port assembly onto the fuel cell cover. Pull the fuel cell and fuel cell cover together. Align the holes for the hardware, install and torque the hardware for a standard fuel system to 25-30 in-lbs/2.8-3.4 Nm, torque the hardware for an Aerazur fuel bladder system to 40-50 in-lbs/4.5-5.7 Nm. Install the filler port cap.

(6) Install the remaining hardware securing the fuel cell covers.

NOTE

If equipped with the CRFS, proceed to step (8).

NOTE

TH-28 S/N 3007 and subsequent and 480 S/N 5011 and subsequent have a fuel quantity probe cover and gasket installed on the right fuel cell cover.

(7) Install two (2) fuel quantity probe spacers (S/N 5197 and prior) between the fuel cell and the fuel cell cover. Place the gasket and cover for the fuel quantity probe into position, align the holes, and install the hardware. Torque the hardware for a standard fuel system to 25-30 in-lbs/2.8-3.4 Nm, torque the hardware for an Aerazur fuel bladder system to 40-50 in-lbs/4.5-5.7 Nm.

(8) Install the air deflector on the top of the cabin.

(9) Install the upper plenum/air inlet (para. 13-31).

NOTE

Allow the sealant to cure for 24 hours before servicing the fuel cells.

(10) Service the fuel cells (para. 4-4).

(11) Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

F. Baggage Compartment Door:

CAUTION

Support the baggage compartment door while installing the hinge hardware.

(1) Install by reversing the removal instructions.

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G. Transfer Duct Access Panel:

(1) Install by reversing the removal instructions.

H. Oil Cooler Access Panel:

(1) Install by reversing the removal instructions.

I. Step Access Panel:

(1) Install by reversing the removal instructions.

J. Upper Plenum/Air Inlet Access Panel:

(1) Install by reversing the removal instructions.

K. Tail Rotor Drive Shaft Covers:

(1) Install by reversing the removal instructions.

L. Tailcone/Horizontal Spar Access Panels:

(1) Install by reversing the removal instructions.

M. Side Cowlings:

(1) Install by reversing the removal instructions.

N. Aft Side Cowlings:

(1) Install by reversing the removal instructions.

O. Aft Bottom Cowling:

(1) Install by reversing the removal instructions.

P. Air Exit Duct:

(1) Install by reversing the removal instructions.

Q. Engine Fire Curtain:

(1) Install by reversing the removal instructions.

(2) Seal openings at the edges of the engine fire curtain using sealant (Dow Corning Brand 732-RTV).

R. Collective Control Covers:

(1) Install by reversing the removal instructions.

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8-18. Crew/Observer Seats - TH-28

8-19. General Description - Crew/Observer Seats - TH-28

The crew seats are crashworthy seats mounted on seat rails that allow for the pilot's seat to be adjusted to one of three (3) positions. The seats provide protection up to 12 "g's" at an occupant weight of 170 pounds/77.3 kg. A seat assembly is comprised of a composite bucket and an aluminum frame. The main vertical members of the frames for the seat assemblies are built-up beams of formed sheet-metal. Control of the seat during vertical stroking is accomplished by a sliding track arrangement. Vertical loads applied to the occupant Are limited by wire-bender energy absorbers. Forward loads applied to the seat are reacted by the rear struts. Lateral loads applied to the seats are reacted by the diagonal braces. The seat assemblies are equipped with cushions for the pan, back, and headrest and a five-point restraint system. The restraint system includes a rotary buckle on the crotch strap, adjustable lap and shoulder belts, and an inertia reel. The inertia reel, mounted on the back of the headrest, does not have an independent control to manually lock the reel. With the shoulder belts properly adjusted, the reel strap will extend to allow the occupant to lean forward; however, the reel automatically lock when the aircraft encounters an impact force of 2 to 3 "g's" deceleration.

The observers seat uses the same bucket, wire-bender energy absorbers, cushions, and restraint system as the crew seats. The seat is mounted to the pylon assembly via the cockpit bulkhead using modified vertical frame members. Forward loads applied to the seat are reacted by the pylon assembly and the cockpit bulkhead. Lateral loads applied to the seat are reacted by diagonal braces mounted on the outboard sides of the vertical members and attached to the pylon assembly and the cockpit bulkhead.

8-20. Adjustment - Crew Seats - TH-28

WARNING

Ensure that the frame vertical members and the seat struts are properly installed on the seat rails and that the quick release pins are properly installed. Failure to do so could result in loss of control of the aircraft or reduction in the crashworthiness of the seat.

A. Pilot Seat:

(1) Remove the quick release pins securing the frame vertical members and the seat struts to the seat rails.

(2) Reposition the seat to the desired position.

(3) Install the quick release pins.

NOTE

The copilot's seat is only installed in the aft position.

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8-21. Removal - Crew/Observer Seats - TH-28

A. Pilot Seat:

NOTE

Removal of the cabins door is not required; however, it will aid the removal of the seats from the cockpit/crew compartment.

(1) Remove the door from the right side of the cabin.

(2) Remove the quick release pins securing the seat to the seat rails.

(3) Remove the seat from the cockpit/crew compartment.

B. Copilot Seat:

NOTE

Removal of the cabins door is not required; however, it will aid the removal of the seats from the cockpit/crew compartment.

(1) Remove the door from the left side of the cabin.

(2) Remove the hardware securing the storage pouch mounting clamps to the vertical members.

(3) Remove the quick release pins securing the seat to the seat rails.

(4) Remove the seat from the cockpit/crew compartment.

C. Observer's Seat:

NOTE

Removal of the cabins door is not required; however, it will aid the removal of the seats from the cockpit/crew compartment.

(1) Remove the pilot and copilot seats.

(2) Remove the engine access panels and the bottom engine access panel, and the air deflector on top of the cabin.

NOTE

The upper plenum/air inlet may be removed if more access to the mounting hardware is desired.

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CAUTION

Support the observer seat while removing the hardware to prevent the seat from falling and damaging the seat, collective control system, or the cockpit floor.

(3) Remove the hardware securing the seat to the pylon assembly and remove the seat.

8-22. Disassembly - Crew/Observer Seats - TH-28

A. Crew Seats:

(1) Remove the pan, back, and headrest cushions from the seat bucket.

(2) Remove the hardware securing the restraint system to the bucket.

(3) Remove the hardware securing the wire-bender energy absorbers to the vertical members and slide the seat bucket off of the vertical members.

(4) Remove the hardware securing the wire-bender energy absorbers and the vertical rail guides to the seat bucket.

(5) Remove the hardware securing the rear struts and the rear strut support brace to the vertical members.

(6) Remove the hardware securing the seat rail guides from the vertical members.

(7) Remove the hardware securing the vertical members to the lateral brace.

(8) Remove the hardware securing the diagonal braces to the vertical members.

B. Observer Seat:

(1) Remove the pan, back, and headrest cushions from the seat bucket.

(2) Remove the hardware securing the restraint system to the bucket.

(3) Remove the hardware securing the wire-bender energy absorbers to the vertical members and slide the seat bucket off of the vertical members.

(4) Remove the hardware securing the wire-bender energy absorbers and the vertical rail guides to the seat bucket.

(5) Remove the hardware securing the diagonal braces to the vertical members.

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8-23. Inspection - Crew/Observer Seats - TH-28

A. Inspect the seat buckets for condition, and the condition and security of the hardware securing the wire-bender energy absorbers, vertical rail guides, and the restraint system to the seat buckets.

NOTE

The observer seat is not equipped with rear struts.

B. Inspect seat frames for corrosion, cracks, damaged rear struts or diagonal braces, and condition and security of the hardware securing the rear struts, diagonal braces, and wire-bender energy absorbers to the vertical members.

C. Inspect the quick release pins for wear and proper operation.

D. Inspect the seat rails for damage, security, and wear.

E. Inspect the cushions for damage and deterioration.

F. Inspect the restraint system for condition, security, and proper operation of the adjustable lap and shoulder belts, rotary buckle, and inertia reel.

8-24. Repair - Crew/Observer Seats - TH-28

A. Seat Bucket:

(1) Minor surface damage may be repaired by sanding out the damage and applying touch-up paint to the area.

(2) Replace buckets that are cracked or broken.

B. Seat Frames:

(1) Replace any components of the seat frame that are damaged.

C. Wire-Bender Energy Absorber:

(1) Replace any damaged parts on the wire-bender energy absorber.

D. Quick Release Pins:

(1) Replace worn or damaged pins.

E. Seat Rails:

(1) Replace damaged seat rails.

F. Cushions:

(1) Replace unserviceable cushions.

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G. Restraint System:

(1) Replace any components of the restraint system that are worn, frayed, or unserviceable.

8-25. Assembly - Crew/Observer Seats - TH-28

A. Crew Seat:

(1) Place the diagonal braces between the vertical members, install the hardware but do not tighten at this time.

(2) Place lateral brace between the vertical members, install the hardware but do not tighten at this time.

(3) Install the seat rail guides on the vertical members and tighten all of the installed hardware.

(4) Install the rear struts and the rear strut support braces to the vertical members and tighten the hardware.

(5) Install the wire-bender energy absorbers and the vertical rail guides onto the seat bucket and tighten the hardware.

(6) Slide the seat bucket onto the vertical members. Install and tighten the hardware securing the wire-bender energy absorbers to the vertical members.

(7) Install the restraint system onto the bucket.

(8) Install the pan, back, and headrest cushions.

B. Observer Seat:

(1) Install the diagonal braces onto the vertical members and tighten the hardware.

(2) Install the wire-bender energy absorbers and the vertical rail guides onto the seat bucket and tighten the hardware.

(3) Slide the seat bucket onto the vertical members. Install and tighten the hardware securing the wire-bender energy absorbers to the vertical members.

(4) Install the restraint system onto the bucket.

(5) Install the pan, back, and headrest cushions.

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8-26. Installation - Crew/Observer Seats - TH-28

WARNING

Ensure that the frame vertical members and the seat struts are properly installed on the seat rails and that the quick release pins are properly installed. Failure to do so could result in loss of control of the aircraft or reduction in the crashworthiness of the seat.

A. Pilot Seat:

(1) Place the seat onto the seat rails and install the quick release pins.

(2) If removed, install the cabin door.

B. Copilot Seat:

NOTE

The copilot's seat must be installed the aft position.

(1) Place the seat onto the seat rails and install the quick release pins so the seat is in the aft position.

(2) Reinstall the storage pouch mounting clamps onto the tabs on the vertical members.

(3) If removed, install the cabin door.

C. Observer Seat:

CAUTION

Support the observer seat while installing the hardware to prevent the seat from falling and damaging the seat, collective control system, or the cockpit floor.

(1) Place the seat into position and install the hardware securing the seat to the pylon assembly.

(2) Reinstall the engine access panels, bottom engine access panel and the air deflector. If removed, reinstall the upper plenum/air inlet.

(3) Reinstall the pilot and copilot seats.

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8-27. Pilot and Passenger Seats - 480 Series

8-28. Description - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seats: The pilot and copilot/passenger seats are adjustable for fore and aft positioning and are easily removed from the aircraft to facilitate maintenance on the seats or the cockpit area. Both seats use a composite bucket mounted on a pedestal assembly. The seats are equipped with a four point restraint system which includes a "lift to release" or rotary buckle, adjusters in the lap and shoulder belts, and an inertia reel mounted on the back of the seat pedestal.

B. Passenger Seats – Standard Configuration: The split bench type passenger seats are mounted to the cockpit bulkhead and fold up to the stowed position when not in use. The seats are equipped with three point restraint systems, which include an inertia reel.

WARNING

The leg guard assembly must be installed when operating the aircraft with the copilot's controls installed (2+2 Configuration).

C. Passenger Seat – 2+2 Configuration: The 2+2 passenger seat configuration consists of a wider, single bench seat, two inertia reel restraint systems, two arm rest assemblies, foot rest assembly, and protective leg guard for the copilot's collective stick. This configuration allows operation of the aircraft with a pilot, copilot, and one or two passengers. The 2+2 configuration is a "permanent" installation and is not intended for switching between the 2+2 configuration and the standard configuration.

8-29. Adjustment - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seat:

(1) Lift the locking handle on the front left side of the seat pedestal.

(2) Reposition the seat to the desired position.

(3) Lower the locking handle. Ensure that the locking studs are fully engaged in the seat track.

B. Passenger Seats – Standard Configuration:

(1) Stowage:

a. Remove the cushion from the seat bottom.

CAUTION

Do not apply any downward load to the passenger seats while the seat legs are not attached to the floor track and the seat is in the down position.

b. Lift the locking rings on the seat leg feet and slide/lift the seat legs out of the floor tracks.

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c. Fold the seat up against the cockpit bulkhead and press down on the seat to engage the stowage slots on the mounting brackets.

d. Reposition the copilot/passenger seat as required if stowing the right side seat.

(2) Installation:

a. Reposition the copilot/passenger seat as required if installing the right side seat.

CAUTION

Do not apply any downward load to the passenger seats while the seat legs are not attached to the floor track. Adjust the seat leg feet as required so the seats **DO NOT** have a downward preload when the seat legs are installed.

b. Lift the seat out of the stowage slots and lower the seat.

c. Lift the locking rings on the seat leg feet and insert the feet into the floor tracks. Ensure the locking rings engage the floor tracks.

C. Passenger Seat – 2+2 Configuration:

(1) The 2+2 seat configuration is not adjustable.

8-30. Removal - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seat:

NOTE

Removal of the cabins door is not required; however, it will aid the removal of the seats from the cockpit compartment.

(1) Remove the door from the corresponding side of the cabin.

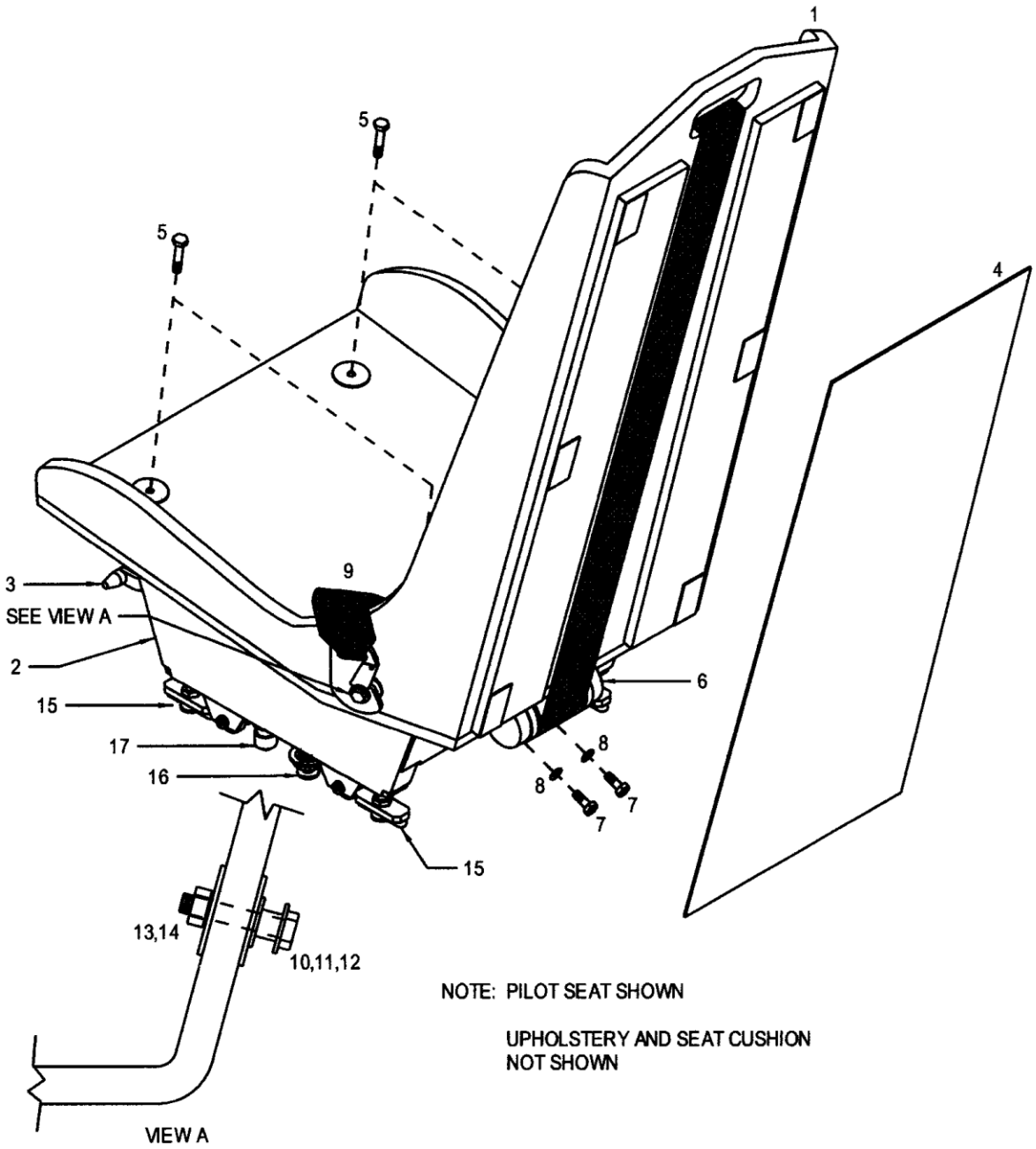
NOTE

The copilot/passenger seat is equipped with a handle that lifts both of the spring retainers simultaneously from the seat tracks. The handle, located inside the seat pedestal, is accessed via the aft side of the seat pedestal.

(2) Lift the spring retainer from the left seat track and install the male end of the seat belt between the seat track and the spring retainer. Lift the spring retainer from the right seat track. Lift the locking handle and position seat to allow removal of the seat retainers. Lift the seat from the seat track and remove the seat from the aircraft.

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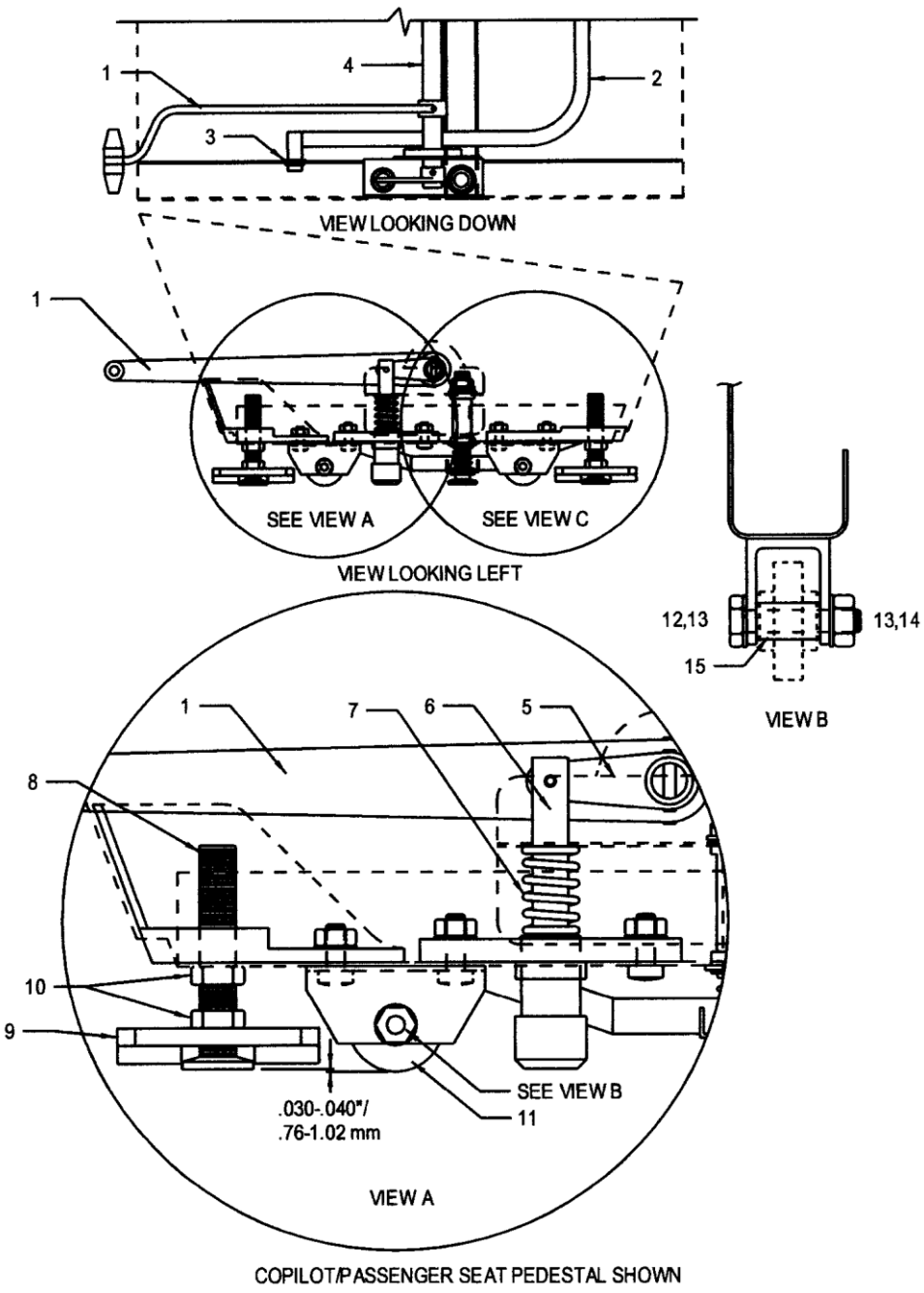


1. Bucket
2. Pedestal
3. Position Adjustment Handle
4. Back Cover
5. Bolt
6. Restraint System Inertia Reel
7. Bolt
8. Washer
9. Restraint System Lap Belt
10. Bolt
11. Harper Washer (2)
12. Spacer
13. Washer
14. Nut
15. Seat Retainer and Guide
16. Spring Retainer
17. Locking Stud

Figure 8-2. Pilot and Copilot/Passenger Seat

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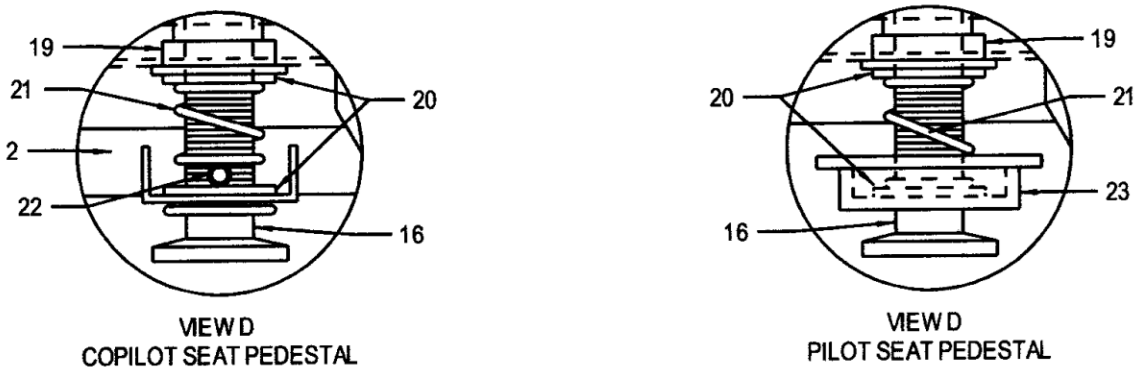
COPILOT/PASSENGER SEAT PEDESTAL SHOWN

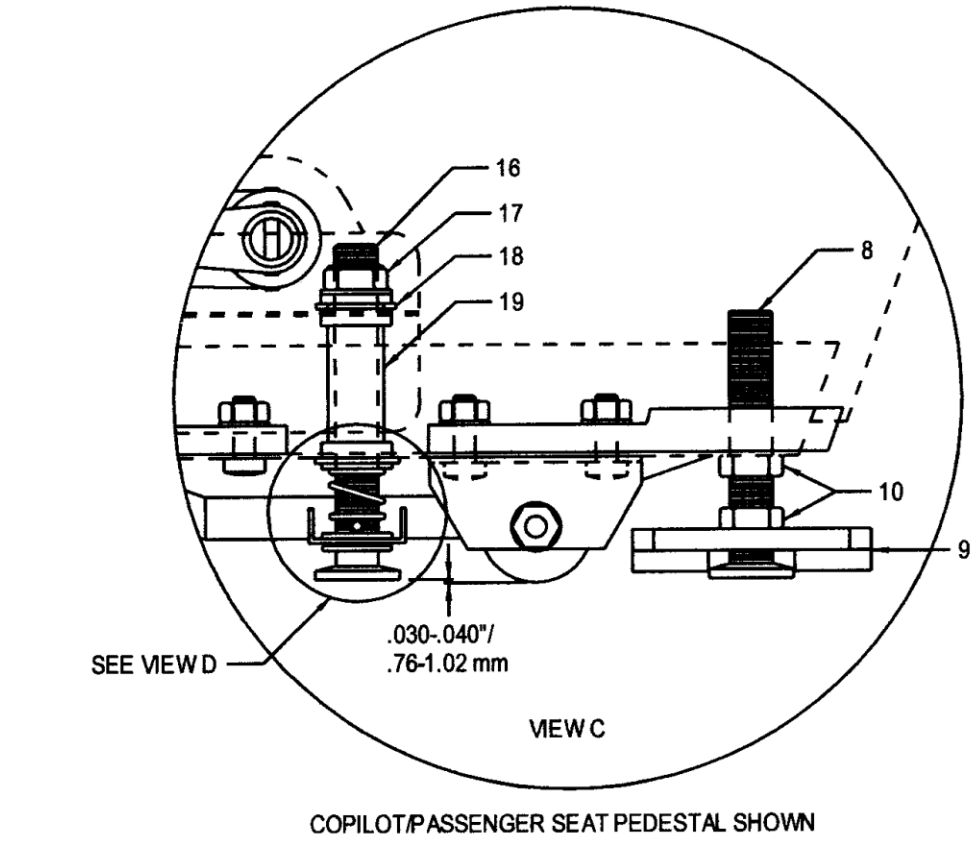
1. Position Adjustment Handle
2. Spring Retainer Handle
3. Plastic Bushing
4. Actuating Rod
5. Locking Stud Arm
6. Locking Stud
7. Spring
8. Seat Retainer
9. Seat Guide
10. Jam Nuts
11. Roller
12. Bolt
13. Washer
14. Nut
15. Spacer

Figure 8-3. Pilot and Copilot/Passenger Seat Pedestal

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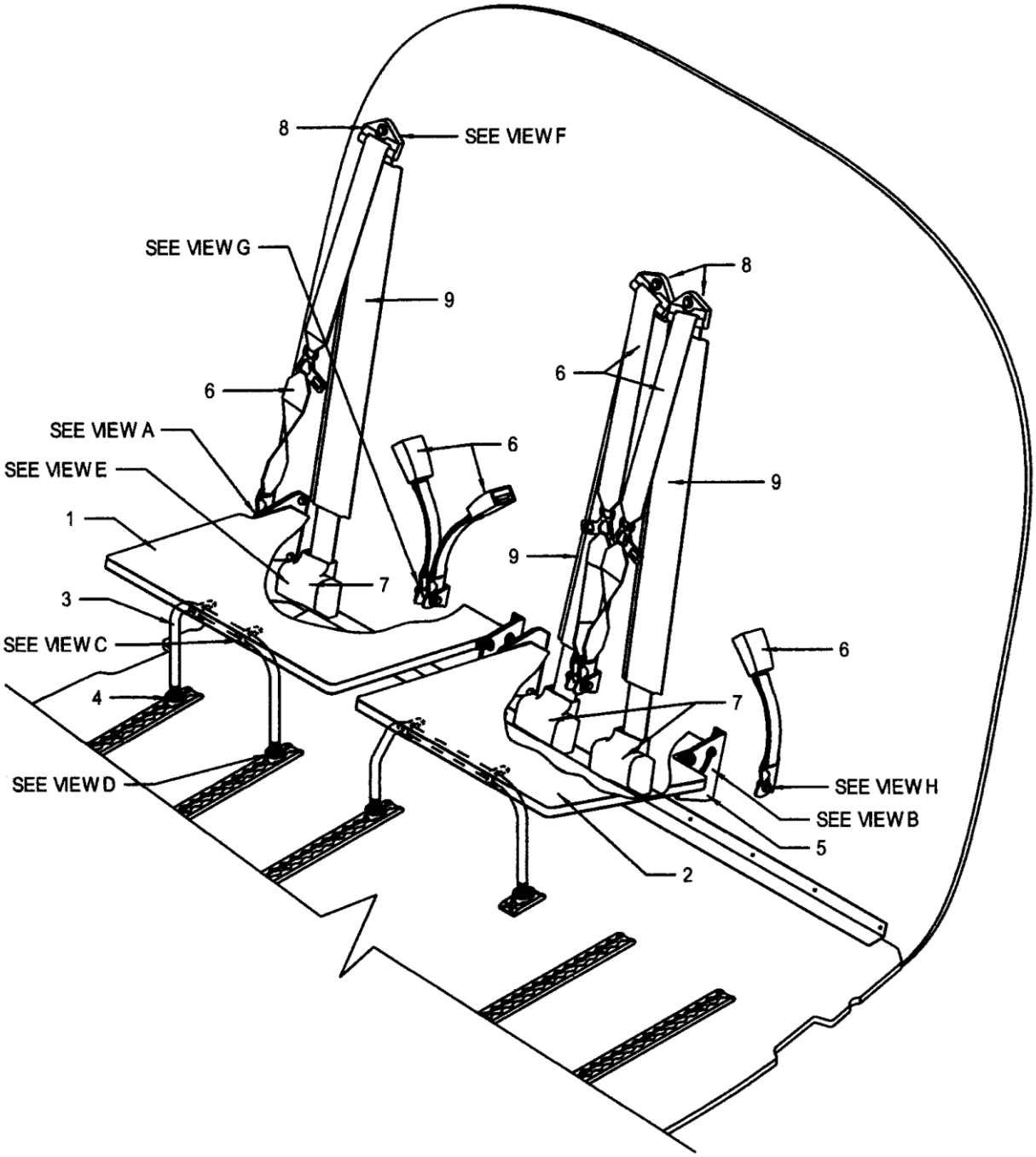
COPILOT/PASSENGER SEAT PEDESTAL SHOWN

16. Spring Retainer
17. Nut
18. Retaining Ring
19. Bushing
20. Washer
21. Spring
22. Roll Pin
23. Cam Washer

Figure 8-3. Pilot and Copilot/Passenger Seat Pedestal

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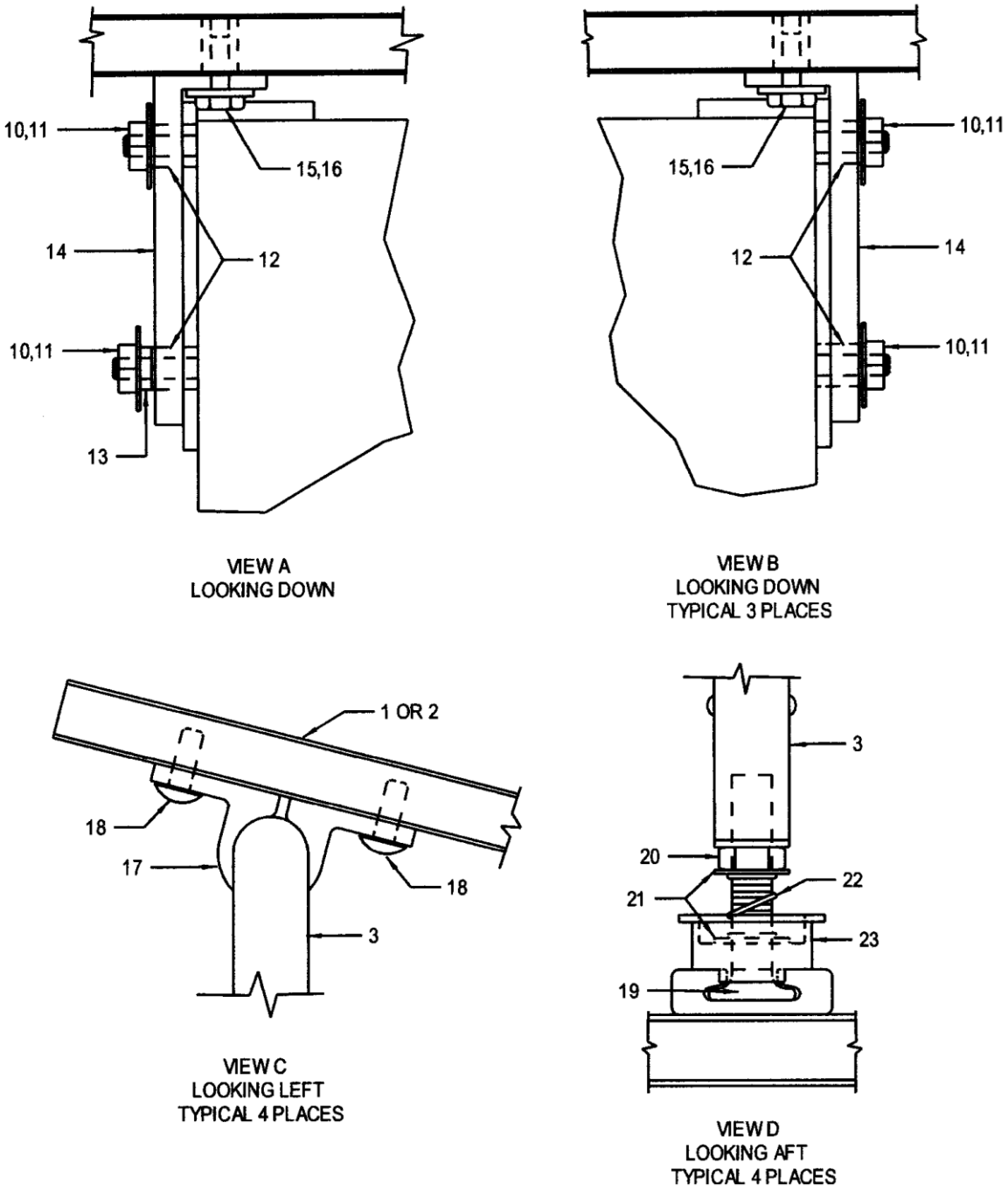


1. Right Passenger Seat
2. Left Passenger Seat
3. Seat Support Assembly
4. Seat Restraint Assembly
5. Seat Mounting Bracket
6. Restraint Systems
7. Inertia Reels
8. Swivel Mounts
9. Covers

Figure 8-4. Passenger Seats – Standard Configuration

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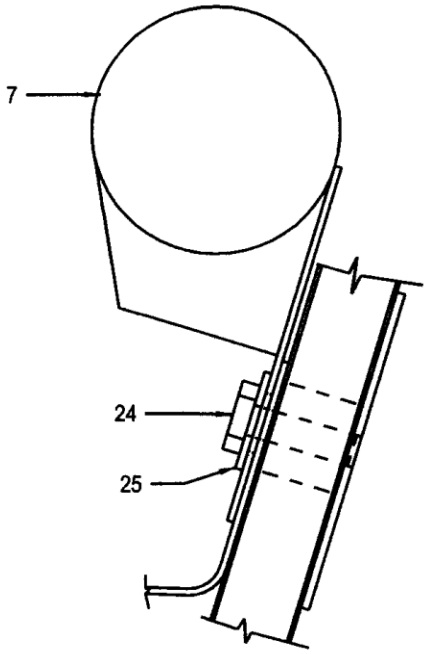


10.	Nut	17.	Clamp
11.	Harper Washer	18.	Screw
12.	Spacer	19.	Retainer
13.	Spacer	20.	Jam Nut
14.	Mounting Bracket	21.	Washer
15.	Nut	22.	Spring
16.	Washer	23.	Cam Washer

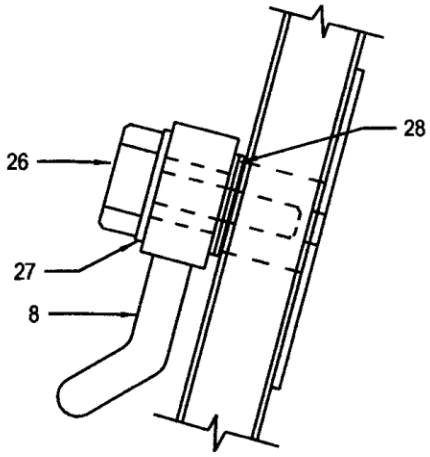
Figure 8-4. Passenger Seats – Standard Configuration

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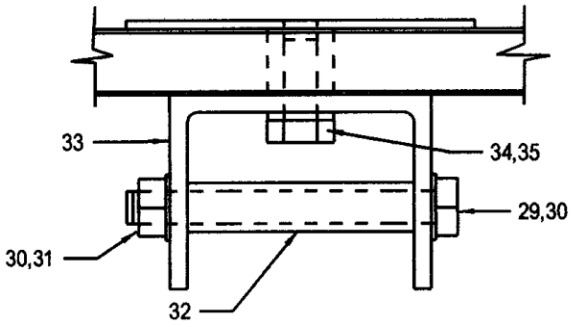
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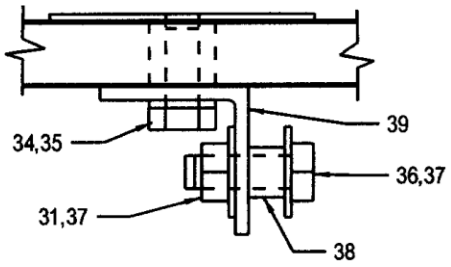
VIEW E
LOOKING LEFT
TYPICAL 3 PLACES



VIEW F
LOOKING LEFT
TYPICAL 3 PLACES



VIEW G
LOOKING DOWN
TYPICAL 2 PLACES



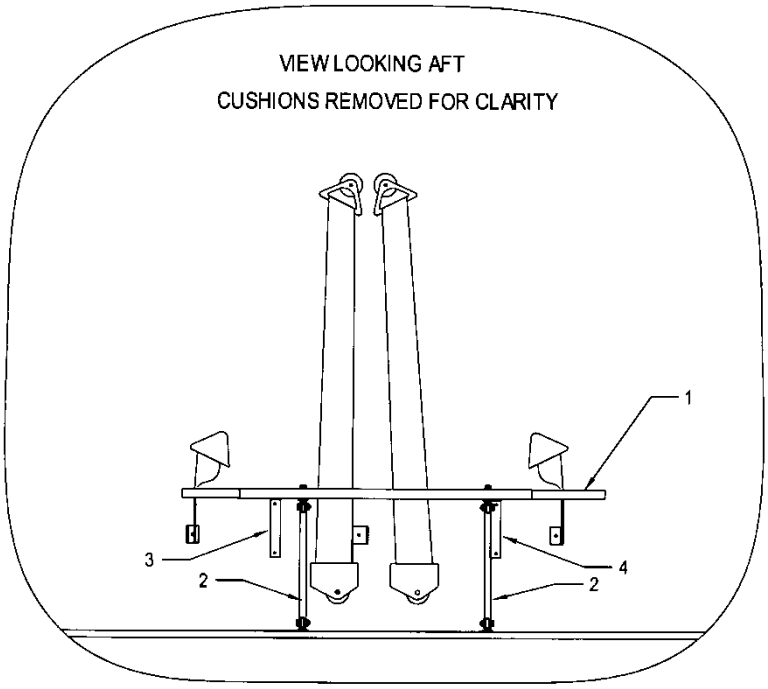
VIEW H
LOOKING DOWN

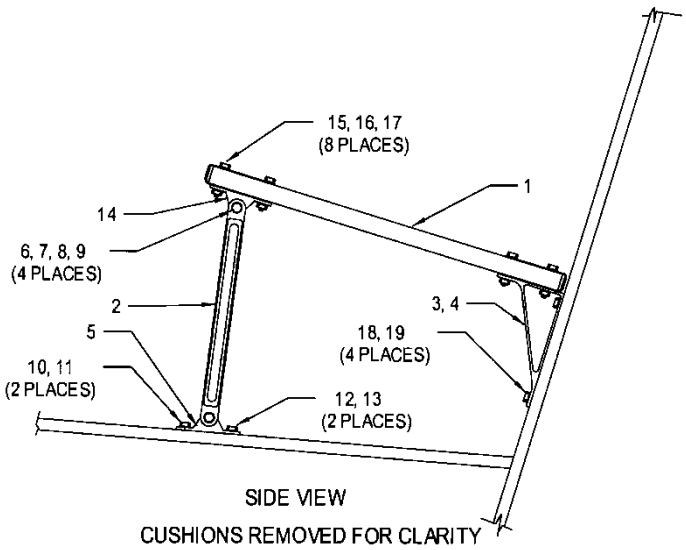
24. Bolt
25. Flanged Washer
26. Bolt
27. Flanged Washer
28. Washer(s)
29. Bolt
30. Washer
31. Nut
32. Spacer
33. Mount Bracket
34. Bolt
35. Washer
36. Bolt
37. Harper Washer
38. Spacer
39. Mount Bracket

Sheet 3 of 3

Figure 8-4. Passenger Seats – Standard Configuration

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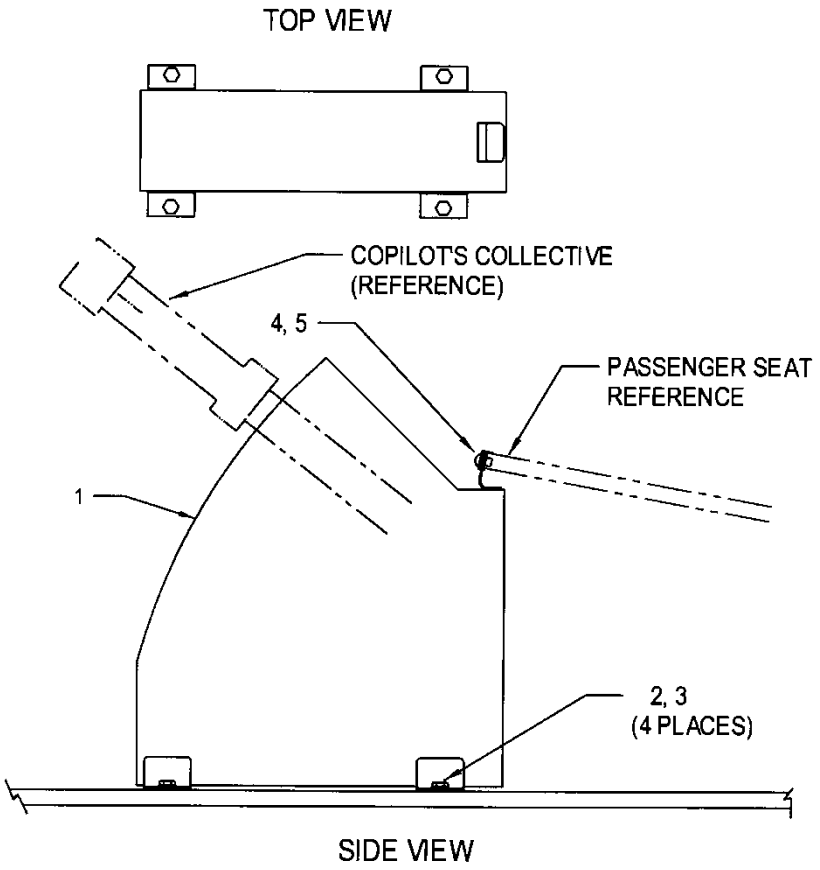
1. Seat Assembly
2. Seat Leg (2)
3. Mounting Fixture
4. Mounting Fixture
5. Mounting Fixture
6. Bolt
7. Spacer
8. Washer (2)
9. Nut
10. Bolt
11. Washer
12. Bolt
13. Washer
14. Mounting Fixture (2)
15. Bolt
16. Washer (2)
17. Nut
18. Bolt
19. Washer

Bench Seat

Sheet 1 of 4

Figure 8-4.1. Passenger Seat – 2+2 Configuration

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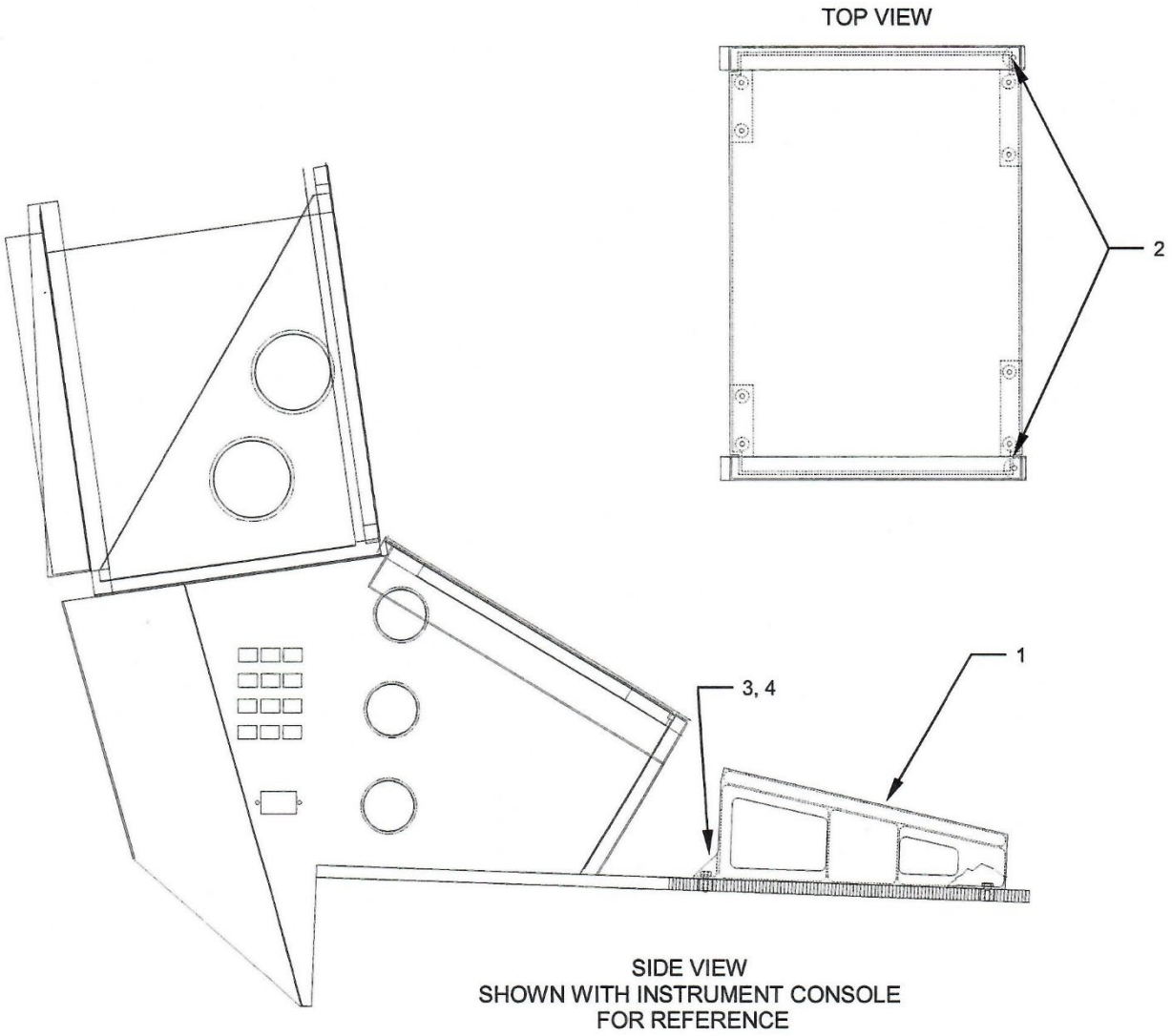
1. Leg Guard
2. Bolt
3. Washer
4. Bolt
5. Washer

Leg Guard

Figure 8-4.1. Passenger Seat – 2+2 Configuration

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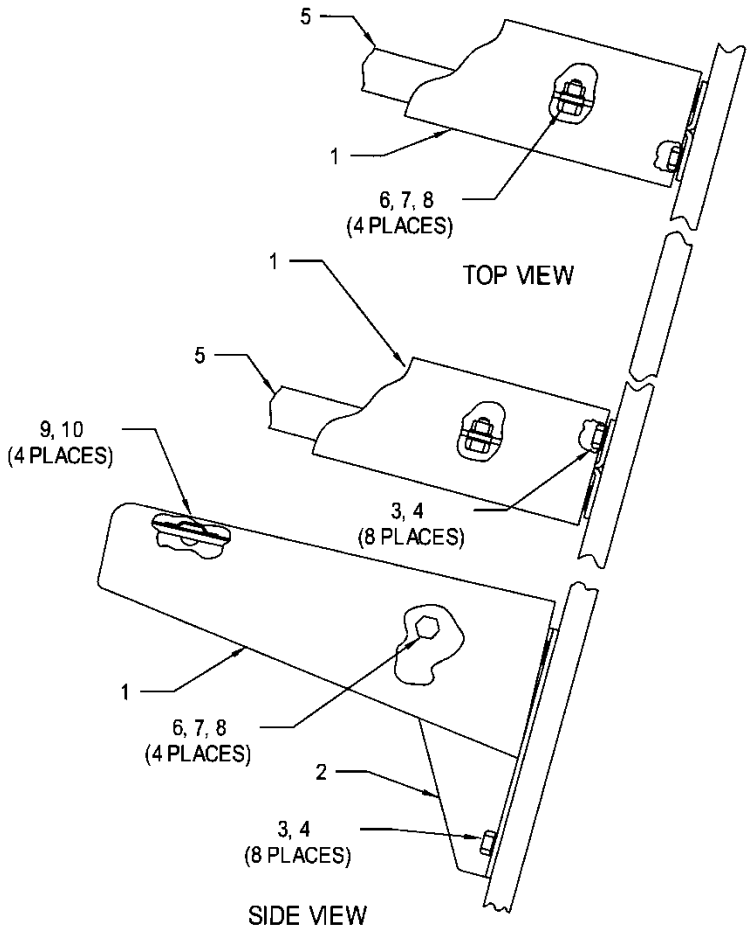
1. Foot Rest
2. Shoulder Bolt (2)
3. Bolt (2)
4. Washer (2)

Foot Rest

Sheet 3 of 4

Figure 8-4.1. Passenger Seat – 2+2 Configuration

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1.	Arm Rest (2)	6.	Bolt
2.	Mount Fitting (2)	7.	Washer (2)
3.	Bolt	8.	Nut
4.	Washer	9.	Stud
5.	Angle (2)	10.	Retainer

Arm Rests

Sheet 4 of 4

Figure 8-4.1. Passenger Seat – 2+2 Configuration

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B. Passenger Seats – Standard Configuration:

CAUTION

Do not apply any downward load to the passenger seats in the down position while the seat legs are not attached to the floor track.

(1) Remove the pilot and copilot/passenger seats.

(2) Disconnect the restraint system from the outboard side of the right bench seat.

(3) Remove the hardware securing the seat brackets to the cockpit bulkhead. Remove the seat and brackets from the aircraft.

(4) If required, remove the restraint systems by disconnecting the restraint systems from the mounting brackets and removing the belt covers. Remove the inertia reels and swivel mounts from the cockpit bulkhead.

C. Passenger Seat – 2+2 Configuration:

(1) Remove the pilot and copilot/passenger seats.

(2) Remove the hardware from the front of the foot rest.

(3) Slide the foot rest aft to disengage the shoulder bolts from the aft mount slots and remove the foot rest.

(4) Remove the hardware securing the leg guard to the seat.

(5) Remove the hardware securing the leg guard to the floor and remove the leg guard.

(6) Remove the seat bottom cushion.

(7) Disconnect the restraint systems from the mount fixture located under the center of the seat.

CAUTION

Do not apply any downward load to the passenger seat while the seat legs are not attached to the floor mounts.

(8) Remove the hardware securing the seat legs to the floor mounting fixtures.

(9) Remove the hardware securing the seat to the mounting fixtures on the cockpit bulkhead and remove the seat.

(10) Unlock the quarter turn fasteners on the arm rest(s) and remove the arm rest(s).

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(11) If required, remove the seat and arm rest mounting fixtures.

(12) If required, remove the restraint systems by disconnecting the restraint systems from the mounting fixtures and removing the belt covers. Remove the inertia reels and swivel mounts from the cockpit bulkhead.

8-31. Disassembly - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seats:

(1) Remove the cushion from the seat bucket.

(2) Remove the back cover from the seat.

(3) Remove the shoulder harness from the seat bucket.

(4) Remove the seat belt halves from the seat bucket.

(5) Remove the hardware securing the seat bucket to the pedestal and remove the bucket.

(6) Remove the shoulder harness inertia reel from the seat pedestal.

(7) Remove the rollers and brackets from the seat pedestal.

(8) Remove the spring retainers as follows:

a. Pilot Seat Pedestal

(1) If installed, remove the cotter pin from the lower end of the retainer.

(2) Turn the cam washer counter-clockwise to expose the wrenching flats on the retainer.

(3) Secure the retainer using the wrenching flats and remove the nut at the opposite end.

(4) Remove the retainer, cam washer, spring, and washers from the seat pedestal.

b. Copilot/Passenger Seat Pedestal

(1) Remove the roll pins from the lower end of the retainers.

(2) Secure the lower end of the retainers with non-marring pliers and remove the nuts from the opposite end of the retainers.

(3) Remove the retainers, springs, and washers from the seat pedestal.

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(4) Remove the handle and plastic bushings from the seat pedestal.

(9) Remove the seat retainers, guides, and jam nuts from the seat pedestal.

(10) Remove the locking assembly as follows:

a. Remove the screws or roll pins securing the locking studs to the locking stud arms and remove the locking studs and springs from the pedestal.

b. Remove the screws or roll pins securing the arms to the actuating rod and remove the arms.

c. Remove the screws or roll pins securing the locking handle and mounting arm to the actuating rod and remove the handle and arm.

d. Remove the rivets securing the actuating rod mounting brackets and remove the actuating rod and brackets.

B. Passenger Seats – Standard Configuration:

(1) Remove the nuts, Harper washers, and spacers securing the mounting brackets to the seats and remove the mounting brackets.

(2) Remove the hardware securing the seat support assemblies and remove the seat support assemblies.

(3) Remove the retainer assemblies from the seat support assemblies.

C. Passenger Seat – 2+2 Configuration:

(1) Remove the hardware securing the legs to the seat and remove the legs.

(2) Remove the hardware securing the seat leg fixtures to the seat and remove the fixtures.

8-32. Inspection - Pilot and Passenger Seats - 480 Series

A. Inspect the seat buckets and seat bottoms for condition, and security of installation.

B. Inspect seat pedestals and mounting brackets for corrosion, cracks, damaged components, and security of installation.

C. Inspect the seat locking assembly for wear and proper operation.

D. Inspect the seat tracks for damage, security, and wear.

E. Inspect the cushions for damage and deterioration.

F. Inspect the restraint systems for condition, security, and proper operation of the adjustable lap and shoulder belts, buckle, and inertia reel.

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8-33. Repair - Pilot and Passenger Seats - 480 Series

A. Repair the seat buckets and seat bottoms I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

B. Repair the seat pedestals I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

C. Replace any components of the seat pedestal that are damaged and unrepairable.

D. Replace the passenger seat mounting brackets if cracked.

E. Replace components of the locking assembly that are worn or damaged and unserviceable.

F. Replace seat tracks that are cracked or worn and unserviceable.

G. Replace cushions that are unserviceable.

H. Replace any components of the restraint system that are worn, frayed, or unserviceable.

8-34. Assembly - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seat:

(1) Install the locking assembly as follows:

a. Install the actuating rod and brackets in the pedestal and secure with rivets I/A/W AC 43.13-1B.

b. Install the locking handle and mounting arm into place and install the screws or roll pins.

c. Install the locking stud arms onto the actuating rod and install the screws or roll pins.

d. Install the springs onto the locking studs and install the locking studs into the pedestal. Install the screws or roll pins securing the locking studs to the arms.

(2) Install the guides and nuts on the seat retainers and install the retainers into the pedestal.

(3) Install the spring retainers as follows:

a. Pilot Seat Pedestal

(1) Install the cam washer, spring, and washers onto the retainer and install the retainer into the pedestal.

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(2) Securing the retainer using the wrenching flats, install the nut on the opposite end.

(3) Position the cam washer on the retainer approximately 0.3 inches/7.6 mm from the bottom surface of the retainer.

b. Copilot/Passenger Seat Pedestal

(1) Install the plastic bushings into the seat pedestal.

(2) Install the handle into the seat pedestal.

(3) Install the retainers, springs, and washers into the handle and seat pedestal.

(4) Secure the retainer with non-marring pliers and install the nuts on the opposite ends.

(5) Install the roll pins.

(4) Install the roller mounting brackets and the rollers.

(5) Adjust the seat retainers and spring retainers for proper seat track alignment using the following procedure:

a. Place the seat pedestal on a flat surface.

b. Adjust the seat retainers and spring retainers so that only the rollers are contacting the flat surface.

c. Using a feeler gauge or other suitable tool, adjust the position of the seat retainers and spring retainers for a .030-.040 inch/.76-1.02 mm gap between the retainer and the flat surface.

d. Install the seat pedestal into the seat tracks and check that the seat pedestal moves properly in the track. Adjust the guides so that the wide portion of the guide does not contact the seat track. Remove the seat pedestal to adjust the guides. Adjust the spring retainer cam washers (Pilot Seat Pedestal) so that they do not touch the seat pedestal. Tighten the jam nuts after final adjustments.

e. Remove the seat pedestal from the seat tracks.

(6) Install the inertia reel onto the back of the pedestal.

(7) Install the seat belt halves (male end on the left side) onto the seat bucket.

(8) Install the seat bucket onto the pedestal and install the mounting hardware.

(9) Install the shoulder harness through the seat bucket at the top of the bucket.

(10) Install the back cover onto the bucket and install the seat cushion.

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B. Passenger Seats – Standard Configuration:

(1) Install the retainer assemblies into the seat support assemblies.

(2) Position the seat support assemblies onto the seats and install the mounting hardware.

(3) Install the mounting brackets onto the seat. Install the spacers, Harper washers and nuts.

C. Passenger Seat – 2+2 Configuration:

(1) Install the seat leg fixtures onto the seat and secure with the hardware.

(2) Install the legs onto the seat and secure with the hardware.

8-35. Installation - Pilot and Passenger Seats - 480 Series

A. Pilot and Copilot/Passenger Seats:

(1) Place the seat onto the seat tracks.

(2) Lift the locking handle and position the seat to allow the seat retainers to engage the seat track.

(3) Push down on the seat until the seat retainers are in the seat track and then slide the seat aft or forward until the spring retainers engage the seat track.

(4) Release the locking handle and ensure the locking studs are fully engaged in the seat track.

B. Passenger Seats – Standard Configuration:

NOTE

The bolt length and number of washers required between the swivel mount and the cockpit bulkhead will vary depending on the type of upholstery installed on the cockpit bulkhead.

(1) If required, install the restraint system inertia reels and swivel mounts onto the cockpit bulkhead. Connect the restraint systems to the mounting brackets and install the belt covers.

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CAUTION

Do not apply any downward load to the passenger seats in the down position while the seat legs are not attached to the floor track.

(2) Install the seats into position and install the hardware securing the mounting brackets to the cockpit bulkhead.

(3) Connect the restraint system to the outboard side of the right bench seat.

(4) Install the pilot and copilot/passenger seats.

C. Passenger Seat – 2+2 Configuration:

(1) If required, install the restraint system inertia reels and swivel mounts onto the cockpit bulkhead. Connect the restraint systems to the mounting fixtures and install the belt covers. Do not attach the restraint systems located at the center of the seat at this time.

(2) If required, install the seat and arm rest mounting fixtures.

(3) Install the arm rest(s) on the mounting fixture(s) and lock the quarter turn fastners.

CAUTION

Do not apply any downward load to the passenger seat while the seat legs are not attached to the floor mount.

(4) Position the seat on the mounting fixtures and install the hardware.

(5) Position the seat legs on the floor mounting fixtures and install the hardware.

(6) Route the ends of the restraint systems through the center of the seat and attach to the mounting fixtures.

(7) Install the seat cushion.

WARNING

The leg guard must be installed when operating the aircraft with the copilot's controls installed.

(8) Install the leg guard into position and install the hardware.

(9) Install the hardware attaching the leg guard to the seat.

(10) Position the aft mounting slots on the foot rest over the shoulder bolts. Lower the foot rest and slide forward to engage the slots.

(11) Install the hardware in the forward side of the foot rest.

(12) Install the pilot and copilot/passenger seat.

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8-36. Cabin Doors

8-37. Description - Cabin Doors

The cabin doors are all composite structures with plexiglass windows in the upper section of the doors. Positive retention door latches are used to secure the doors in the closed position and key operated locks in the door handles are used to secure the aircraft. Optional pneumatic springs are available to hold the doors open and an emergency jettison system is available for the TH-28 and 480 prior to serial numbers 3007 and 5027 respectively.

8-38. Removal - Cabin Doors

NOTE

Removal procedures are the same for removing either cabin door.

CAUTION

Support the cabin door when removing the hinge pins to prevent from damaging the doors or the door hinges.

A. Open the door and hold it in the open position.

WARNING

The pneumatic springs have approximately 45 pounds/20.5 kg of pressure. Use extreme caution when removing the pneumatic springs.

B. If equipped, remove the retaining clip from the upper end of the pneumatic spring and disconnect the spring from the door.

C. If equipped, pull the door jettison handle and remove the door.

D. If equipped, disconnect the restraint strap from the cabin.

E. Remove the hinge pins and remove the door.

8-39. Disassembly - Cabin Doors

NOTE

Disassembly of the cabin doors is the same for either door.

CAUTION

Protect the plexiglass window from damage during disassembly of the door.

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A. Remove the hardware securing the hinge halves to the cabin door and remove the hinge halves. If required remove the hinge halves attached to the cabin shell.

B. Remove the hardware securing the door restraint strap and the closure pull strap.

C. Remove the hardware securing the storage pouch to the cabin door.

D. Remove the hardware securing the door catch to the aft side of the door.

E. Remove the hardware securing the door strikers to the cabin shell.

F. Remove the door latching system as follows:

(1) Remove the hardware securing the upper and lower latch assemblies to the door.

(2) Loosen the latch bellcrank pivot screw and remove the cable and retainer from between the latch bellcrank halves. Remove the assemblies from the door.

(3) Remove the roll pin securing the internal door handle and remove the handle.

(4) Remove the screws securing the door handle assembly cover. Remove the cover.

(5) Loosen the set screw securing the cable pulley to the door handle pin. Remove the cable pulley and cables.

(6) Remove the screws securing the door handle assembly. Remove the door handle assembly.

(7) Remove the cables from the cable pulley by removing the solder slugs from the end of the cables, loosening the retainer set screws and pulling the cables through the retainers.

G. Disassembly the door latch assemblies as follows:

(1) Remove the pivot screw securing the latch bellcranks to the latch assembly.

(2) Remove the clevis pin that secures the latch operating rod to the latch bellcranks.

(3) Disconnect the return spring.

8-40. Inspection – Cabin Doors

A. Inspect the cabin doors and hinges for condition, damage, and security.

B. Inspect the door latching assembly for condition, damage, and proper operation.

C. Inspect the window and pop-out vent for condition, damage, and security.

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8-41. Repair – Cabin Doors

A. Repair the door I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

B. Replace the seal strips around the door if deteriorated or damaged. Attach the new seal using trim adhesive (8031, 3M).

C. Replace components of the door latching assembly that are unserviceable.

8-42. Assembly – Cabin Doors

NOTE

Assembly of the cabin doors is the same for either door.

CAUTION

Protect the plexiglass window from damage during assembly of the door.

NOTE

If the hinges have been replaced, shimming may be required to properly align the doors for proper sealing and operation of the latches.

A. Install the hinges on the door and cabin shell.

B. Assemble the latch assemblies as follows:

(1) Connect the return spring to the outboard (as installed in the door) latch bellcrank half.

(2) Position the operating rod between the bellcranks and install the clevis pin, washer, and cotter pin.

(3) Place an AN960-416 washer between the bellcranks as a spacer. Insert the pivot screw and washer into the bellcranks. Lightly coat the screw threads with Vibra-tite and install the screw.

NOTE

References to top, bottom, outboard, inboard, forward, and aft are as the door is installed on the aircraft.

C. Install the door latching system as follows:

(1) Install the cables so that the bottom latch (short) cable is installed on the outboard groove of the pulley from bottom to top and the retainer is in the top forward hole. The upper latch (long) cable is installed in the inboard groove of the pulley from top to bottom and the retainer is in the bottom forward hole.

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(2) Install the retainers on the latch assembly ends of the cables. Adjust the retainer until 0.25 inches of cable extend from the end of the retainer and solder the end to form a solder slug.

(3) Install the cables and pulley into the door.

(4) Install the door handle assembly onto the door.

(5) Install the cable pulley onto the door handle pin and tighten the set screw in the pulley.

(6) Connect the cable ends to the latch assemblies by loosening the latch bellcrank pivot screw and positioning the cable retainer between the bellcranks and tightening the pivot screw. Do not over tighten the pivot screws.

(7) Install the latch assemblies on to the door.

(8) Operate the door handle and observe the upper and lower latches. If the latches do not retract at the same time, adjust the latch cables at the pulley until they retract at the same time.

(9) Install the door handle assembly cover and bushing.

(10) Install the internal door handle and the roll pin.

D. Install the storage pouch onto the cabin door.

E. Install the door catch onto the aft side of the door.

F. Install the door restraint strap and the closure pull strap.

G. Install the door strikers onto the cabin shell.

8-43. Installation – Cabin Doors

A. If equipped, Position the door on the hinges and insert the jettison pins in the hinges and in the restrain strap on the inside of the door. Ensure the jettison handle is correctly positioned in the handle retainer. Lockwire the hinge jettison pins to the hinges using breakaway lockwire (MS20995CY20 or equivalent).

B. Position the door on the hinges installed on the cabin shell and install the hinge pins and secure.

C. Install the pin securing the restraint strap to the cabin and secure.

WARNING

The pneumatic springs have approximately 45 pounds/20.5 kg of pressure. Use extreme caution when installing the pneumatic springs.

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NOTE

Install the pneumatic springs with the piston rod oriented down to prevent the seals from drying out and subsequent loss of gas pressure.

D. Install the pneumatic spring onto the fitting located on the cabin floor and install the retaining clip. Install the upper end of the pneumatic spring onto the door fitting and install the retaining clip.

E. Check the door assembly for proper fit and the latching system for proper operation. If required, adjust the door hinges by shimming or the latching system by adjusting the strikers.

8-44. Windshields and Windows

8-45. Inspection – Windshields and Windows

A. Inspect the windshields and windows for cracks, crazing, pits, and scratches.

8-46. Repair – Windshields and Windows

A. Damage to the windshields and windows which does not interfere with pilot's line of sight during normal flight and landing attitudes or damage that does not impair structural integrity may be repaired by stop drilling or patching I/A/W AC 43.13-1B; however, the windshield or window should be replaced at the earliest opportunity.

B. If installed, decorative vinyl tape (P/N 70-0160-1056-6), which covers the paint line, may be repaired by removing damaged portions and applying new tape. Use a cotton glove and apply firm pressure while installing the tape. Do not stretch the tape when applying.

8-47. Replacement – Windshields and Windows

A. Replace the windshields as follows:

NOTE

Replacement procedures are the same for both windshields.

NOTE

All replacement windshields are now the "blown" version. Replace both windshields if replacing a "flat" windshield with a "blown" windshield.

(1) Remove the cabin doors.

(2) If equipped, disconnect the defroster from the supply line and remove the hardware securing it to the cabin shell.

(3) Remove the center strip from the windshields.

(4) Remove the hardware securing the windshield to the cabin shell.

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CAUTION

Use extreme care while removing the windshield with a putty knife to prevent from damaging the cabin shell or injuring yourself.

CAUTION

Use extreme care when using a portable heat gun to prevent from damaging the paint finish due to excessive heat.

(5) Heat the edge of the windshield and adhesive using a portable heat gun and separate the windshield from the cabin shell and center support with a putty knife.

NOTE

Tape application for the windshield installation was discontinued for S/N 5238 and subsequent. All windows have since been installed with adhesive from the factory.

(6) If applicable, remove the residual foam tape or adhesive from the windshield recess in the cabin shell and the center support. Clean the recess with acetone or equivalent.

(7) Fit the replacement windshield to the cabin.

a. Place the replacement windshield into position over the opening and tape and/or clamp it into position.

b. Apply 1/4-inch masking tape following the windshield recess in the cabin to mark the windshield size for cutting.

CAUTION

Do not undercut the outline. If too much acrylic is removed, the replacement windshield may have to be scrapped.

CAUTION

Do not allow the cut tail to bend or pull away during cutting. Excess strain at the head of the cut can cause cracking into the window area.

CAUTION

Use extreme caution while using power tools or other suitable devices to prevent from damaging the aircraft or injuring yourself.

c. Carefully cut or trim the outline (leaving the window slightly oversized for the opening).

1 Use a die grinder with a 1/16-inch cutoff wheel or an oscillating saw for cutting and trimming.

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2 Support the cut tail of the acrylic while cutting to prevent sagging and potential breakage and cracking into the prime window area.

d. Fit the window into the cabin and continue cutting, filing, and/or sanding as necessary to create a proper fit.

1 Ensure the cabin door upper hinge post cutout in the replacement windshield is large enough.

2 Sand the edge with a belt sander.

(8) Drill holes for the attachment hardware.

a. Tape the window in place.

b. Mark the hole locations from the outside of the window with a fine marker or equivalent. Remove the window.

CAUTION

Drilling acrylics is best accomplished using a drill manufactured or modified specifically for drilling acrylics.

c. Drill the holes with a small bit (#40). Support the back of the window with a block of wood (approximately a 1-inch square block) to prevent the drill bit from cracking the window when it exits the acrylic. (Cracks are commonly caused by the drill bit if a backup material is not used.)

d. Open the hole to finish size with #19 drill bit.

e. Final finish the hole with #16 relief bit.

f. Deburr the hole edges.

1 Use a rotary grinding stone to polish the hole interior surface.

2 Use a sanding block with 100 grit sandpaper to round the outside hole edges.

(9) Prepare for bonding.

a. Mask off the area inside the window at the edge of the bondline.

b. Lightly sand (120 grit) the area to be bonded and wipe clean with acetone or equivalent.

c. Mask off the area around the windshield on the outside of the aircraft and place protective coverings inside the aircraft to prevent damage from excess adhesive.

d. Prepare the adhesive (PR-1425-B2 or equivalent) following the manufacturer's instructions.

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(10) Apply the prepared adhesive to the center support and in the cabin shell recess. Coating thickness is approximately .0625 in/1.6 mm.

CAUTION

Do not over tighten the mounting screws for the windshields.

(11) Position the windshield in place. Temporarily install and tighten the mounting hardware. Allow the adhesive to cure for 24 hours.

(12) Remove the mounting hardware and using a plastic scraper, remove the excess adhesive.

(13) Apply a small bead of vinyl adhesive caulk (Phenoseal or equivalent) on each side of the windshield center strip and at the top and bottom and place into position. Apply a small amount of vinyl adhesive caulk (Phenoseal or equivalent) onto the shanks of the windshield mounting hardware and install the mounting hardware. Do not over tighten the mounting hardware.

(14) Paint the outer edges of the windshield(s).

(15) Install the defroster(s).

(16) Install the cabin doors.

B. Replace the overhead, opera, and cheek windows as follows:

(1) (Opera window only) Remove the pop-out vent window.

NOTE

Rivets and foam tape were used to secure the opera windows only in early production TH-28/480 aircraft.

NOTE

Overhead and cheek windows for late production 480 aircraft had putty-filled cleco holes. Rivets are used in early (TH-28/480) and current production aircraft (480B).

NOTE

Replacement window installations using a MS20604AD4WX rivet must include a washer under the head and under the tail of the rivet. If using CR91484-4-X rivet, a washer is only required under the tail of the rivet.

(2) Drill out the existing rivets.

CAUTION

Use extreme care while removing the windows with a putty knife to prevent from damaging the cabin shell or injuring yourself.

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CAUTION

Use extreme care when using a portable heat gun to prevent from damaging the paint finish due to excessive heat.

(3) Heat the edge of the window and adhesive using a portable heat gun and separate the window from the cabin shell with a putty knife.

(4) Remove the residual adhesive from the window recess while it is still warm.

(5) Remove any remaining adhesive by sanding and wipe the recess area clean with acetone or equivalent.

(6) Place the replacement window on the cabin and verify it will properly fit. Mark areas of interference and trim the window.

a. Apply 1/4 (0.25) inch masking tape following the window recess in the cabin to mark the window size for cutting.

b. Remove the window and cut to size using a die grinder with a 1/16-inch cutting wheel or a bone saw and sand the edges on a belt sander.

(7) Check the fit of the window and re-sand the edges as necessary.

(8) Drill holes for the attachment hardware.

a. Using a marker, mark the cabin hole locations.

b. Remove the window.

CAUTION

Drilling acrylics is best accomplished using a drill manufactured or modified specifically for drilling acrylics.

c. Drill the marked hole locations with a small bit (#40). Support the back of the window with a block of wood (approximately 1-inch square) to prevent the drill bit from cracking the window when it exits the acrylic. (Cracks are commonly caused by the drill bit if a backup material is not used.)

d. Open the hole to finish size with #30 drill bit.

e. Final finish the hole with #16 relief bit.

f. Deburr the hole edges.

1 Use a rotary grinding stone to polish the hole interior surface.

2 Use a sanding block with 100 grit sandpaper to round the outside hole edges.

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(9) Clean the recess in the cabin shell.

(10) Lightly sand the bonding edges of the window and wipe clean with acetone or equivalent.

(11) Mask off the area around the window on the outside of the aircraft and place protective coverings inside the aircraft to prevent damage from excess adhesive.

(12) Prepare the adhesive (PR-1425-B2 or equivalent) following the manufacturer's instructions and apply a coating approximately .0625 in/1.6 mm thick in the cabin shell recess.

(13) Install the window into position and press firmly against the adhesive. Install the mechanical fasteners (clecos). Allow the adhesive to cure for 24 hours.

(14) Remove the mechanical fasteners (clecos).

(15) Remove excess adhesive from around the window using a plexiglass scraper made from the damaged window.

(16) Install rivets and washers, as required.

(17) Apply sealant (732-RTV or equivalent) to the washers and rivets upon installation.

(18) Apply sealant (732-RTV or equivalent) between the window and the cabin shell.

(19) (Opera window only) Install the pop-out vent window.

(20) Paint the outer edges of the window.

C. Replace/Remove the chin windows as follows:

NOTE

TH-28, S/N 3007 and subsequent, and 480/480B, S/N 5039 and subsequent, are equipped with removable chin windows. Refer to paragraph 8-47, B, for aircraft not equipped with removable chin windows.

(1) Remove the screws securing the chin window.

CAUTION

Use extreme care while removing the windows with a putty knife to prevent from damaging the cabin shell or injuring yourself.

(2) Using a putty knife, carefully break the seal around chin window and remove the chin window.

(3) If required replace the foam tape (4516-75).

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(4) If required, replace any damaged Rivnuts.

(5) Place the replacement window on the cabin and tape into position.

(6) Apply 0.25 inch/6 mm masking tape following the window recess in the cabin to mark the window size for cutting.

(7) Remove the window and cut to size using a fine tooth bandsaw and sand the edges on a belt sander.

(8) Check the fit of the window and re-sand the edges as necessary.

(9) Place the replacement window on the cabin and tape into position.

CAUTION

Drilling acrylics is best accomplished using a drill manufactured or modified specifically for drilling acrylics.

(10) Using a pointed dull #30 drill bit, carefully drill the mounting pilot holes in the window using the Rivnuts as guides.

(11) Remove the window from the cabin and open the pilot holes with a pointed dull #15 drill bit.

CAUTION

Do not over tighten the mounting screws for the chin windows.

(12) Place the window on the cabin and install the mounting screws but do not tighten. Apply sealant (Phenoseal 102 or equivalent) under the screw heads and tighten the screws until the screw head contacts the window.

(13) Apply sealant around the seam between the chin window and the cabin. Remove excess sealant from the seam and the screw heads as required.

(14) Paint the outer edges of the window.

D. Replace the opera windows as follows:

NOTE

Previous content was incorporated into para. 8-47.B.

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E. Replace the cabin door window as follows:

(1) Remove the cabin door.

(2) Remove the upper hinge half from the door.

(3) Remove the pop-out vent window or the sliding vent window.

CAUTION

Use extreme care while removing the windows with a putty knife to prevent from damaging the cabin shell or injuring yourself.

CAUTION

Use extreme care when using a portable heat gun to prevent from damaging the paint finish due to excessive heat.

(4) Heat the edge of the window and adhesive using a portable heat gun and separate the window from the cabin shell with a putty knife.

(5) Remove the residual adhesive from the window recess while it is stall warm.

(6) Remove any remaining adhesive by sanding and wipe the recess area clean with acetone or equivalent.

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(7) Place the replacement window into position and verify it will properly fit. Mark areas of interference and trim the window using a belt sander.

NOTE

Avoid drilling holes in the area of the upper hinge half and the forward edge of the sliding vent window installation.

(8) Tape the window into position and drill approximately 20 to 25 holes using a pointed dull #41 drill bit through the window around the edges for mechanical fasteners (clecos).

(9) Remove the window and clean the recess in the cabin shell.

(10) Lightly sand the bonding edges of the window and wipe clean with acetone or equivalent.

NOTE

Mask off the area around the window on the outside of the aircraft and place protective coverings inside the aircraft to prevent damage from excess adhesive.

(11) Prepare the adhesive (PR-1425-B2 or equivalent) following the manufacturer's instructions and apply a coating approximately .0625 in/1.6 mm thick in the cabin shell recess.

(12) Install the window into position and press firmly against the adhesive. Install the mechanical fasteners (clecos). Allow the adhesive to cure for 24 hours.

(13) Remove the mechanical fasteners (clecos) and fill the holes with glazing putty (Bondo 801 or equivalent).

(14) Remove excess adhesive from around the window using a plexiglass scraper made from the damaged window.

(15) Paint the outer edges of the window.

(16) Back drill the holes for the upper hinge half using a pointed dull #11 drill bit and Back drill the holes for the forward edge of the sliding vent window frame using a pointed dull #28 drill bit.

(17) Install the pop-out vent window or the sliding vent window.

(18) Install the upper hinge half.

(19) Install the cabin door.

F. Replace the sliding vent window as follows:

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CAUTION

Protect the plexiglass window from damage.

(1) Remove the cabin door.

(2) Remove the handle from the sliding window and remove the window from the track.

(3) Remove the hardware securing the window track to the door window and remove the window track.

(4) Remove any residual tape from the cabin door window and the sliding vent track if the track is going to be reused.

NOTE

If a replacement track is installed and the cabin window is drilled for the installation, proceed to step (8). If the track is going to be reused and the cabin door window is not drilled, proceed to step (9). If the track or the window is not drilled for the installation, use as much of the damaged track and damaged cabin door window as possible for a template and the hole pattern.

(5) Tape the replacement track onto the cabin door window and Back drill through the window using a pointed dull #28 drill bit for the mounting holes.

(6) Tape the track into position and install the four screws in the forward edge of the track. Drill the remaining holes in the window using a pointed dull #28 drill bit. Turn the door over and carefully drill the four holes for the air deflector mounting blocks.

CAUTION

Use extreme caution while using an awl or similar tool to prevent from damaging the aircraft or injuring yourself.

(7) Remove the track from the window and apply double backing tape (3M brand # 4910-50) to the track. Perforate the tape at the rivet holes using an awl or other suitable device.

CAUTION

Do not over tighten the hardware for the window track.

(8) Install the track into position and press firmly against the window. Install the mounting hardware.

(9) Install the sliding window and the handle.

(10) Install the cabin door.

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8-48. Landing Gear Assembly (Figures 8-5 & 8-6)

8-49. Description – Landing Gear Assembly

The landing gear assembly consists of two cross tubes, four landing gear legs, four air/oil oleos, two drag struts and two skid tubes. The cross tubes, which distribute the weight of the aircraft to the landing gear assembly, are sleeved aluminum tubes with clamps and end caps used to attach the gear legs and oleos. The aft cross tube is mounted to the bottom of the pylon assembly and the forward cross tube is mounted in the keel assembly. The gear legs are tubular steel and attach the skid tubes to the cross tubes. The oleos, connected between the ends of the oleos and just above were the landing gear legs attach to the skid tubes, cushion ground contact during landing. The oleos have a step attached to the lower portion to aid in entering and exiting the cockpit and performing inspections or maintenance in the aft fuselage area. The drag struts are tubular steel and used to give the gear stability and strength and to prevent fore and aft movement during ground contact maneuvers. The skid tubes are aluminum tubes which are used to distribute the weight of the aircraft onto the landing surface. Replaceable hardened steel skid shoes are installed on the skid tubes to protect against skid tube wear on hard surfaces. Attaching bolts or brackets for the ground handling wheels are also installed in the skid tubes. (Refer to SIL T-066, latest revision, for additional ground handling wheel bracket installation information.) All attachment points of the landing gear assembly except the cross tubes to pylon/keel assemblies and the gear legs to the skid tubes are pivoting attachments.

8-50. Removal – Landing Gear Assembly (Figures 8-5 & 8-6)

A. Remove the keel access panels.

B. Hoist up the aircraft (para. 4-68).

C. Remove the oleos (para. 8-65).

D. Remove the bolts securing the forward gear legs to the forward cross tube.

E. Remove the bolts securing the aft gear legs to the aft cross tube and remove the gear legs and skid tubes.

F. Remove the bolts securing the aft cross tube to the pylon and remove the cross tube.

G. Remove the forward cross tube as follows:

(1) Remove the hardware from one of the end caps.

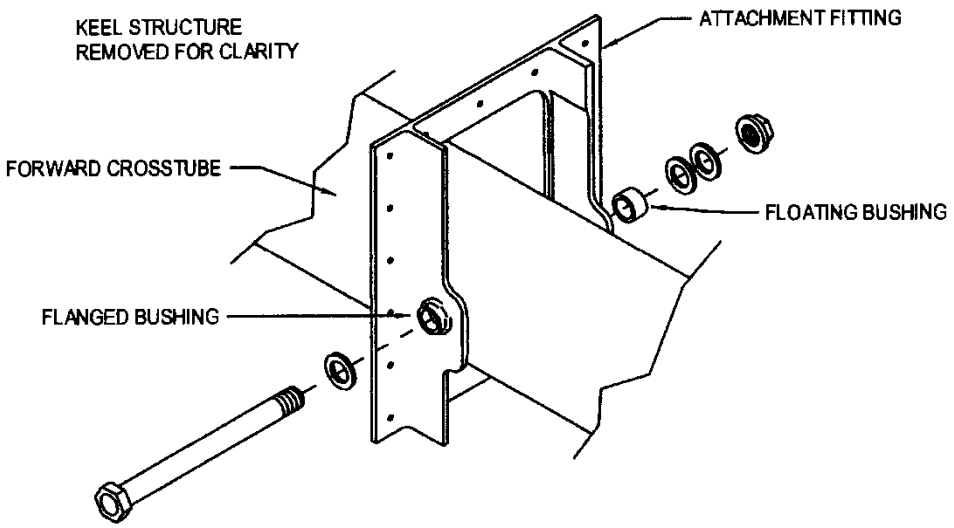
(2) Loosen the clamping hardware and remove the positioning hardware from both gear leg attachment clamps.

(3) Remove the hardware securing the cross tube in the keel assembly.

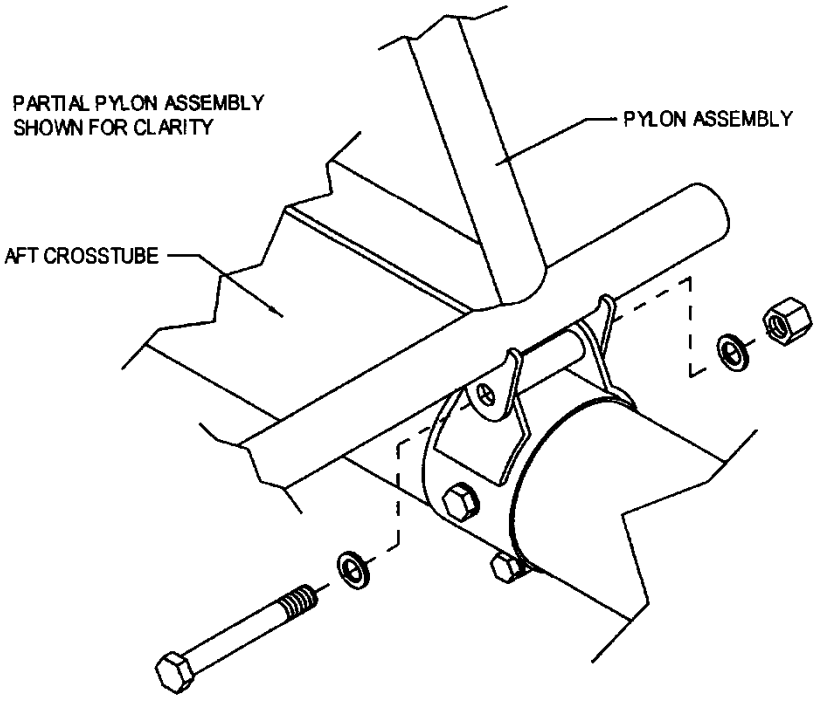
(4) Slide the cross tube out the side of the aircraft opposite of the end cap with the hardware removed. Remove the gear leg attachment clamps as they clear the end of the cross tube.

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FORWARD CROSSTUBE INSTALLATION

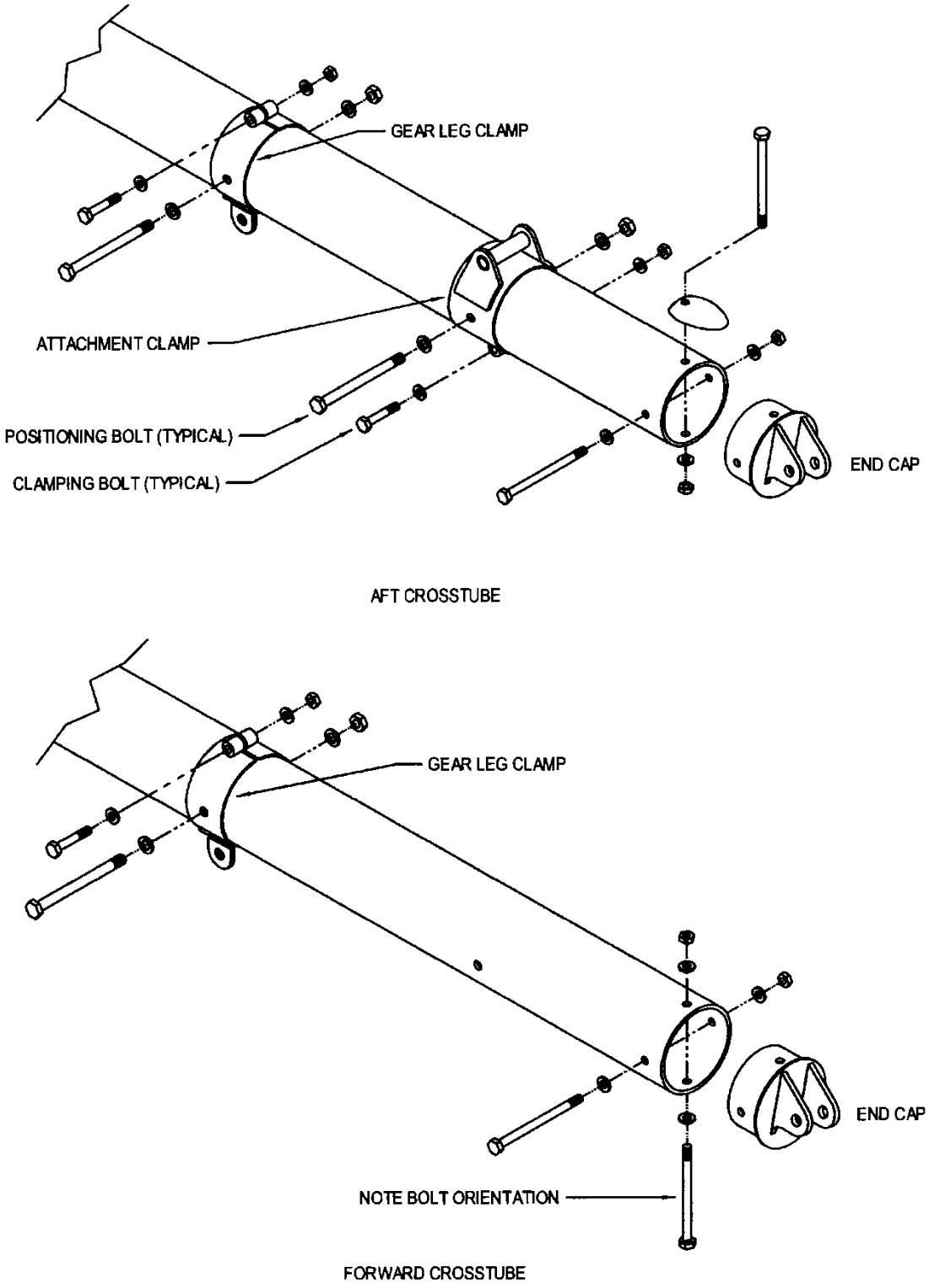


AFT CROSSTUBE INSTALLATION

Figure 8-5. Crosstube Installation

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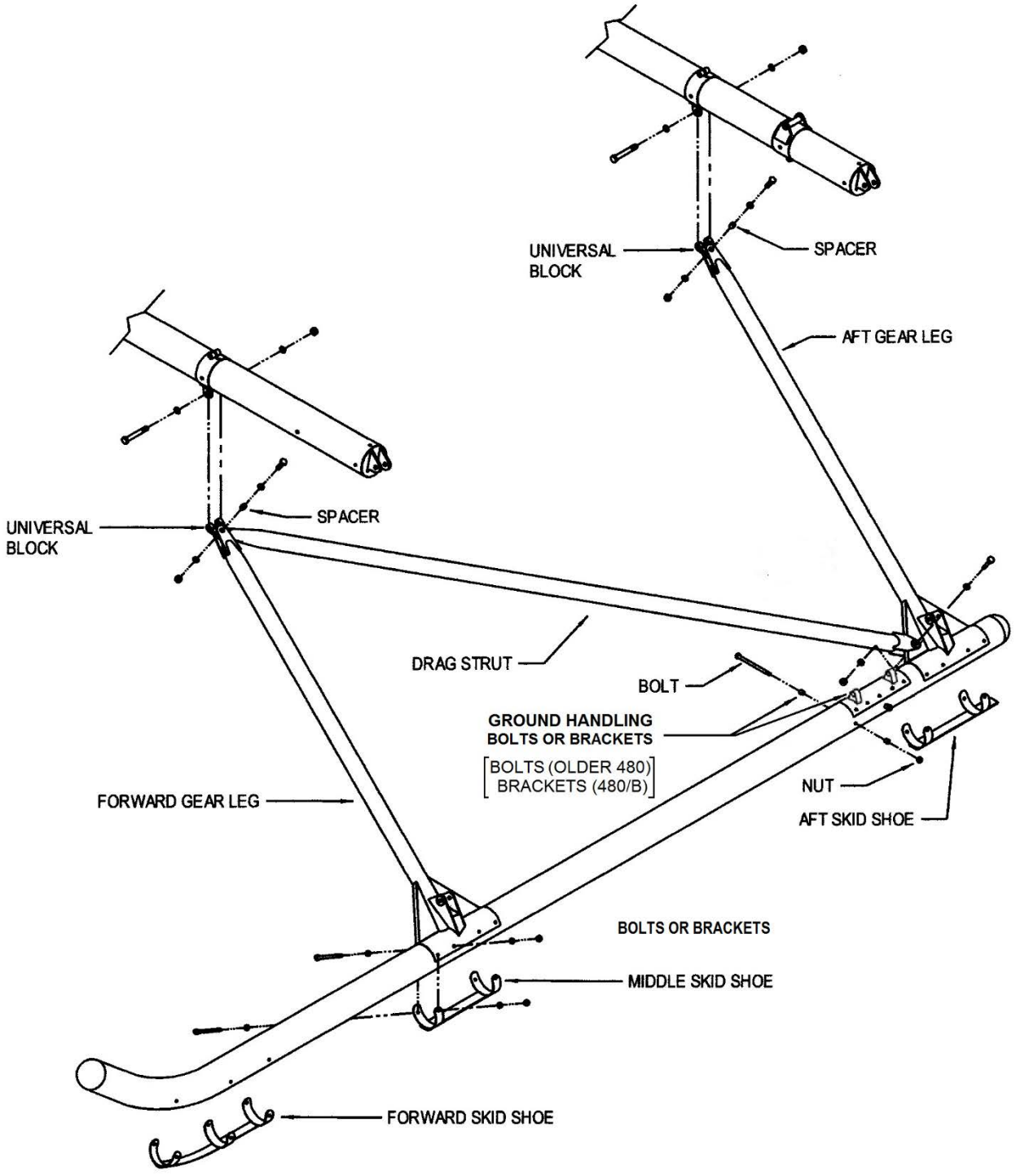


Sheet 1 of 2

Figure 8-6. Landing Gear Assembly

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Sheet 2 of 2

Figure 8-6. Landing Gear Assembly

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8-51. Disassembly – Landing Gear Assembly

NOTE

Disassembly of the landing gear is the same for both sides.

A. Remove the hardware and spacer attaching the universal blocks to the ends of the gear legs.

B. Remove the hardware attaching the drag strut to the aft gear leg and remove the strut.

C. Remove the hardware attaching the skid shoes and gear legs to the skid tube and remove the gear legs.

D. Remove the hardware attaching the forward skid shoe to the skid tube and remove the skid shoe.

E. Remove the attachment bolts or brackets, as applicable, for the ground handling wheels.

NOTE

Disassembly of the cross tubes is the same except as noted.

F. Remove the hardware securing the end caps into the cross tubes and remove the end caps.

G. Loosen the clamping hardware and remove the positioning hardware from the gear leg and the pylon attachment clamps and remove the clamps from the aft cross tube.

8-52. Inspection – Landing Gear Assembly

A. Inspect the cross tubes for bends, bows, corrosion, and cracks. Inspect the pylon attachment (aft cross tube) and the gear leg attachment clamps for corrosion, cracks, evidence of elongated bolt holes, and security of the attaching hardware.

B. Inspect the landing gear legs and drag struts for any deformation, distortion, all fittings and bolt holes for elongation, and all welds and gussets for cracks and corrosion.

C. Inspect the skid tubes for bends, bows, corrosion, cracks, dents, wear, and hardware attachment holes for elongation. Inspect the ground handling wheel attachment lugs for damage and security.

D. Inspect the skid shoes for wear (para. 8-62).

E. Inspect the oleos for damage, leakage, proper extension, and freedom of movement (para. 8-67).

F. Inspect all skid tube bolts for corrosion, especially if the helicopter is operated with the skids submerged, such as with floats.

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8-53. Repair – Landing Gear Assembly

A. Cross Tubes:

(1) Cross tubes with bows up to 0.5 inches/12.7mm are serviceable. Replace cross tubes with bends, cracks, or elongated bolt holes.

(2) Replace end caps that are cracked or the bolt holes are elongated. Repair pylon attachment (aft cross tube) or gear leg attachment clamps that are cracked by welding I/A/W AC 43.13-1B. Replace pylon attachment (aft cross tube) or gear leg attachment clamps that have elongated bolt holes.

B. Landing Gear Legs and Drag Struts:

(1) Landing gear legs and drag struts that are bent, bowed, or cracked may be repaired I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

(2) Replace landing gear legs with elongated bolt holes. Replace drag struts that have deformed, distorted, cracked, or elongated bolt holes (> 0.465 inch in any direction) of the forward attachment plate.

C. Skid Tubes:

(1) Skid tubes that are bent, bowed, dented, or have holes in them are repairable I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

(2) Replace skid tubes with elongated bolt holes.

8-54. Assembly – Landing Gear Assembly

NOTE

Assembly of the cross tubes is the same except as noted.

A. Install the gear leg clamps and the pylon attachment clamps onto the aft cross tube. Ensure all of the clamps are oriented properly.

(1) Line the holes up between the P/N 4174013-903 clamp and the cross tube.

NOTE

Perform step 2 only if installing a new replacement aft cross tube and/or clamps.

(2) Ream the holes using a 5/16 Chicago-Latrobe type 405 Chucking Reamer.

(3) Lubricate the attachment bolts with a light coat of MIL-PRF-81322 grease.

NOTE

Eductor must be aligned IAW para. 13-14 before tightening the aft clamp bolts.

(4) Install and tighten the positioning and clamping bolts.

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B. Install the end caps into the aft cross tube and in one side of the forward cross tube. Tighten the hardware.

NOTE

Assembly of the landing gear is the same for both sides.

C. Install the ground handling wheel attachment bolts or brackets, as applicable.

D. Install the forward skid shoe onto the skid tube.

E. Install the gear legs onto the skid tube. Install the two center bolts in the gear legs. Install the skid shoes into place and install the remaining hardware and tighten.

F. Attach the drag strut to the aft gear leg. Torque the hardware to 40-60 in-lbs/4.5-6.8 Nm.

G. Install the universal blocks onto the ends of the gear legs. Do not torque at this time.

8-55. Installation – Landing Gear Assembly

A. Install the forward cross tube as follows:

NOTE

Perform step 1 only if installing a new replacement forward cross tube.

(1) Ream the holes for the installation of the cross tube to the keel and the clamps to the cross tube using a 5/16 Chicago-Latrobe type 405 Chucking Reamer.

(2) Install the cross tube from the opposite side of the aircraft that the end cap is not installed in. Install the gear leg attachment clamps as the cross tube is installed into the keel assembly.

(3) Lubricate the attachment bolts with a light coat of MIL-PRF-81322 grease.

(4) Install the hardware securing the cross tube in the keel assembly and tighten.

(5) Install the positioning and clamping hardware into the gear leg attachment clamps and tighten.

(6) Install the end cap and tighten the hardware.

B. Install the aft cross tube onto the pylon and tighten the hardware.

C. Place the landing gear into position and install the hardware attaching the aft gear leg to the attachment clamp on the aft cross tube.

D. Install the hardware attaching the forward gear leg to the attachment clamp on the forward cross tube. Torque the gear leg and universal block attachment hardware to 40-60 in-lbs/4.5-6.8 Nm.

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E. Repeat steps 3 and 4 for the opposite side.

F. Install the oleos (para. 8-70).

G. Lower the aircraft to the ground.

H. Install the keel access panels.

8-56. Landing Gear Fairings

8-57. Removal – Landing Gear Fairings

A. TH-28, Serial Number 3006:

(1) Remove the fairings attached to the cabin and the fairings attached to the aft crosstube.

(2) Remove the two screws securing the top fairing on the oleos. Slide the fairing down to expose the oleo mounting hardware.

NOTE

The fairings on the oleos may be removed without removing the landing gear from the aircraft.

(3) Hoist the aircraft, disconnect the oleos and the gear legs from the crosstubes and remove the landing gear.

(4) Slide the top fairing from the oleos.

(5) Remove the screws securing the middle fairing on the oleos and remove the fairing.

(6) Loosen the hardware securing the steps and slide the step up and temporarily secure the steps with tape.

(7) Remove the screws securing the lower fairings and slide the fairings up to expose the bottom mounting hardware for the oleos.

(8) Remove the oleos from the landing gear and remove the lower fairings, lower fairing mounting clamps, and steps from the oleos.

(9) Mark the position of the mounting clamps for the fairings the remove the mounting clamps.

(10) Remove the screws securing the gear leg fairings to the gear legs and remove the fairings.

(11) Mark the position of the mounting clamps and remove the mounting clamps.

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B. TH-28, Serial Number 3007 and Subsequent and 480/B, Serial Number 5001 and Subsequent:

(1) Remove the fairings attached to the cabin and the fairings attached to the aft crosstube.

(2) Remove the screws securing the top fairings on the oleos. Slide the fairings down to expose the oleo mounting hardware.

NOTE

For aircraft which have incorporated SIL T-028, it is not required to hoist the aircraft or disconnect the top attachment point of the oleo from the cross tube to remove the fairings.

(3) Hoist the aircraft and disconnect the upper end of the oleos from the crosstubes. Remove the top fairings from the oleos.

(4) Remove the screws securing the lower fairings and completely loosen the clamp at the upper end of the fairings. Remove the lower fairings from the oleos.

(5) Disconnect the lower end of the oleos and remove them from the landing gear.

(6) Remove the landing gear from the aircraft.

(7) Loosen the clamps at the upper end of the landing gear leg fairings and remove the fairings from the landing gear legs.

8-58. Inspection – Landing Gear Fairings

A. Inspect the landing gear fairings for cracks, bends, dents, and security of installation.

8-59. Repair – Landing Gear Fairings

A. Replace hardware and mounting clamps that are unserviceable.

B. Repair damage to the fairings I/A/W AC 43.13-1B. Ensure that the repair does not affect the sliding operation of the fairing. Replace fairings that are economically unrepairable.

8-60. Installation – Landing Gear Fairings

NOTE

Install vinyl tape (electrician tape) under the mounting clamps to protect the gear legs and oleos.

A. TH-28, Serial Number 3006:

(1) Install the mounting clamps for the gear leg fairings onto the gear legs and install the fairings. Make adjustments to the mounting clamps as required.

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(2) Install the mounting clamps for the middle and top fairings. Install the steps onto the oleos and slide to the middle mounting clamp. Temporarily secure the steps in that location with tape.

(3) Install the lower fairings onto the oleos and slide them up against the step.

(4) Install the lower end of the oleo to the gear leg and slide the lower fairing into position and secure. Adjust the mounting clamp as required.

(5) Install the steps into position and tighten the mounting hardware.

(6) Install the middle and upper fairing onto the oleos and secure the middle fairing in place. Adjust the mounting clamp as required. Slide the upper fairing down over the middle fairing.

(7) Install the landing gear assembly onto the aircraft and connect the oleos to the crosstubes.

(8) Slide the top fairings into position and secure in place. Adjust the mounting clamps as required.

(9) Install the fairings onto the aft crosstube and the cabin.

B. TH-28, Serial Number 3007 and Subsequent and 480/B, Serial Number 5001 and Subsequent:

(1) Install the landing gear leg fairings onto the gear legs and tighten the mounting clamps.

(2) Install the landing gear onto the aircraft and install the oleos onto the landing gear.

NOTE

For aircraft which have not incorporated SIL T-028, it is required to disconnect the top attachment point of the oleo from the cross tube to install the fairings.

(3) Slide the lower fairing onto the oleo. Tighten the mounting clamp and install the screws to close the fairing.

(4) Install the top fairings onto the oleos and slide them down to connect the oleos to the crosstubes.

(5) Connect the oleos to the crosstubes. Slide the top fairings into position and install the screws to secure them in position.

(6) Install the fairings onto the aft crosstube and the cabin.

8-61. Skid Shoes

8-62. Inspection - Skid Shoes

A. Inspect the skid shoes for cracked or torn mounting straps and for excessive wear.

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8-63. Replacement - Skid Shoes

NOTE

Use the following procedures to replace any of the skid shoes.

A. Install the ground handling wheel and raise the side of the aircraft with the damaged or worn skid shoe. Place 4" X 4" blocks of wood under the skid tube to stabilize the aircraft.

B. Remove the hardware securing the damaged or worn skid shoe and remove the skid shoe.

C. Place the replacement skid shoe into position and insert the mounting hardware into the skid shoe and skid tube.

D. Using C-clamps, clamp the skid shoe into position.

E. Insert the mounting hardware completely through the skid tube until it contacts the skid shoe strap.

F. Press the skid tube strap against the skid tube and rotate the mounting hardware so that a mark will be made on the strap.

G. Remove the mounting hardware, C-clamps, and skid shoe.

H. Punch (preferred using a hand held "Whitney" punch) or drill the straps were the marks are for the mounting holes.

I. Install the skid shoes and mounting hardware. Use a small file to adjust the mounting holes in the skid shoe straps as required.

J. Remove the wooden blocks from beneath the skid tube and lower the aircraft.

8-64. Oleos

8-65. Oleos - Removal (Figure 8-7)

NOTE

Use the following procedures to remove any of the oleos.

A. Hoist up the aircraft.

B. Remove the oleos from the aircraft using the procedures for removing the fairings from the oleos.

C. Remove the hardware attaching the universal links to the oleo and remove the links.

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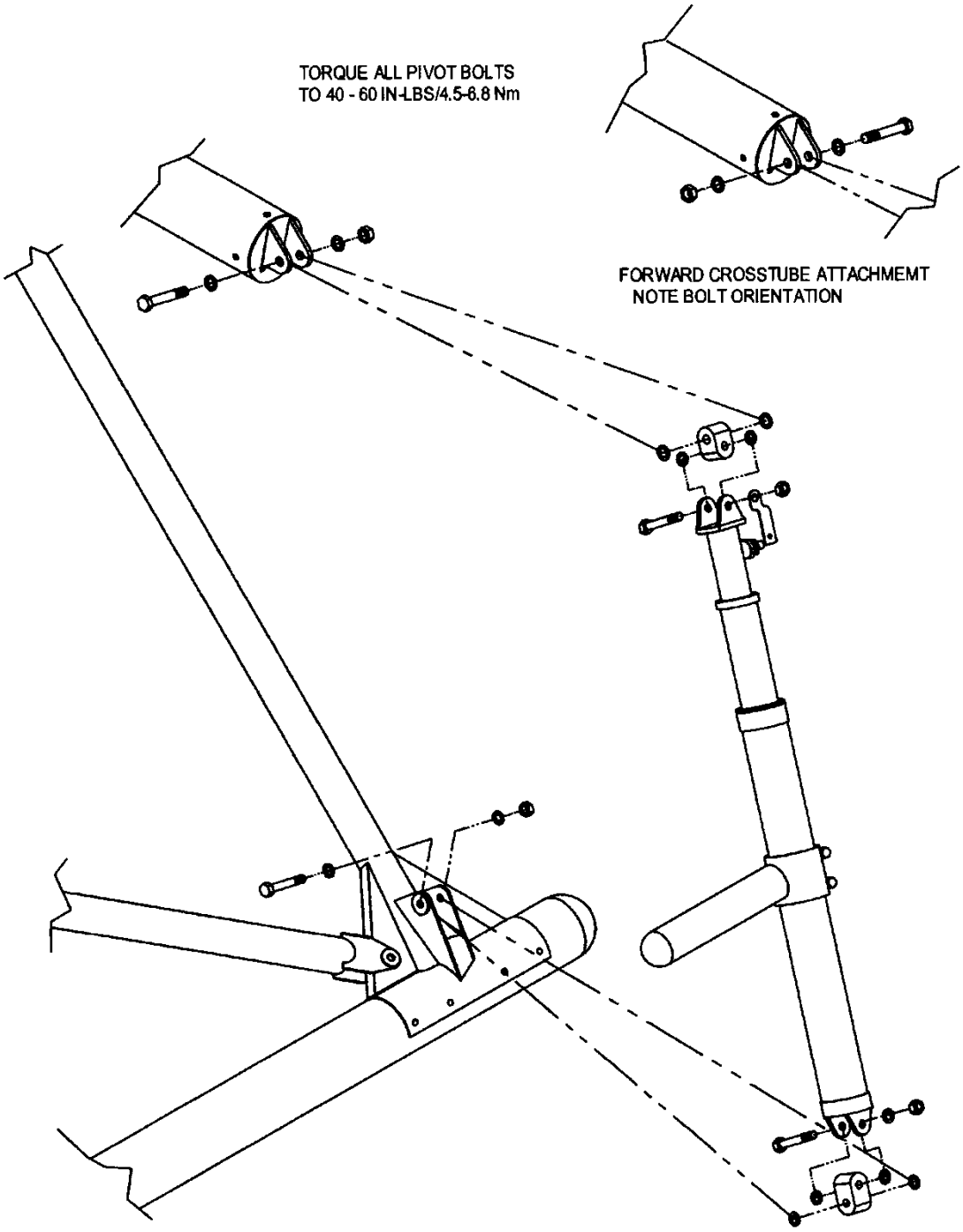
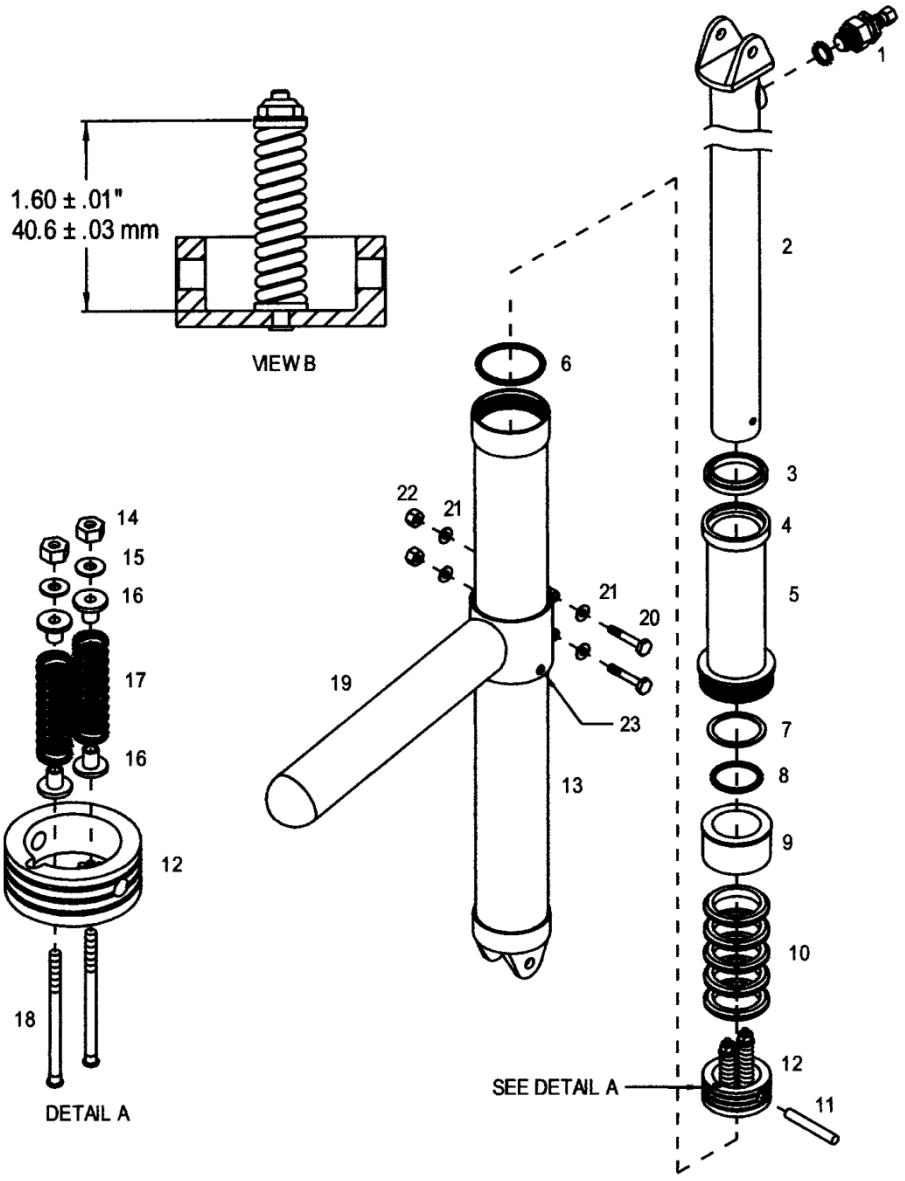


Figure 8-7. Oleo Strut Installation

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1. Valve Assembly
2. Piston Shaft
3. Wiper
4. Brass Guide
5. Guide Shaft Assembly
6. O-ring
7. Backup Ring
8. O-ring
9. Spacer
10. Rebound Rings
11. Pin
12. Piston
13. Cylinder Assembly
14. Nut
15. Washer
16. Valve Piston
17. Spring
18. Shaft
19. Step
20. Bolt
21. Washer
22. Nut
23. Rivet

Figure 8-8. Oleo Strut Assembly

8-66. Disassembly - Oleos (Figure 8-8)

NOTE

Use the following procedures to disassemble any of the oleos.

A. Remove the cap from the valve (1) and slowly open the valve to relieve the pressure in the oleo.

B. Remove the valve (1) and pour the hydraulic fluid into a suitable container.

C. Use a razor blade to cut paint line between the seal housing assembly (5) and the cylinder assembly (13).

D. Install tool T-0035 on the seal housing assembly (5) and T-0169-1 between the ears on the cylinder assembly (13).

CAUTION

Do not clamp the cylinder in a vise by the ears at the bottom of the cylinder.

E. Clamp T-0035 in a vise and use a wrench on tool T-0169-1 to unscrew the seal housing from the cylinder.

F. Slowly pull the piston assembly out of the cylinder assembly.

CAUTION

Use care in removing the dowel pin to prevent damage to the piston.

G. Lay the piston shaft assembly with the edge of the piston (12) on a block of wood, and using a flat punch remove the dowel pin (11).

H. Remove the piston assembly (13) from the piston shaft (2).

I. Remove the rebound rings (10) and the spacer (9).

J. Slide the guide shaft assembly (5) from the piston shaft.

K. Disassembly the guide shaft assembly (5) as follows:

(1) Remove the O-ring (6) from the O.D. of the threaded area.

(2) Remove the O-ring (8) and back-up ring (7) from the I.D. of the guide shaft assembly.

(3) Remove the wiper (3) from the brass guide (4).

(4) If the brass guide is worn or damaged, it can be removed by tapping out with a nylon drift.

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NOTE

Do not disassemble the piston assembly unless the piston or valves are worn or damaged.

L. Disassemble the piston assembly (12) if required as follows:

(1) Remove the nuts (14) and washers (15).

(2) Remove the valve pistons (16) and springs (17) from the shafts (18).

(3) Carefully press the shafts (18) from the piston (12).

8-67. Inspection - Oleos

A. Inspect the oleos for damage, leakage, proper extension, and freedom of movement.

B. When the strut is disassembled inspect the internal components I/A/W Table 8-1.

C. Inspect for the presence of the oleo condition placard (indicator strip).

8-68. Repair - Oleos

A. Damage to the lower end of the cylinder assembly may be repaired I/A/W AC 43.13-1B. Replace the cylinder assembly if the damage affects the piston stroke of the oleo or the bolt holes in the ears are elongated.

B. Repair or replace the internal components of the oleos I/A/W the repair/replacement criteria in Table 8-1.

C. Replace the oleo condition placard if it is damaged or is missing (para. 8-70.4).

8-69. Assembly - Oleos (Figure 8-8)

A. Assemble the piston assembly (12) if required as follows:

CAUTION

If excessive pressure is used to press the shafts into the piston, damage to the valve area of the piston can result.

(1) Carefully press the shafts (18) into the piston (12).

(2) Install the valve pistons (16) and springs (17) onto the shafts.

(3) Install the washers (15) and nuts (14).

(4) Adjust the valve and spring length to 1.60 inches ± .010 inches/40.6 mm ± .25 mm (See "View B").

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Table 8-1. Oleo Strut Assembly

P/N	Fig. 8-8 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
MS28889-2	1	Valve	Valve O-rings for cracks or tears	None Allowed	Not Repairable	Replace O-rings
28-17146-7	2	Piston Shaft	Shaft Dia. 1.2495 to 1.2515	-.0005	-.001	Return to factory for re-chrome and grind
			Nicks or scratches	None Allowed	Not Repairable	Replace Shaft
			Dowel pin hole Dia. .2490 to .2495	+.0005	Not Repairable	Replace Shaft
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Shaft
28-17144-1, -5	5	Guide Shaft Assembly	Brass guide bore Dia. 1.256 to 1.258	+.002	Not Repairable	Replace Brass Guide (P/N 28-17153)
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Guide Shaft
28-17149-1	9	Spacer	Nicks or scratches	None Allowed	≤ .010 deep	Blend and polish out smooth
28-17151-1	10	Rebound Rings	Cracks or tears	None Allowed	Not Repairable	Replace Rings
28-17147-3	11	Dowel Pin	O.D. .2495 to .2505	-.0002	Not Repairable	Replace Pin
28-17145-1	12	Piston	O.D. 1.762 to 1.763	-.001	Not Repairable	Replace Piston
			Dowel pin hole Dia. .2490 to .2495	+.002	Not Repairable	Replace Piston
			Scratches in O.D.	None Allowed	≤ .002 deep	Polish out smooth

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Table 8-1. Oleo Strut Assembly

P/N	Fig. 8-8 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
4174501-901	13	Cylinder Assembly	Piston bore Dia. 1.7645 to 1.7655	+.001	Not Repairable	Replace Cylinder
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Cylinder
			Bolt hole Dia. in ears .312	+.001	Not Repairable	Replace Cylinder

* All dimensions are in inches.

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B. Assemble the guide shaft assembly (5) as follows:

(1) Press the brass guide (4) into position if previously removed.

(2) Install the wiper (3) into the brass guide (4).

(3) Install the O-ring (6) on the O.D. of the guide shaft (threaded end).

CAUTION

The concave side of the back-up ring must face toward the O-ring.

(4) Install the back-up ring (7) and then the O-ring (8) into the groove in the I.D. of the guide shaft (threaded end).

C. Lubricate both ends of the guide shaft assembly with hydraulic fluid (MIL-PRF-5606) and install the guide shaft assembly onto the piston shaft (2).

CAUTION

The flanged end of the spacer faces towards the threads of the guide shaft assembly.

D. Install the spacer (9) onto the piston shaft (2).

CAUTION

The notches in the rebound rings must be staggered.

E. Install the rebound rings (5 each) (10) on to the piston shaft (2).

F. Align the flow passage port on the inner edge of the piston assembly (12) to the flow passage hole in the piston shaft (2) and install the piston assembly.

CAUTION

The ends of the dowel pin must be seated below the O.D. surface of the piston to prevent possible binding on installation in the cylinder assembly.

G. Secure the piston assembly to the piston shaft with the dowel pin (11).

CAUTION

The notches in the rebound rings must be staggered.

H. Slide the guide shaft assembly (5) and the rebound rings (10) up against the piston assembly (12).

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CAUTION

Do not clamp the cylinder in the vise by the ears at the bottom of the cylinder. Use tool T-0169-1.

I. Clamp the cylinder assembly (13) in a vise using tool T-0169-1 in an upright position. Fill the cylinder to the base of the threads with hydraulic fluid (MIL-PRF-5606).

CAUTION

The notches in the rebound rings must be staggered.

NOTE

The piston must be inserted into the cylinder assembly slowly to allow the hydraulic fluid to work through the staggered notches of the rebound rings and the flow passage in the piston assembly.

J. Install the piston and guide shaft assembly. Insert piston and guide assembly into the base of the cylinder assembly.

K. Hand tighten the guide shaft assembly to the cylinder assembly. Make an index mark from the guide shaft assembly (5) to the cylinder assembly (13).

L. Torque the guide assembly using tool T-0169-1. Using the index mark from step K above, torque the guide assembly to the cylinder assembly by turning the index mark on the cylinder assembly approximately 1/4 in/6 mm past the index mark on the guide assembly.

M. Install and secure oleo valve (1) and torque to 170-180 in-lb/19.2-20.3 Nm. Safety (0.032) the valve to the mount flange of the piston shaft. Loosen the air valve.

N. Attach one end of a clear plastic hose to the oleo valve and the other end in a container of MIL-PRF-5606. Open the oleo valve. Slowly pump the strut in and out until the hose is free of air bubbles when compressing the oleo assembly. Fully collapse the strut, tighten the air valve, and remove the hose.

O. Torque the guide assembly using T-0169-1. Using the index mark, torque the guide assembly to the cylinder assembly by turning the index mark on the cylinder assembly approximately ¼ inch past the index mark on the guide assembly.

NOTE

The oleo may be pressurized before or after installation in the helicopter.

P. Connect the nitrogen pressure line to the oleo valve. Set the nitrogen pressure regulator to 550 psig/3790 kPa for the aft oleos and 250 psig/1720 kPa for the forward oleos. Remove oleo from the vise and remove tools T-0035 and T-0169-1.

WARNING

The piston shaft will extend when the oleo valve is opened.

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Q. **Slowly** open the oleo valve and allow the oleo to fill until the piston shaft is fully extended and the oleo pressure has equalized to the regulator pressure. Close the oleo valve.

R Close the nitrogen tank valve, set the regulator pressure back to zero, and disconnect the nitrogen pressure line from the oleo valve.

S. Install the valve cap.

T. Inspect the oleo for leaks.

8-70. Installation – Oleos (See Figure 8-7)

NOTE

If required, install the oleo condition placard (para. 8-70.2) prior to lowering the aircraft.

Use the following procedures to install any of the oleos.

Refer to SIL T-028 to facilitate oleo fairing installation. If SIL T-028 has not been complied with, install the fairings for the oleos while installing the oleos.

A. Install the top and bottom universal block to the oleo assembly.

NOTES

The P/N 4174027-11 bolt used to attach the universal to the oleo is a special bolt with the head thickness and thread length decreased. Install the bolt so that the nut will be facing outward when the oleo is installed on the aircraft.

Install the bolt attaching the forward oleos to the crosstube with the bolt head facing aft.

Lubricate the attach bolt hardware with LPS 2, ACF 50, or MIL-PRF-81322 grease and install while wet.

(1) Place a light washer on each side of the universal link and install the link between the mounting ears of the cross tube. Secure using a bolt, heavy washers, and a nut.

(2) Install the oleo with the valve facing aft to the top cross tube.

(3) Connect a spring scale to the bottom hole in the bottom universal link and torque the top attachment hardware until it requires 2 lb force to swing the oleo strut assembly in and out and fore and aft.

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(4) Use a beam type in/lb torque wrench to record the torque on the nut that is installed on the bolt facing aft.

(5) Place a light washer on each side of the universal link and connect the bottom universal block to the landing gear leg.

(6) Remove the hardware connecting the top of the oleo to the cross tube. Set the hardware aside in the same position and order for installation.

(7) Connect the spring scale to the top hole in the top universal link and torque the attachment hardware at the bottom universal block connections with a required 2 lb drag as in step 3 above.

(8) Reinstall the top universal link to the cross tube. Ensure the hardware is installed in the position and order as previously installed.

(9) Tighten the nut to the torque setting recorded in step 4.

B. Pressurize the oleos in accordance with para. 8-70, steps O through S if not pressurized previously.

C. Lower the aircraft.

D. Check the oleos for proper extension and adjust as required.

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8-70.1. Oleo Condition Placard

8-70.2. Installation – Oleo Condition Placard (Figure 8-8.1)

NOTE

The following procedure is typical for all the oleo/fairing assemblies.

NOTE

For aircraft which have incorporated SIL T-028, it is not required to hoist the aircraft or disconnect the top attachment point of the oleo from the cross tube to remove the fairings.

A. Hoist (para. 4-68) or jack up the aircraft (para. 4-69), if not previously accomplished.

B. Remove the upper fairing (para. 8-57), if not previously accomplished.

C. Install the oleo condition placard (indicator strip) as shown in Figure 8-8.1.

(1) Position the placard on the inboard side of the centerline of the lower fairing.

(2) Center the green band of the placard on the dimension referenced from the universal block upper bolt (the long yellow band on top).

(3) Cover the placard with transparent tape (3M, #5430).

D. Lower the aircraft.

E. Reinstall the fairing, as required (para. 8-60).

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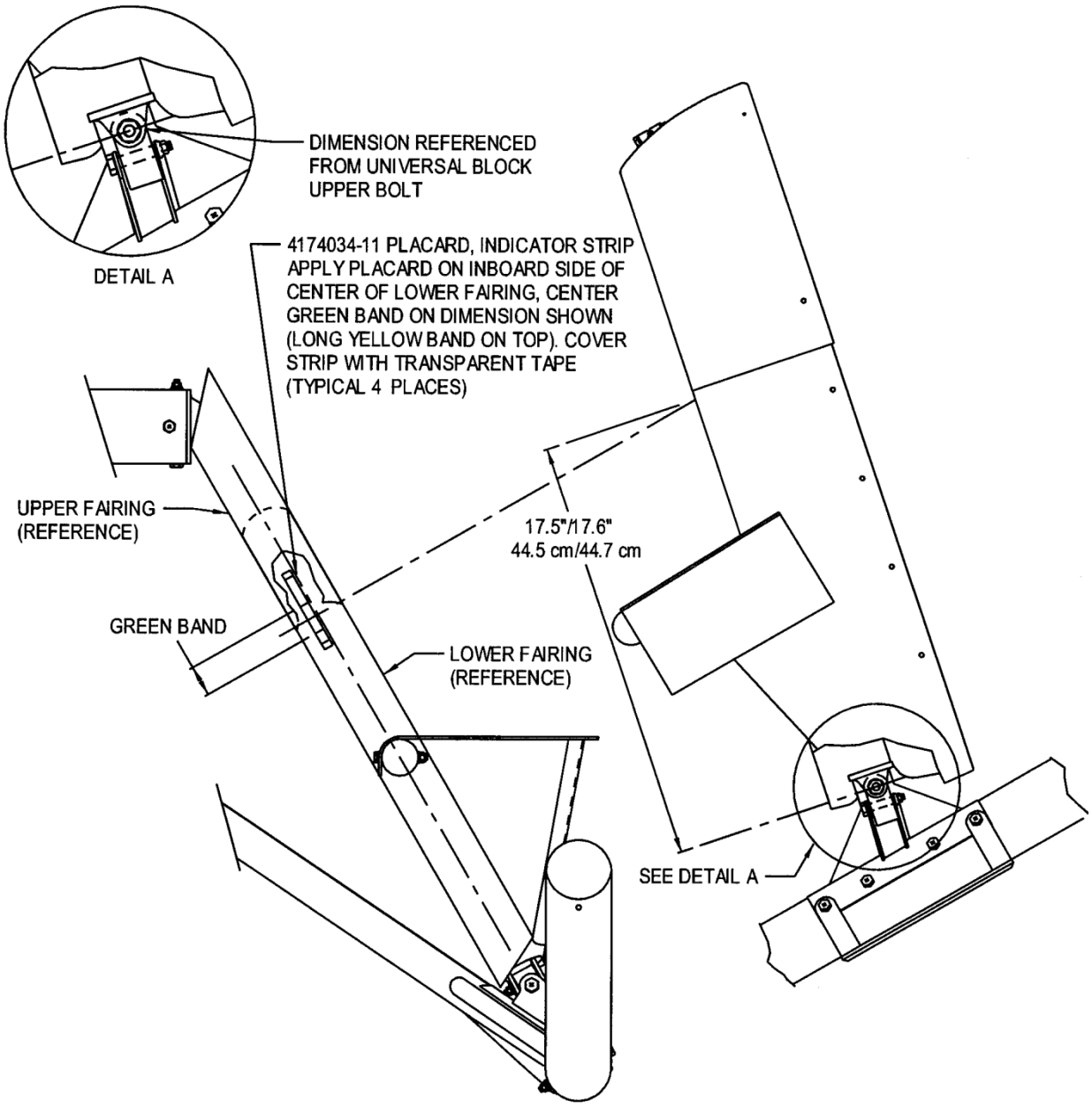


Figure 8-8.1. Oleo Condition Placard Installation

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8-71. Fuel Cell Support Structures

8-72. Description – Fuel Cell Support Structures

The fuel cell support structures, which are mounted to the pylon assembly and the cowl ring, are made of composite honeycomb panels and conform to the shape of the fuel cells.

8-73. Removal – Fuel Cell Support Structures

A. Defuel the aircraft (para. 4-5).

NOTE

Do not remove both fuel cells if only one support structure is going to be removed.

B. Remove the fuel cells (para. 10-4).

NOTE

Note the location and thickness of any shims and retain for reinstallation.

C. Remove the hardware securing the support structure(s) to the mounting brackets on the cockpit bulkhead, aft cowl ring, pylon assembly, and the support structure/engine access panel mounting bracket.

D. Remove the support structure from the aircraft.

8-74. Inspection – Fuel Cell Support Structures

A. Inspect the fuel cell support structure for obvious damage, loose inserts, and the condition and security of the hardware securing the support structure to the pylon and mounting supports.

B. The right hand fuel cell support structure in aircraft serial numbers 5134, 5136 through 5197 has an EMI/RFI shielding coating. Inspect the coating for cracks, blisters, or any areas exhibiting a lack of adhesion.

8-75. Repair – Fuel Cell Support Structures

A. Replace damaged or missing hardware.

B. Repair damage to the fuel cell support structure I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

C. Reference paragraph 8-76 for making repairs to the shielding coating.

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8-76. Installation – Fuel Cell Support Structures

NOTE

Steps A, B, and G below apply to aircraft having an EMI/RFI shielding coating on the surfaces of the right hand fuel cell structure (S/N 5134, 5136 through 5197).

A. The pylon mounting surface must be clean and free of paint. If required, apply Kopr-Shield #CP8-TB to the pylon surface before installing mounting washer.

B. If required, apply Kopr-Shield #CP8-TB to the washer surface that is in contact with the shielding coating.

C. Install the support structure into the aircraft.

NOTE

Install any shims found during disassembly. If the support structure was replaced, check the areas where the shims were installed and reshim if required.

D. Install the mounting hardware and tighten.

E. If not installed, install the gaskets for the sump drain and fuel supply lines. Use sealant meeting AMS-S-8802 Type II Class B as the adhesive.

NOTE

Use sealant meeting AMS-S-8802 Type II Class B. Follow the mixing instructions for the sealant. Allow the sealant to cure for 24 hours.

F. Seal the seams between the support structure and the mounting brackets on the cockpit bulkhead, the support structure and the support structure/engine access panel mounting bracket, and the mounting hardware in the support structure.

NOTE

The right hand support structure has an EMI/RFI shielding coating applied on the fuel cell side of the support structure at the time of manufacture.

G. If the shielding coating has been removed due to repair or inspection, touch-up or apply a new coat of Electrodag 437 to the support structure.

1) Lightly sand the structure surface and wipe off the residue. The surface must be dry prior to applying the coating.

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2) Spray-apply a two-pass coating to ensure coverage. A brush may be used for touch-up areas. Ensure a coating thickness of 0.002 to 0.003 inches (50-75 µm).

3) Allow to cure for 24 hours. Touch-up or second coats must be applied within 5 minutes or before flash-off of the first coat occurs or after 24 hours.

NOTE

Washers coated with Kopr-Shield are installed under the screw head with the coated surface in contact with the support structure.

NOTE

The support structures have a fuel resistant coating applied on the fuel cell side of the support structure at the time of manufacture.

H. If the fuel resistant coating has been removed due to repair or inspection, apply a coat of 3M brand EC-776 sealant to the support structure. Allow to cure for 24 hours.

I. Install the fuel cells (para. 10-8).

8-77. Oil Cooler Assembly Shelf

8-78. Description – Oil Cooler Assembly Shelf

The oil cooler assembly shelf is a composite honeycomb panel mounted in the aft end of the pylon assembly. It supports the engine oil cooler, engine oil cooler blower and the associated ducting, and components of the avionics/electrical system.

8-79. Removal – Oil Cooler Assembly Shelf

NOTE

If the optional baggage compartment is installed, the forward bulkheads of the baggage compartment will have to be removed.

A. Remove the blower air ducts (para. 13-82).

B. Remove the blower assembly (para. 13-75).

C. Remove the oil cooler (para. 13-65).

D. Remove the avionics/electrical components.

E. Remove the hardware securing the oil cooler assembly shelf and remove the shelf from the aircraft.

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8-80. Inspection – Oil Cooler Assembly Shelf

A. Inspect the oil cooler assembly shelf for obvious damage, loose inserts, and the condition and security of the hardware securing the shelf to the mounting brackets.

B. Inspect the mounting brackets for damage and security.

8-81. Repair – Oil Cooler Assembly Shelf

A. Replace damaged or missing hardware.

B. Repair damage to the oil cooler assembly shelf or the mounting brackets I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

8-82. Installation – Oil Cooler Assembly Shelf

A. Install the shelf into the aircraft. Install and tighten the mounting hardware.

B. Install the avionics/electrical components.

C. Install the oil cooler (para. 13-68).

D. Install the blower assembly (para. 13-80).

E. Install the blower air ducts (para. 13-85).

8-83. Baggage Compartment

8-84. Description – Baggage Compartment

The baggage compartment consists of a composite honeycomb shelf mounted in the forward portion of the tailcone and sheet-metal bulkheads used to form the compartment.

8-85. Removal – Baggage Compartment

A. Remove the baggage compartment door.

B. Remove the hardware securing the bulkheads to the mounting structure and brackets. Remove the bulkheads from the aircraft.

C. Remove the hardware securing the shelf and remove the shelf from the aircraft.

8-86. Inspection – Baggage Compartment

A. Inspect the baggage compartment shelf and bulkheads for obvious damage, loose inserts, and the condition and security of the hardware.

B. Inspect the mounting brackets for damage and security.

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8-87. Repair – Baggage Compartment

A. Replace damaged or missing hardware.

B. Repair damage to the baggage compartment shelf, bulkheads, or the mounting brackets I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

8-88. Installation – Baggage Compartment

A. Install the shelf into the aircraft.

B. Install and tighten the mounting hardware.

C. Install the bulkheads into the aircraft and install the mounting hardware.

D. Install the baggage compartment door.

8-89. Tailcone

8-90. Description – Tailcone

The tailcone is a semi-monocoque structure that supports the horizontal and vertical stabilizers, tail rotor drive train, tail rotor transmission, tail rotor assembly, extension tube, tail rotor guard, and avionics/electrical components. The tailcone is attached to the aft end of the pylon assembly in three places.

8-91. Removal – Tailcone

A. Remove the upper plenum/air inlet (para. 13-28).

B. Remove the aft bottom cowling.

C. Remove the baggage compartment (para. 8-85).

D. Remove the oil cooler assembly shelf (para. 8-79).

E. Remove the tail rotor short shaft (para. 11-63).

F. Remove the horizontal stabilizers (para. 8-97).

G. Remove the tail rotor control cables from the tailcone as follows:

(1) Disconnect the tail rotor control cables from the tail rotor transmission.

(2) Remove the cotter pins from the guide holes in the pulleys in the tailcone.

(3) Attach strings to the tail rotor cables and pull the cables from the tailcone.

(4) Detach the strings and leave in the tailcone.

(5) Coil the tail rotor cables and secure out of the way.

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H. Disconnect the electrical connector located on the right side of the forward bulkhead of the tailcone.

I. Disconnect and remove the leads to the avionic components located in the tailcone.

J. Disconnect the static lines from the static air inlets in the forward end of the tailcone.

K. Detach any avionics/electrical wiring that does not stay in the tailcone from its mounting device located in the tailcone.

NOTE

Proceed to paragraph 8-94, Replacement - Tailcone, if the tailcone is going to be replaced before removing the tailcone from the aircraft.

L. Place two (2) supporting fixtures under the tailcone to support the tailcone during removal.

CAUTION

If any shims are found between the tailcone and the pylon assembly, they must be reinstalled with a new tailcone.

CAUTION

Use care when removing the tailcone to prevent from damaging the tail rotor assembly and/or transmission.

NOTE

If the tailcone will be reinstalled, record placement and stackup of shims between tailcone and pylon mounts. Shims are reinstalled in the same position.

M. Remove the three bolts and shims (if used) securing the tailcone to the pylon assembly and remove the tailcone (Refer to Figure 8-9).

8-92. Inspection – Tailcone

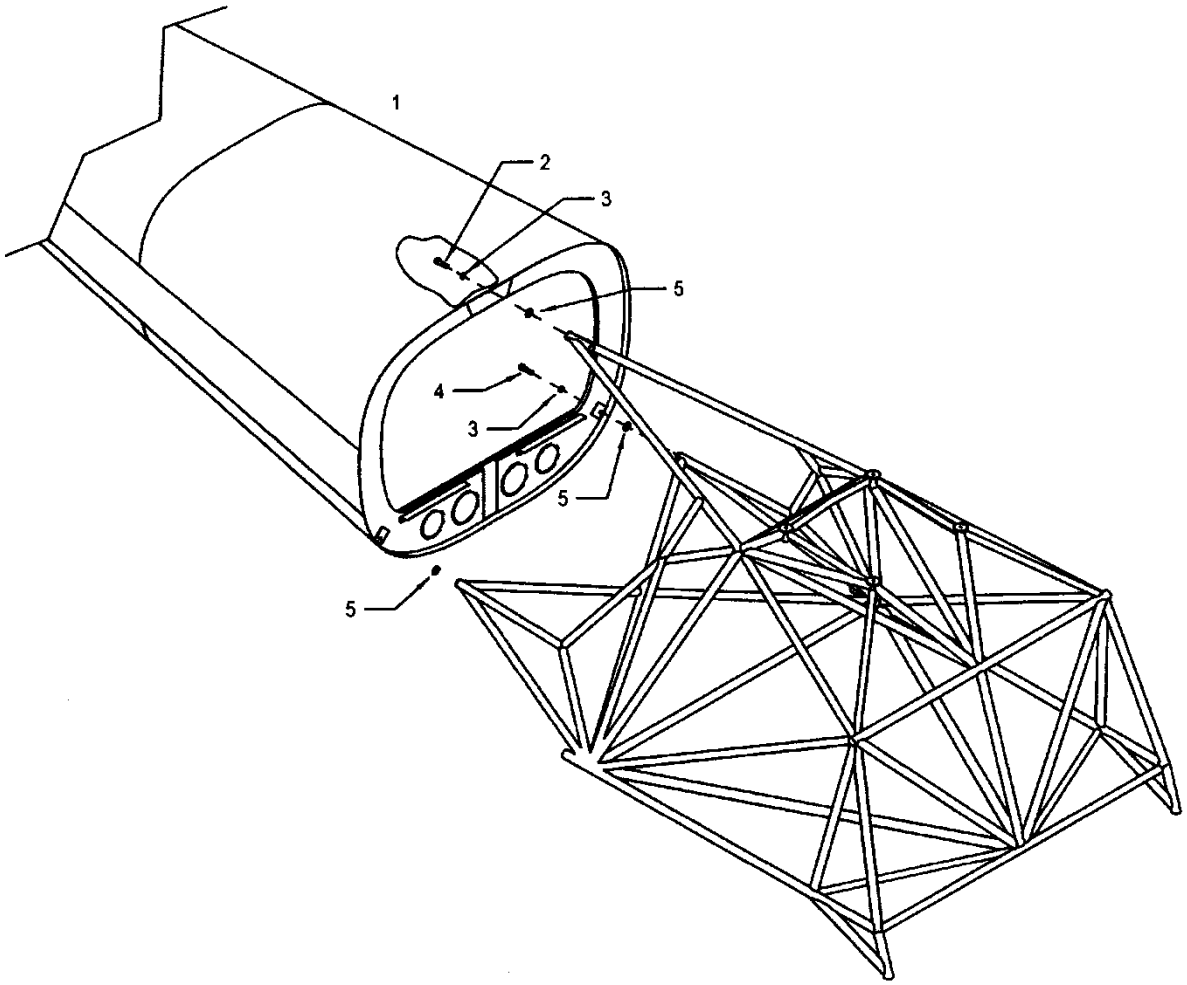
A. Inspect the tailcone for buckling, corrosion, cracks, dents, and working rivets.

8-93. Repair – Tailcone

A. Repair damage to the tailcone I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

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1. Tailcone
2. Bolt
3. Washer
4. Bolt
5. Shim (Washer)

Figure 8-9. Tailcone Installation

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8-94. Replacement - Tailcone

A. Remove the tail rotor guard (para. 8-114).

NOTE

The tail rotor transmission can be removed with the tail rotor assembly installed.

B. Remove the tail rotor transmission (para. 11-88).

C. Remove the horizontal stabilizer spar (para. 8-104).

D. Remove the long tail rotor drive shaft (para. 11-69) and drive shaft covers.

NOTE

Note the location and routing of the avionics and electrical components and the associated wiring.

NOTE

Support the tailcone under the mounting bracket for the tail rotor guard. Install a plank into the tailcone and set it on the first three bulkheads (shim as required) to aid in the removal/installation of the avionics/electrical components and wiring.

E. Remove the avionics and electrical components and wiring installed in the tail cone.

F. Remove the tailcone from the aircraft (para. 8-91) and install the replacement tailcone (para. 8-95).

NOTE

The replacement tailcone will have the extension tube and tail rotor cable pulleys installed.

G. Install the avionics and electrical components and wiring into the tailcone.

H. Install the tail rotor transmission (para. 11-92) and the tail rotor assembly (para. 9-51).

I. Install the tail rotor guard (para. 8-117).

J. Install the horizontal stabilizer spar (para. 8-107).

K. Install the tail rotor drive shafts (short and long) (para. 11-67 and 11-73), align the drive shafts (para. 11-61), and install the covers.

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L. Proceed to paragraph 8-95, Installation - Tailcone.

8-95. Installation - Tailcone

NOTE

Tailcone installation requires a person at each end to lift and align the tailcone to the pylon assembly.

NOTE

If installing a replacement tailcone go to paragraph 8-94.

A. Align the tailcone to the pylon assembly and install the bolts and shims (if used) (Refer to Figure 8-9). Torque the bolts to 240 in-lbs/27.3 Nm and safety with .032 wire.

B. Connect the lower plenum static line and electrical connector to the air inlet differential pressure switch.

C. Install and connect the leads to the avionic components located in the tailcone.

D. Connect the electrical connector located on the right side of the forward bulkhead of the tailcone.

E. Install the tail rotor control cables as follows:

(1) Uncoil the control cables and attach the strings in the tailcone.

(2) Pull the cables through the tailcone and detach the strings.

(3) Ensure the cables are correctly routed over the pulleys in the tailcone and install the cotter pin safeties.

CAUTION

The connecting links must pivot freely at the cable connections.

(4) Connect the control cables to the tail rotor transmission, check the cable tension (para. 12-99), and tail rotor rigging (para. 12-100).

F. Install the horizontal stabilizers (para. 8-102).

G. If the tailcone was not replaced, install the tail rotor short shaft (para. 11-67).

H. Attach/reconnect all the avionics/electrical wiring to its mounting/support devices.

I. Install the oil cooler assembly shelf (para. 8-82).

J. Install the baggage compartment (para. 8-88).

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K. Install the aft bottom cowling.

L. Install the upper plenum/air inlet (para. 13-31).

8-96. Horizontal and Vertical Stabilizers (Figure 8-10)

8-97. Removal - Horizontal and Vertical Stabilizers

NOTE

The removal procedures are the same for both stabilizers.

A. Remove the aft tailcone/horizontal spar access panel.

B. Loosen the three clamping bolts located in the horizontal stabilizer.

NOTE

Mark the position of the bolts securing the aft spar if more than one set of holes exists in the aft spar.

C. Remove the bolts securing the horizontal stabilizer aft spar to the tailcone.

D. Pull the stabilizer off of the main spar approximately 2 - 3 inches/5-8 cm and disconnect the electrical connectors for the anti-collision and navigation lights.

E. Pull the stabilizer off of the main spar.

8-98. Disassembly - Horizontal and Vertical Stabilizers

NOTE

The horizontal stabilizer does not have to be removed from the aircraft to remove the vertical stabilizer.

NOTE

Disassembly procedures are the same for both stabilizers.

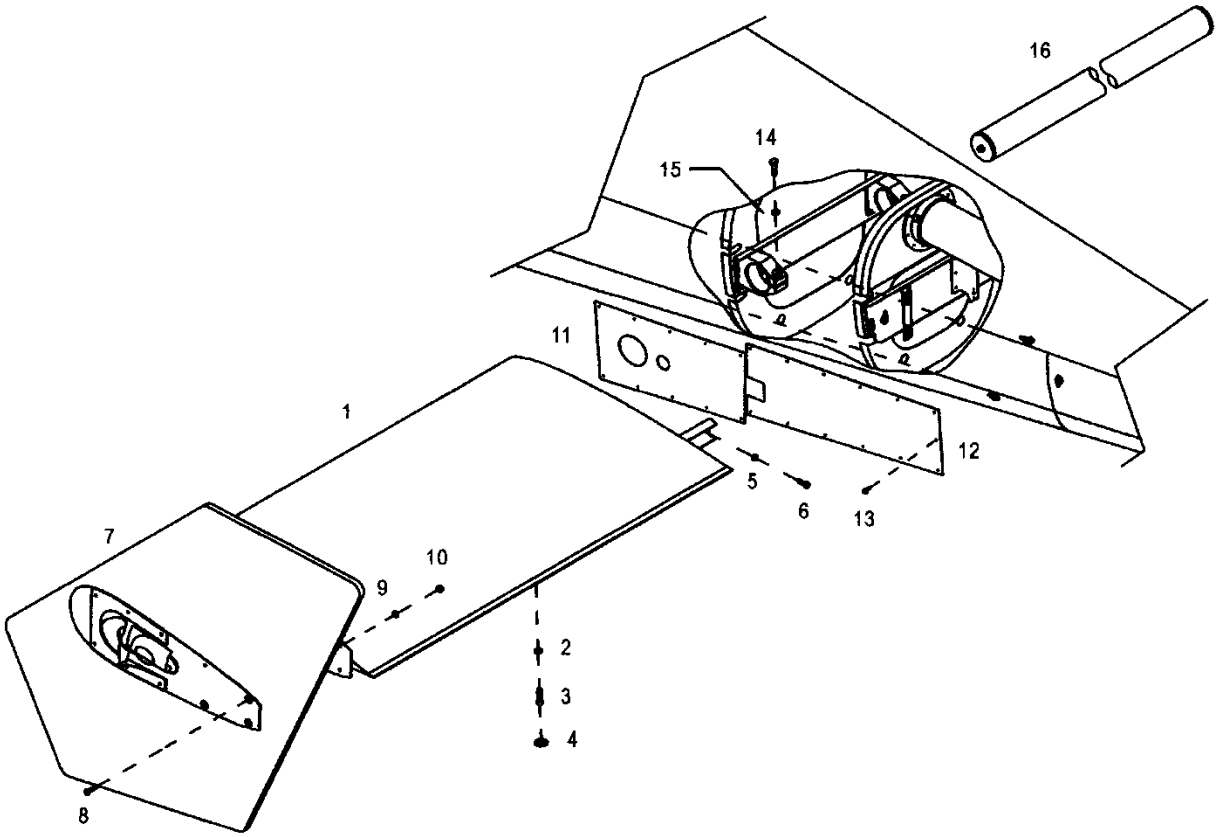
A. Remove the glare shield and anti-collision/navigation light assembly and from the vertical stabilizer and disconnect the electrical connectors.

B. If required, remove the electrical wiring from the horizontal stabilizer.

C. Remove the remaining hardware securing the vertical stabilizer to the horizontal stabilizer and separate the stabilizers.

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1.	Stabilizer Assembly	9.	Washer
2.	Washer	10.	Nut
3.	Bolt	11.	Access Panel
4.	Cap	12.	Access Panel
5.	Washer	13.	Screw
6.	Bolt	14.	Bolt
7.	Vertical Stabilizer	15.	Washer
8.	Screw	16.	Spar Assembly

Figure 8-10. Horizontal/Vertical Stabilizer Installation

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8-99. Inspection - Horizontal and Vertical Stabilizers

A. Inspect the horizontal stabilizer for corrosion, cracks, security of installation, and working rivets.

B. Inspect the vertical stabilizer for cracks, loose inserts, obvious damage, and security of installation.

8-100. Repair - Horizontal and Vertical Stabilizers

A. Repair the horizontal and vertical stabilizers I/A/W AC 43.13-1B. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations.

8-101. Assembly - Horizontal and Vertical Stabilizers

NOTE

The horizontal stabilizer does not have to be removed from the aircraft to install the vertical stabilizer.

NOTE

Assembly procedures are the same for both stabilizers.

A. Place the vertical stabilizer into position on the horizontal stabilizer. Install and tighten the aft four bolt assemblies securing the vertical stabilizer to the horizontal stabilizer.

B. If removed, install the electrical wiring into the horizontal stabilizer for the anti-collision/navigation light assembly.

C. Reconnect the anti-collision/navigation light assembly to its wiring and reinstall onto the vertical stabilizer.

D. Install the glare shield and remaining bolt assemblies securing the vertical stabilizer.

8-102. Installation - Horizontal and Vertical Stabilizers

NOTE

The installation procedures are the same for both stabilizers.

A. Install the horizontal stabilizer onto the main spar and slide toward the tailcone until approximately 2 -3 inches/5-8 cm from the tailcone.

B. Connect the wiring for the anti-collision and navigation lights and slide the stabilizer completely onto the spar.

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NOTE

Ensure the bolts are installed in the set of holes marked before removal if more than one set of holes exists in the spar.

C. Install and tighten the hardware securing the stabilizer aft spar to the tailcone.

D. Tighten the three clamping bolts located in the horizontal stabilizer to 50-70 in-lbs/5.7-8.0 Nm.

E. Install the aft tailcone/horizontal spar access panel.

8-103. Horizontal Stabilizer Spar (Figure 8-10)

8-104. Removal - Horizontal Stabilizer Spar

A. Remove the horizontal stabilizers.

B. Remove the forward tailcone/horizontal spar access panels.

NOTE

The tie rod assembly does not have to be removed to remove the spar.

C. Remove the hardware securing the tie rod and end caps to the spar and remove the tie rod and end caps.

D. Loosen the clamping bolts in the mounting clamps securing the spar in the tailcone.

E. Carefully remove the spar from the mounting clamps and tailcone.

8-105. Inspection - Horizontal Stabilizer Spar

A. Inspect the horizontal stabilizer spar for, corrosion, cracks, nicks, scratches, condition and security of the mounting clamps, and security of the installation.

8-106. Repair - Horizontal Stabilizer Spar

A. Corrosion, nicks, and scratches not exceeding 0.005 inch/.13 mm in depth may be polished out. Replace the spar if cracked or damage exceeds 0.005/.13 mm inch in depth.

B. Replace the mounting clamps if cracked.

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8-107. Installation - Horizontal Stabilizer Spar

A. Lightly coat the spar with MIL-PRF-81322 grease. Install the spar into the mounting clamps and position so that the length of the spar extending from the mounting clamps is the same on both sides.

B. Tighten the clamping bolts to 50 to 70 in-lbs/5.7-8.0 Nm.

NOTE

Ensure the end caps are centered on the spar or the horizontal stabilizers will not slide on the spar.

NOTE

Ensure a torque of 50 in-lb/5.6 Nm on the nuts installed on the ends of the threaded rod assembly prior to installation of the horizontal stabilizer.

C. If removed, install the tie rod and end caps into the spar and tighten the hardware (torque of 50 in-lb/5.6 Nm).

D. Install the forward tailcone/horizontal spar access panels.

E. Install the horizontal stabilizers.

8-108. Extension Tube (Figure 8-11)

8-109. Removal - Extension Tube

NOTE

The tail rotor assembly does not have to be removed from the tail rotor transmission.

A. Remove the tail rotor transmission (para. 11-88).

B. Remove the tail rotor guard.

C. Remove the aft tailcone/horizontal spar access panels.

D. Remove the aft tail rotor drive shaft cover and remove the bolts securing the aft tail rotor drive shaft bearing pillow block.

E. Remove the three attachment bolts from the forward end of the extension tube in the tailcone.

F. Remove the bolts from the extension tube clamp and remove the tube by pulling aft with a slight oscillating motion.

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8-110. Inspection - Extension Tube

A. Inspect the extension tube for corrosion, cracks, dents, nicks, scratches, elongated bolt holes, condition and security of the nutplates installed in the end of the tube, and security of the installation.

B. Inspect the extension tube mounting clamp for condition, damage, and security.

8-111. Repair – Extension Tube

A. Corrosion, nicks, and scratches not exceeding 0.008 inch/.2 mm may be polished out. Replace damaged nut plates. Replace the extension tube if cracked, damage exceeds 0.008 inch/.2 mm, or the tail rotor transmission screw holes are elongated.

B. Replace the mounting clamp if cracked or damage makes it unserviceable.

8-112. Installation – Extension Tube

A. Lightly coat the end of the extension tube with Lubriplate 630-AA (MIL-PRF-81322). Note the orientation of the tube and install the tube into the tailcone.

B. Install and tighten the hardware securing the tube to its mount in the tailcone. Install the aft tailcone/horizontal spar access panels.

NOTE

The top half of the extension tube clamp is not symmetric. If there is interference between the clamp and the bulkhead, turn the clamp 180°.

C. Install the top half of the extension tube clamp. Ensure clearance with the bulkhead. Install the clamping bolts and torque (50-70 in-lb/5.6-7.9 Nm). Check that the difference between the gap on both sides of the clamp is within 0.010 inch/.25 mm, adjust as required.

D. Install and tighten the bolts securing the aft tail rotor drive shaft bearing pillow block. Safety wire with .032 wire and install the aft tail rotor drive shaft cover.

E. Install the tail rotor transmission (para. 11-92). If removed from the tail rotor transmission, install the tail rotor assembly (para. 9-51).

F. Install the tail rotor guard.

G. Check the tail rotor control cable tension and rigging (para. 12-99 and 12-100).

8-113. Tail Rotor Guard (Figure 8-11)

8-114. Removal - Tail Rotor Guard

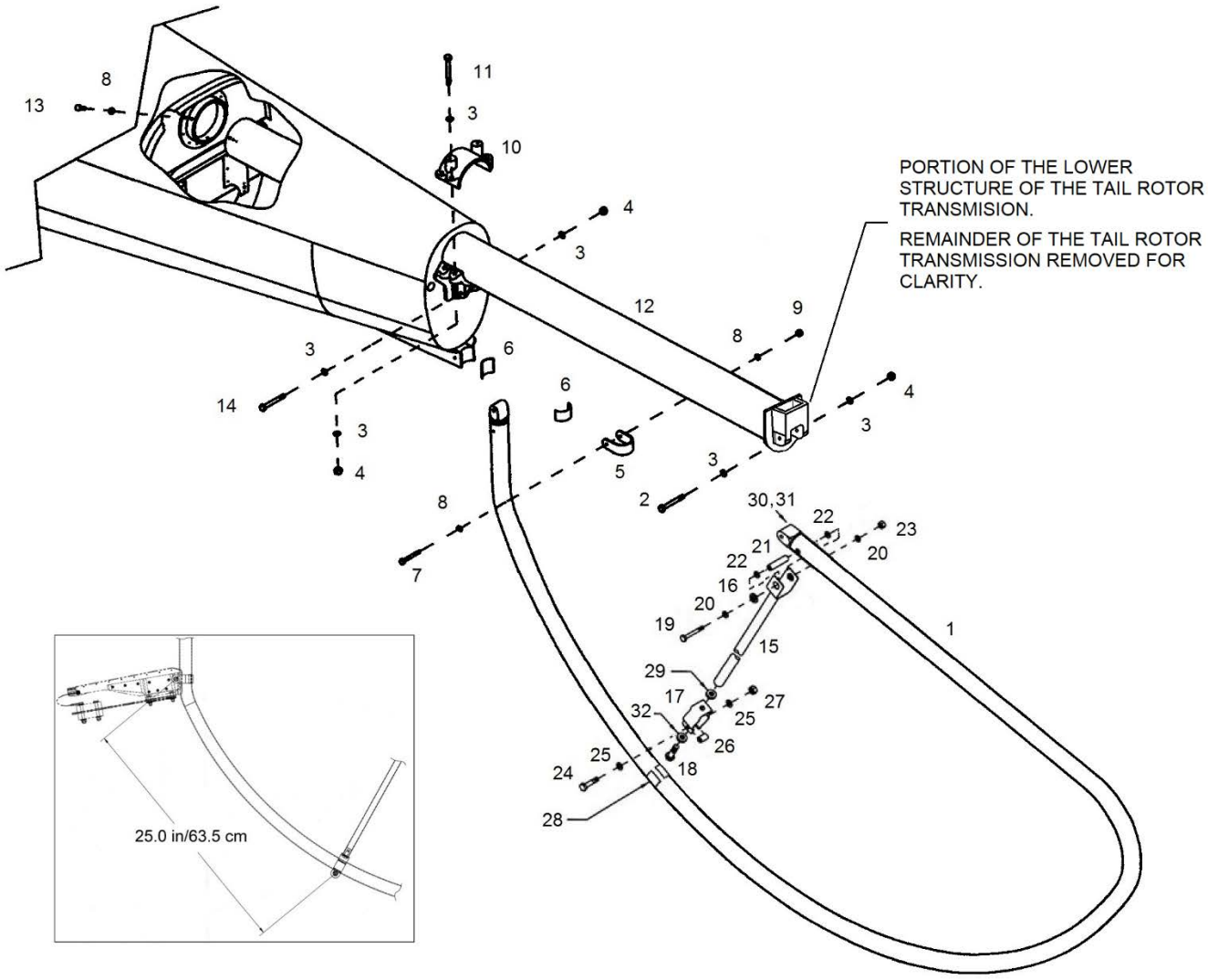
A. Remove the hardware from the mounting clamp on the tailcone.

B. Remove the hardware securing the tail rotor guard to the extension tube clamp and the tail rotor transmission.

C. Remove the tail rotor guard.

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1.	Tail Rotor Guard	12.	Extension Tube	23.	Nut
2.	Bolt	13.	Bolt	24.	Bolt
3.	Washer	14.	Bolt	25.	Washer
4.	Nut	15.	Strut	26.	Spacer
5.	Clamp	16.	Bushing	27.	Nut
6.	Pad	17.	Clamp	28.	Pad (bonded to clamp (17))
7.	Bolt	18.	Bolt		
8.	Washer	19.	Bolt	29.	Spacer
9.	Nut	20.	Washer	30.	Fitting (plug)
10.	Clamp	21.	Bushing	31.	Rivet
11.	Bolt	22.	Washer (if equipped)		

Figure 8-11. Tail Rotor Guard & Extension Tube Installation

8-115. Inspection - Tail Rotor Guard

A. Inspect the tail rotor guard for cracks and wear or damage associated with ground contact.

B. Inspect the end fittings for loose or sheared rivets and elongated bolt holes.

C. Inspect the tail rotor guard tube and plug fitting joint for looseness.

D. Inspect the securing hardware for damage and the anti-chaffing pads for condition and security.

E. Verify a dimension of 25.0 in/63.5 cm from the vibration absorber clamp assembly bolt (7) to the strut clamp assembly bolt (24) (see Figure 8-11).

8-116. Repair - Tail Rotor Guard

A. Replace tail rotor guard if cracked or extensively damaged from ground contact.

NOTE

If the tail rotor guard is worn due to ground contact but is not worn through the guard, install a piece of tape over the area as a contact indicator.

B. Replace sheared or working rivets in the end fittings. Replace the end fittings if the bolt holes are elongated.

C. Install washer (22) (Figure 8-11) between tail rotor guard tube and strut if plug fitting joint is loose.

D. Replace damaged hardware and worn anti-chaffing pads.

8-117. Installation - Tail Rotor Guard

NOTE

Shimming may be required at the extension tube clamp or tail rotor transmission locations.

A. Apply grease (MIL-PRF-81322) to the inside surface of the ears of the extension tube clamp. Place the tail rotor guard into position and install the hardware attaching the guard to the extension tube clamp.

B. Install the clamp half and hardware onto the fitting at the bottom of the tailcone.

C. Apply grease (MIL-PRF-81322) to the inside surface of the ears of the tail rotor gearbox assembly. Install the tail rotor guard fitting into the tail rotor transmission and install the attaching hardware. Tighten all the attaching hardware.

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8-118. Vibration Absorber (Figure 8-12)

NOTE

The vibration absorber can only be installed on aircraft equipped with Tailcone Assembly, P/N 4112000-103, or after modification of the tailcone in accordance with Vibration Absorber Kit, P/N 4230018-1, 4230018-3, or 4230018-5.

8-119. Removal - Vibration Absorber

A. Disconnect the lanyard (10) from the tailcone tab.

B. Remove the hardware (3, 4) attaching the beam (1) to the tailcone and remove the backing plate (2) and beam (1).

8-120. Disassembly - Vibration Absorber

NOTE

Removing/moving the weights from a tuned vibration absorber will require absorber tuning when the vibration absorber is reinstalled.

A. Remove the hardware (7, 4, 8, 9) attaching the lanyard (10) and weights (6) to the beam and remove the weights (6).

8-121. Inspection - Vibration Absorber

A. Inspect the beam, weights, and support brackets for cracks, nicks, scratches, corrosion and security of installation.

B. Inspect the mounting hardware for damage.

C. Inspect the lanyard for condition.

8-122. Repair - Vibration Absorber

A. Replace the beam if cracked or damage exceeds a depth of .020 inches/.51 mm. Polish out damage to a maximum depth of .020 inches/.51 mm.

B. Replace cracked support brackets or brackets with damage exceeding .020 inch/.51 mm in depth. Polish out damage to a maximum depth of .020 inches/.51 mm.

C. Replace damaged hardware or the lanyard as required.

8-123. Assembly - Vibration Absorber

A. Install the weights (6) and lanyard (10) on the beam (1) and secure with the hardware (7, 4, 8, 9). Position the weights 0.3 inches/7.6 mm from the end of the beam and torque the bolts (7) to 75 in-lbs/8.5 Nm.

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8-124. Installation - Vibration Absorber

NOTE

The purpose of the tail mounted vibration absorber is to reduce the three-per-revolution ('three-per' or 3/rev) vibration inherent with a three-bladed rotor system. The three-per is most noticeable when the helicopter is passing through translational lift while transitioning from a decent into a hover and also at high cruise speeds.

A. Position the beam (1) and backing plate (2) on the mounting bracket and install the hardware (3, 4, 5). Torque the bolts (3) to 75 in-lbs/8.5 Nm.

B. Attach the lanyard (10) to the tailcone tab.

C. Tune the vibration absorber using the following procedure:

NOTE

This procedure is optimized by tuning the vibration absorber to customer preferences, usually the airspeed that the helicopter is commonly flown at. For instance, if the vibration absorber is set for 100 Kts, the 'three per' vibrations are reduced for 100 Kts but may not reduce significantly at 30 Kts. If the aircraft is regularly operated at low airspeed, the absorber can be tuned to minimize the vibration at 30 Kts, but the ride will not be as smooth at other airspeeds.

NOTE

The following instructions for installation and use of the vibration analysis equipment are generic due to the number of different models in use.

(1) Install an accelerometer/velicometer in the vertical position on the instrument panel pedestal and connect the cable to the balancing unit.

(2) If the vibration analysis equipment requires manual input of the frequency, set the vibration analysis equipment to 1095 CPM for standard 480 aircraft (N_R=365) and 1116 CPM for 480B aircraft and 480 aircraft equipped with the Increased Rotor Speed Kit, P/N 4230002 (N_R=372).

NOTE

The RPM setting is the customer's preference. The N_2 setting at 103% is typical.

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(3) Perform a spectrum analysis test flight with the N_2 set at 103% and record the IPS reading and airspeed on the chart for the following: hover, 30 Kts, commonly used airspeed (customer choice per type of operation), and 100 Kts.

(4) Loosen the bolts (7) and adjust the position of the weights on the absorber beam aft by 0.05 inches/1.3 mm. Torque the bolts to 75 in-lbs/8.5 Nm.

(5) Repeat the test flight in step (3) for the same torque setting and airspeeds, and record the data.

(6) At the desired airspeed, note if the 'three per' IPS increases or decreases.

(7) If 'three per' IPS decreases, move the weight aft an additional 0.05 in/1.3 mm. If 'three per' IPS increases, move the weight forward 0.05 in/1.3 mm.

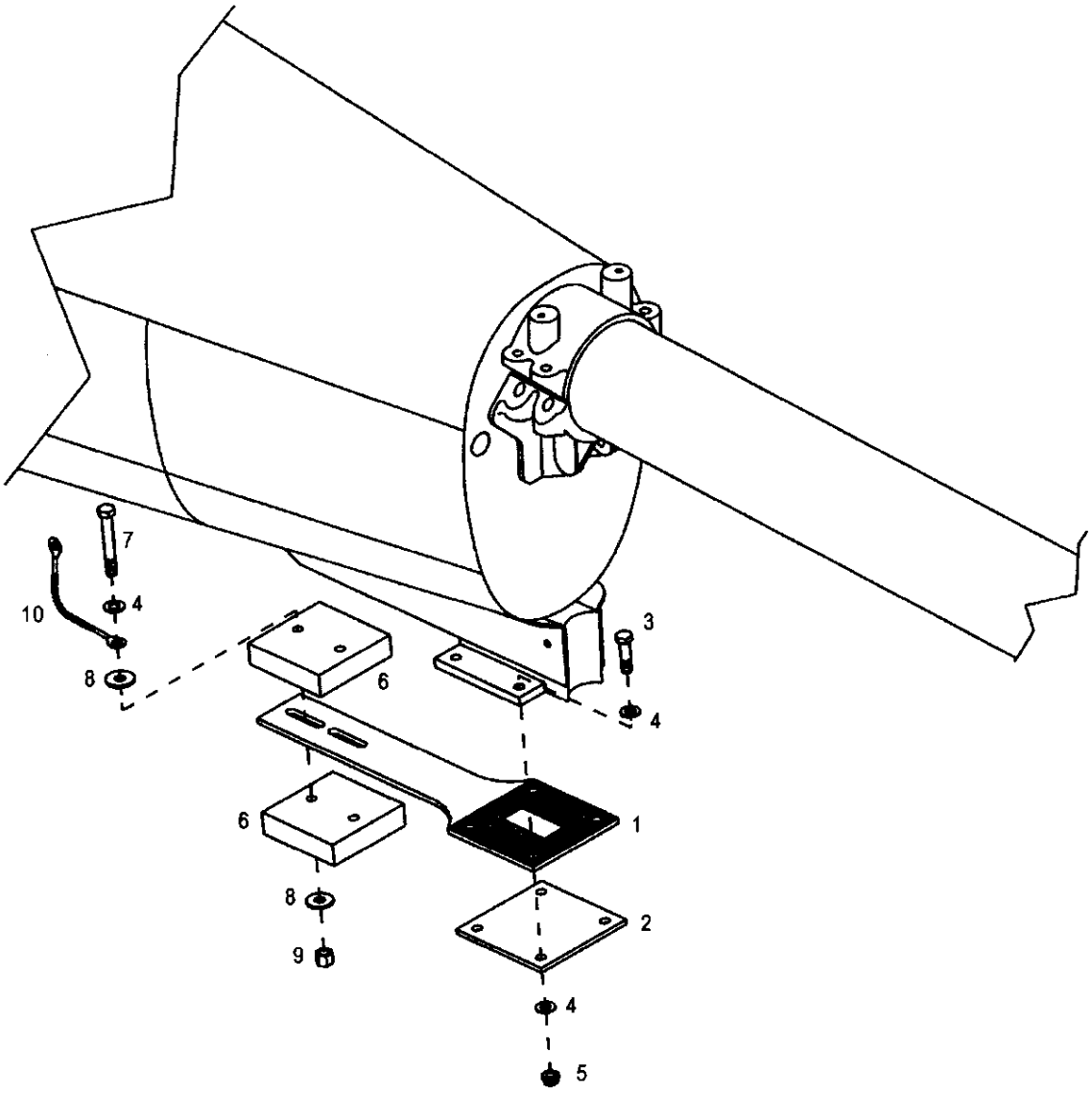
(8) The adjustments can be corrected until the IPS reading at the desired airspeed stops decreasing and begins increasing.

(9) Secure the weight at the point before IPS begins to increase.

(10) Remove the vibration analysis equipment when tuning is completed.

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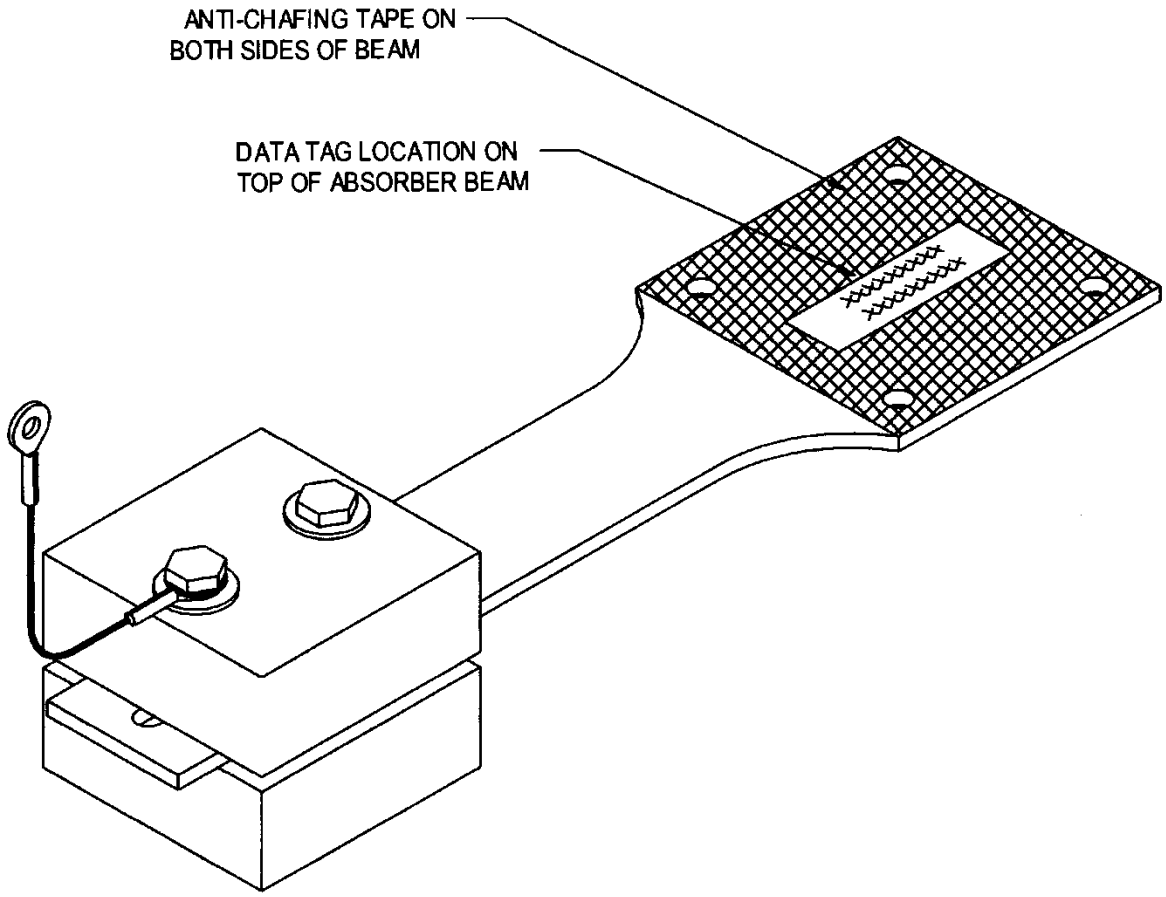


1.	Beam	6.	Weight
2.	Backing Plate	7.	Bolt
3.	Bolt	8.	Washer
4.	Washer	9.	Nut
5.	Nut	10.	Lanyard

Figure 8-12. Vibration Absorber

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Sheet 2 of 2

Figure 8-12. Vibration Absorber

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8-125. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Acetone	Acetone Solvent	
Adhesive	Trim Adhesive, 3M Brand	8031
Adhesive	Window/Windshield Adhesive, Courtaulds Aerospace	PR-1425-B2
Caulk (vinyl adhesive)	Phenoseal Does It All[1] - Translucent (10 fl. oz/296 mL cartridge)	051136 00006 (UPC)
Compound	Anti-Corrosion, Conductive Compound, Kopr-Shield Brand	CP8-TB
Compound	ACF-50 Anti-Corrosion/Lubricant, Lear Chemical Research	10013
Fabric	Fire Curtain, Nextel Brand	Enstrom P/N 400-006
Grease	Grease, Lubriplate Brand	630-AA[2] (06701)
Grease	Grease	MIL-PRF-81322
Hydraulic Fluid	Hydraulic Fluid	MIL-PRF-5606[3]
Lockwire	Lockwire Copper .020”	MS20995CY20
Lockwire	Lockwire.032”	MS20995C32
Lubricant	LPS 2 Heavy Duty Lubricant, LPS Laboratories	00216
Nitrogen	Nitrogen	
Paint, Touch-Up	Flat Black, Spray Can	
Primer	Epoxy Primer	MIL-PRF-23377[4]
Putty	Glazing and Spot Putty, Bondo	801
Sealant	Fuel Resistant Coating, 3M Brand	EC 776
Sealant	Fuel Resistant, AMS-S-8802 Type II Class B	
Sealant	Silicone Sealant, Dow Corning Brand	732-RTV
Sealant	Fire Barrier Sealant, 3M Brand	CP25WB+
Shielding Coating	EMI/RFI Shielding Coating, Acheson Brand	Electrodag 437

[1] Previously branded as 102 Phenoseal.
[2] MIL-PRF-81322 is an acceptable alternate.
[3] AeroShell Fluid 41 (Shell Oil), Royco 756 (Anderol), or Phillips X/C 5606H (Phillips 66)
[4] Example: PRC-DeSoto Brand 513x390/activated by 910x624; or equivalent.

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ITEM	DESCRIPTION	PART NUMBER
Solder	“44” Resin Solder	
String	Cotton String	
Tape	Transparent, 3M Brand	5430
Tape	Tape, Masking 1“	
Tape	Double Sided, Foam .50”, 3M Brand	4910-50
Tape	Single Sided, Foam .75”, 3M Brand	4516-75
Tape	Vinyl, Black .25”, 3M Brand	70-0160-1056-6
Thread	Sewing Thread Metalized, 0.020”	Enstrom P/N 300-093 (MT13)
Thread Sealant	Thread Sealant, Loctite Brand	Threadlocker Blue 242[5]
Thread Sealant	Thread Sealant, Vibra-Tite Brand	VC-3

[5] Acceptable alternate to VC-3.

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ROTOR SYSTEMS

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SECTION 9

ROTOR SYSTEMS

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9-1. Main Rotor System

9-2. Description – Main Rotor System

The main rotor system is a three bladed, high inertia, fully articulated rotor system. The main rotor hub assembly is composed of two opposing forged aluminum hub plates separated by an aluminum cylindrical spacer. Through bolts hold these items together along with steel spline adapters. Three steel universal blocks are mounted in roller bearing units that permit flapping and lead-lag motions. Laminated phenolic pads are used to limit blade travel in both the lead-lag and flapping axes. A thrust nut on the bottom of each universal block transfers vertical blade forces to both hub plates through the universal block. The rotor blades are secured to each universal block on the hub through a forged aluminum grip which is in turn secured to a steel spindle assembly through a retention nut (used on TH-28, S/N 3006, and 480, S/N 5001-5006) or a tension-torsion strap assembly and supporting bearings. Centrifugal blade loads are carried by Lamiflex elastomeric bearing assemblies (used on TH-28, S/N 3006, and 480, S/N 5001-5006) or tension-torsion strap assemblies mounted between the blade grip and the spindle. Blade feathering loads into the collective control system are balanced throughout the flight regime by Planipetal weights that are a part of the pitch change horn on the leading edge of each blade grip. The Planipetal weights are only used with the Lamiflex bearing assemblies. Either closed circuit hydraulic dampers or elastomeric dampers are incorporated between each flapping pin and the rotor hub to limit the lead-lag velocity of the blades. The main rotor blades are of hollow construction consisting of an extruded leading edge spar, with a 7.25 degree twist, to which is bonded upper and lower aluminum skins. The blade root is composed of a bonded doubler assembly. A single retention pin connects the blade root to the grip and a non-adjustable drag brace connects the trailing edge of the blade to the grip. A cap is bonded to the tip of each blade in which there are provisions for span wise and cord wise balance weights. Two tracking tabs are riveted to the trailing edge of each blade.

9-3. Troubleshooting – Main Rotor System

A. Lateral Vibration

NOTE

Due to the design of the Enstrom rotor system, trying to correct for lateral vibrations by balancing blades with weights is normally not effective. If a lateral vibration is suspected, the best course of action is to install a lateral velocimeter in addition to the vertical velocimeter and to take both a lateral and a vertical ips reading. The ips reading that is higher is the one that is driving the vibration.

(1) Erratic lateral vibrations in a hover with control inputs or through translational flight.

a. Air entrapped in the hydraulic main rotor dampers.

Bleed and service the hydraulic dampers.

(2) Steady lateral vibration in hover flight.

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a. Low fluid level in the hydraulic main rotor dampers.

Bleed and service the hydraulic dampers.

b. A faulty relief valve in the hydraulic main rotor dampers.

Replace the faulty valve(s).

c. A universal block assembly hanging up in the lead/lag axis.

Replace the defective parts.

d. An incorrect tip weight assembly installed in a blade.

Install correct tip weight configuration I/A/W the maintenance records or the "Blade Information Sheet".

e. A repair made to a main rotor blade without rebalancing the blade.

Return the blade to the factory for rebalancing or balance the main rotor system using an appropriate tracking and balancing system.

(3) Steady lateral vibration in steep turns in flight or during steady climb.

a. Worn main rotor damper rod end bearing and/or inboard pivot attachment point.

Replace hydraulic damper rod end bearing(s).

b. Air entrapped in the hydraulic main rotor dampers.

Bleed and service the hydraulic dampers.

c. Weak relief valve in a hydraulic main rotor damper.

Replace the relief valve(s).

B. Vertical Vibration

(1) Vertical vibration (1/rev) that increases with airspeed and may be accompanied by cyclic stick feedback.

a. Main rotor out of track.

Track main rotor.

b. Worn pitch change link bearing(s).

Replace the worn bearing(s).

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c. Worn bearing(s) in the flight control systems.

Replace worn bearing(s).

d. Trim tab inadvertently bent.

Check trim tab setting against the maintenance records or the "Blade Information Sheet" and set the trim tabs.

e. Lamiflex bearing(s) deteriorating.

Replace lamiflex bearing(s).

C. Ground Rock

(1) Excessive ground rock during ground run.

a. Air entrapped in the hydraulic main rotor dampers.

Bleed and service the hydraulic dampers.

b. Faulty relief valve(s) in the hydraulic main rotor dampers.

Replace the faulty valve(s).

c. Oleos improperly serviced.

Bleed and service the oleos.

D. Main Rotor RPM Out of Tolerance During Autorotation

(1) Main rotor rpm low or high during autorotation.

a. Low pitch blade angle incorrect.

Adjust the pitch change links.

9-4. Autorotation RPM Adjustment - Main Rotor System

A. If the autorotation rpm is not satisfactory during the autorotation rpm check portion of the maintenance test flight, adjust the autorotation rpm as follows:

(1) Turning the pitch link barrel one full turn will change the main rotor RPM by 20. Turning one pitch link bearing one full turn will change the main rotor RPM by 10.

a. If the rotor over-speeds, turn the pitch link barrels clockwise or disconnect the upper end of the pitch change links and shorten the links using the upper rod end bearing. If disconnected, reconnect the links to the pitch change bellcranks. Ensure the rod end bearings are centered, the jam nuts are tight, and there is satisfactory thread engagement in the pitch change link barrel witness holes (para. 12-96).

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(2) If the rotor under-speeds, perform the same actions as in step (1) except turn the barrel counter-clockwise or lengthen the pitch change links.

(3) Perform an autorotation rpm check and readjust as required.

NOTE

If the barrel is to be turned, it is necessary to index the rod ends and the pitch link barrel with reference lines and to re-index these lines perfectly to avoid changing the track.

9-5. Tracking - Main Rotor System

NOTE

The Honeywell Chadwick 2000 system installation and operation are described in the following instructions. Follow the operating instructions for the equipment being used if different than the instructions for the Chadwick 2000.

NOTE

This procedure should be followed when using the MicroVib™II and ACES systems with modifications required by the individual system used.

NOTE

Do not change the tip weights in the blades from original factory settings.

The purpose in tracking the main rotor blades is to obtain a smooth ride. This is accomplished by adjusting the blade track to reduce vibration. An out-of-track condition will produce a vibration, usually a one-per rev which is felt as a vertical vibration, however for the rotor system to be in track, it does not necessarily mean that the blades are flying in the same plane. With the advent of modern digital tracking equipment it has been found that the best ride is not necessarily the result of the blades flying in plane, but in a track that gives the least magnitude of vertical vibration. For this reason, Enstrom recommends that the strobe light only be used on the ground for initial ground track or for initial hover track if the initial ride is unacceptably rough.

A. Installation of Equipment

(1) Install the magnetic pick-up sensor in the bracket located on the aft right side of the upper swashplate assembly (Figure 9-1a). Set the gap between the magnetic pick-up and the interrupter in the upper swashplate housing to .040. Tighten the magnetic pick-up nuts and safety together.

(2) Position number one blade (target blade) over the nose of the helicopter (over the windshield center line).

(3) Route the cable along the engine mount upper lateral support and through one of the opera window pop-out vents.

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(4) Install the vertical velocimeter on the right side of the instrument panel pedestal (Figure 9-1b).

(5) Install the strobe light, if desired, or if there is reason to believe that the initial hover will be unacceptably rough.

(6) Set up the analyzer using the manufacturer's instructions and the following parameters:

a. Three main rotor blades

b. Counterclockwise rotation when viewed from above

c. S/N prior to 5016: 365 RPM; S/N 5016 and subsequent: 372 RPM

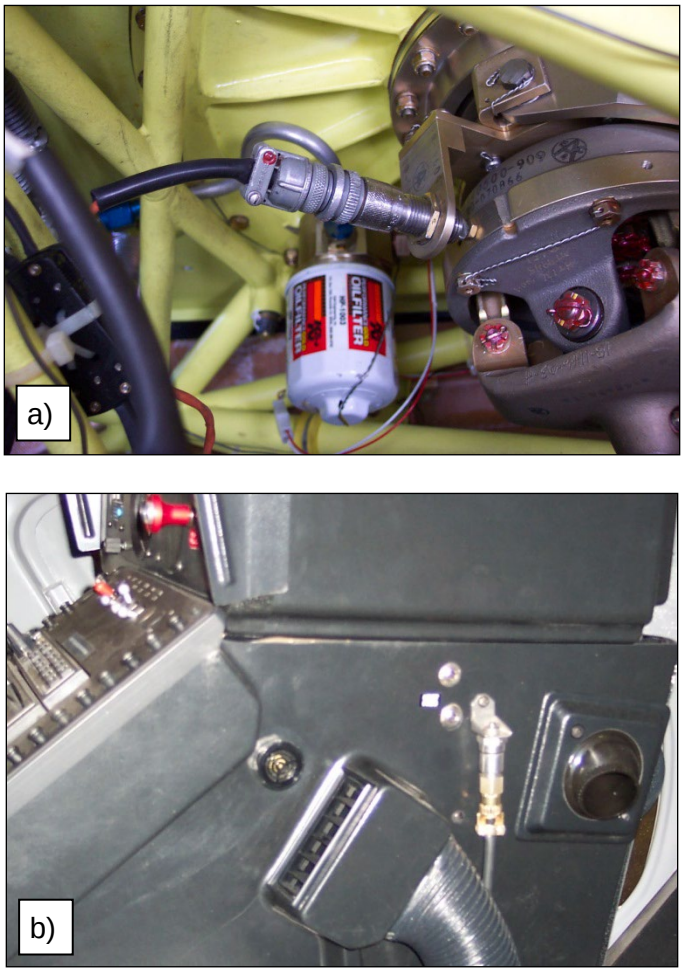


Figure 9-1. a) Installation of the magnetic pick-up sensor to the upper swashplate assembly. b) Installation of the vertical velocimeter to the instrument panel pedestal.

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B. Tracking Procedure

(1) Grease the main rotor head.

(2) Bleed the main rotor dampers.

NOTE

If the helicopter is already flying reasonably well do not make any adjustments to the tabs at this time.

(3) Set the tabs at recorded angles on the “Blade Information Sheet” or zero all the tabs.

WARNING

The following steps are to be performed by authorized personnel.

(4) Ground run helicopter with rotor engaged at full “flat pitch” rpm.

(5) If the strobe light is being used, observe the track of the blades and use pitch links to adjust the track into a reasonable flat track.

(6) Hover the helicopter into the wind at 372 RPM (for S/N 5016 and prior, hover the helicopter into the wind at 365 RPM).

NOTE

The best results are obtained if the helicopter is loaded so that the helicopter is relatively heavy. Normally, adding weight will make the blades fly at a higher angle of attack and will increase the roughness of the ride, while as the helicopter gets lighter from fuel burn, the ride will improve.

(7) Record the ips reading and the clock angle. Using the Vertical Velocimeter Polar Chart (Figure 9-2), adjust track for ips readings of less than .2 using pitch links.

NOTE

If the move line of the weight change does not coincide with the move lines on the chart, use the “Clock Angle Correction” procedure (para. 9-5, F).

NOTE

The rotor system must be hover tracked to .2 ips or less before performing the procedure to tab out cyclic feedback.

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C. Tabbing Out Feedback

Cyclic feedback is a pulsing felt in the cyclic stick at main rotor 1/rev frequency. Tabbing out cyclic feedback is the most difficult and the most important procedure in achieving optimum ride in Enstrom helicopters with minimum cyclic vibration. Less than optimum outboard tabbing will result in excessive inboard tab to achieve a smooth ride and also excessive cyclic stick vibration. Unfortunately there is no reliable method of determining the correct outboard tab other than trial and error.

(1) Create a chart such as the one shown below to record the results of the tabbing runs.

Tab	Result
1 Up	
1 Down	
2 Up	
2 Down	
3 Up	
3 Down	

(2) Operate the helicopter on the ground at full flat pitch blade RPM (96%-98%).

(3) Move the cyclic six to eight inches in a forward and aft movement at approximately one cycle per second and feel for feedback in the cyclic motion.

NOTE

Feedback will not necessarily be indicated by cyclic stick shake, although stick shake will result from significant feedback.

NOTE

In the 480 series helicopters, it is typical to have some slight mechanical feedback that gives the appearance of blade tab feedback but is not. It helps to pull a bit of collective pitch and allow the helicopter to rise slightly to extend the landing gear oleos a bit. This will eliminate the mechanical feedback and allow the pilot or technician to feel the blade feedback.

(4) Stop the blades and add two degrees up to the #1 blade outboard tab.

(5) Run the helicopter again using the same procedures and again check the cyclic for feedback. The purpose of this procedure is to check the magnitude of the cyclic feedback in the current blade tab configuration with the original and with the previous tab settings. The severity of the feedback will stay the same, get better or get worse. Record this result in the table above.

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(6) If the feedback is eliminated, this procedure is finished. If the magnitude of the cyclic feedback either stays the same, or worsens, then change the setting on the same outboard tab to two degrees down. If the feedback gets better but is still present, add one more degree. Do not use more than 5° in any tab.

(7) Run the helicopter again and using the same procedure, compare the magnitude of the cyclic feedback. Again, it should either be eliminated, stay the same or get worse. If it stays the same or gets worse, then set the #1 blade outboard tab back to zero, and add two degrees up to the #2 blade outboard tab.

(8) Continue this procedure until each blade has been checked for both up and down tab, or until the feedback has been eliminated.

(9) By following this procedure it should be possible to eliminate the cyclic feedback with one outboard tab adjustment on one blade.

D. Using pitchlinks, re-track the hover to less than 0.2 ips. If the above procedure is followed, once the hover has been tracked smooth, the cyclic feedback should not reoccur.

E. Forward flight is tracked using the inboard blade tabs.

(1) Fly the helicopter at normal cruise settings (50 psi for TH-28/480) (58 psi for 480B) and record the ips reading and the clock angle.

(2) Using the same polar chart (Figure 9-2) adjust the forward flight to less than 0.2 ips with the inboard tabs.

NOTE

If addition of inboard tab affects the hover, take that tab out again and try opposite tab on the other two blades.

NOTE

If a tab change does not improve the ips reading, it is advised to take the tab adjustment out again and try adjusting the inboard tab on another blade. Failure to follow this procedure will result in excessive tab amounts on all the blades.

(3) Continue this procedure until the forward flight ips reading is 0.2 or less.

F. Clock Angle Corrections

NOTE

Clock angle corrections are related to how well the balance equipment matches the helicopter so most helicopters will use the same clock angle correction when they are balanced using the same balance equipment.

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NOTE

The clock angle correction is seldom the same in hover as it is in forward flight so when the tracking progresses to the forward flight phase, a new chart should be used, and the correction will have to be figured again.

In some cases, particularly when the ips readings progress from a large number to a small number, the clock angle correction may change or go away entirely. The technician needs to plot all the moves and to be ready to recalculate or abandon the clock angle correction, if needed.

If a series of plotted blade track corrections move in a circular direction on the polar chart rather than moving toward the center of the chart, as shown in the example in Figure 9-2.1, a clock angle correction is required. The following procedure was developed using the Chadwick Vibrex 2000 balance system. The procedure can be adapted for use with any of the digital balance boxes when the internal learning program is disabled.

(1) A reading of .6 ips at a clock angle of 3:30 for the first hover run is plotted on the polar chart (Figure 9-2.2).

(2) #2 blade is adjusted approximately 1/3 flat down. A reading of .5 ips at a clock angle of 1:30 for the second hover run is plotted (Figure 9-2.3). Clearly, the adjustment did not produce the expected move on the polar chart. This indicates that the polar chart is not correctly aligned to the helicopter.

(3) Observation of run #1 and run #2 plots indicates that the tracking response is following the #3 blade axis line. Therefore, the blade correction move lines must be shifted clockwise one flat (60°) (Figure 9-2.4). This is the Clock Angle Correction.

(4) According to the corrected chart, the #3 blade should be adjusted 1/3 flat down. A reading of .2 ips at a clock angle of 1:00 for the third hover run is plotted on the corrected chart (Figure 9-2.5). The move corresponds well with the corrected chart and the tracking procedure is complete.

G. Lateral Vibration

Due to the design of the Enstrom rotor head attempting to correct lateral vibrations by balancing the blades with weight changes is normally not effective. If a lateral vibration is suspected, the best troubleshooting action is to install a lateral velocimeter in addition to the vertical velocimeter and to take both a lateral and vertical ips reading. The ips reading that is higher is the one that is driving the vibration. If the lateral vibration is higher than the vertical vibration, refer to para. 9-3, A.

H. Check the autorotation rpm after finishing the tracking and balancing procedures and adjust if required.

I. Remove the tracking and balancing equipment from the aircraft.

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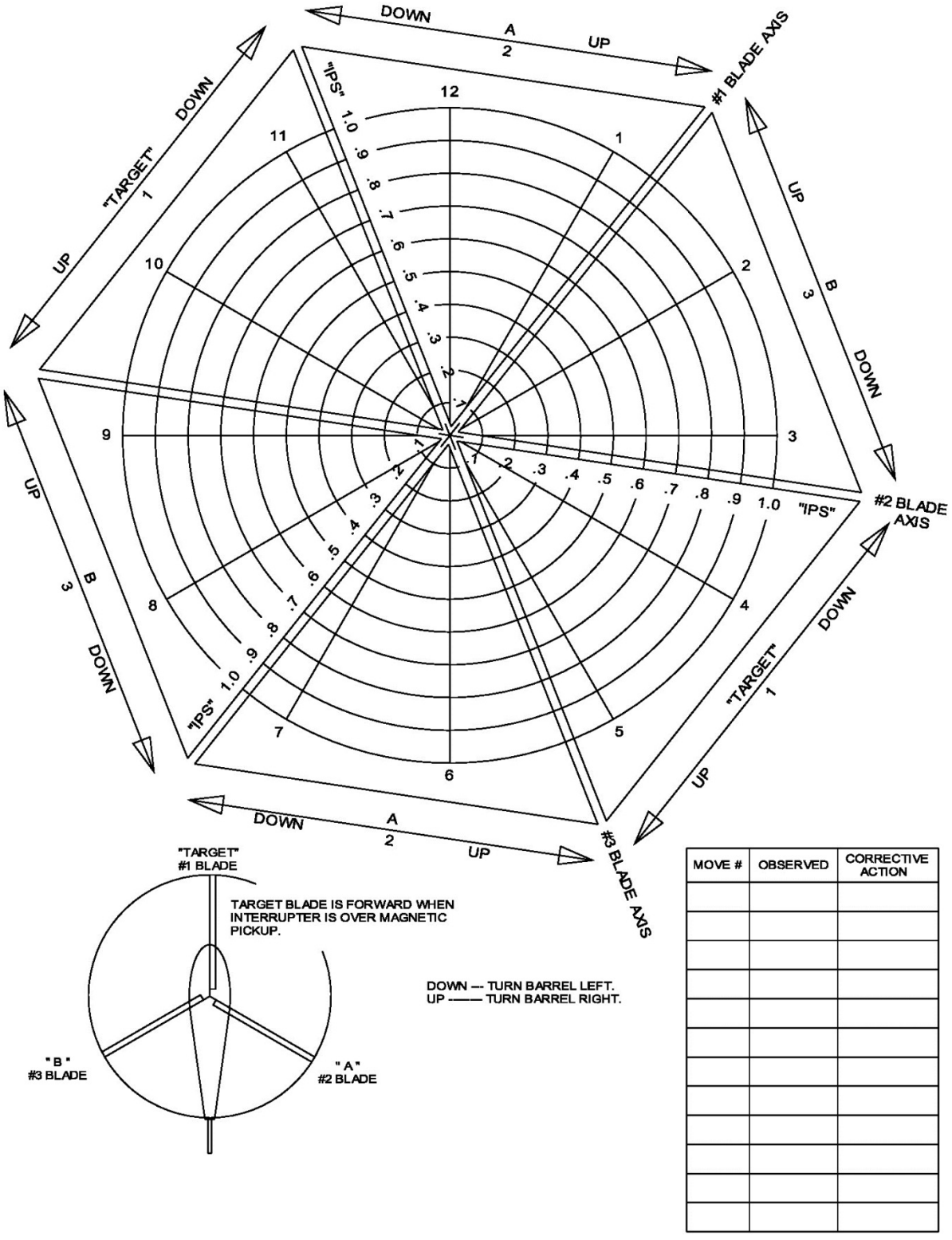
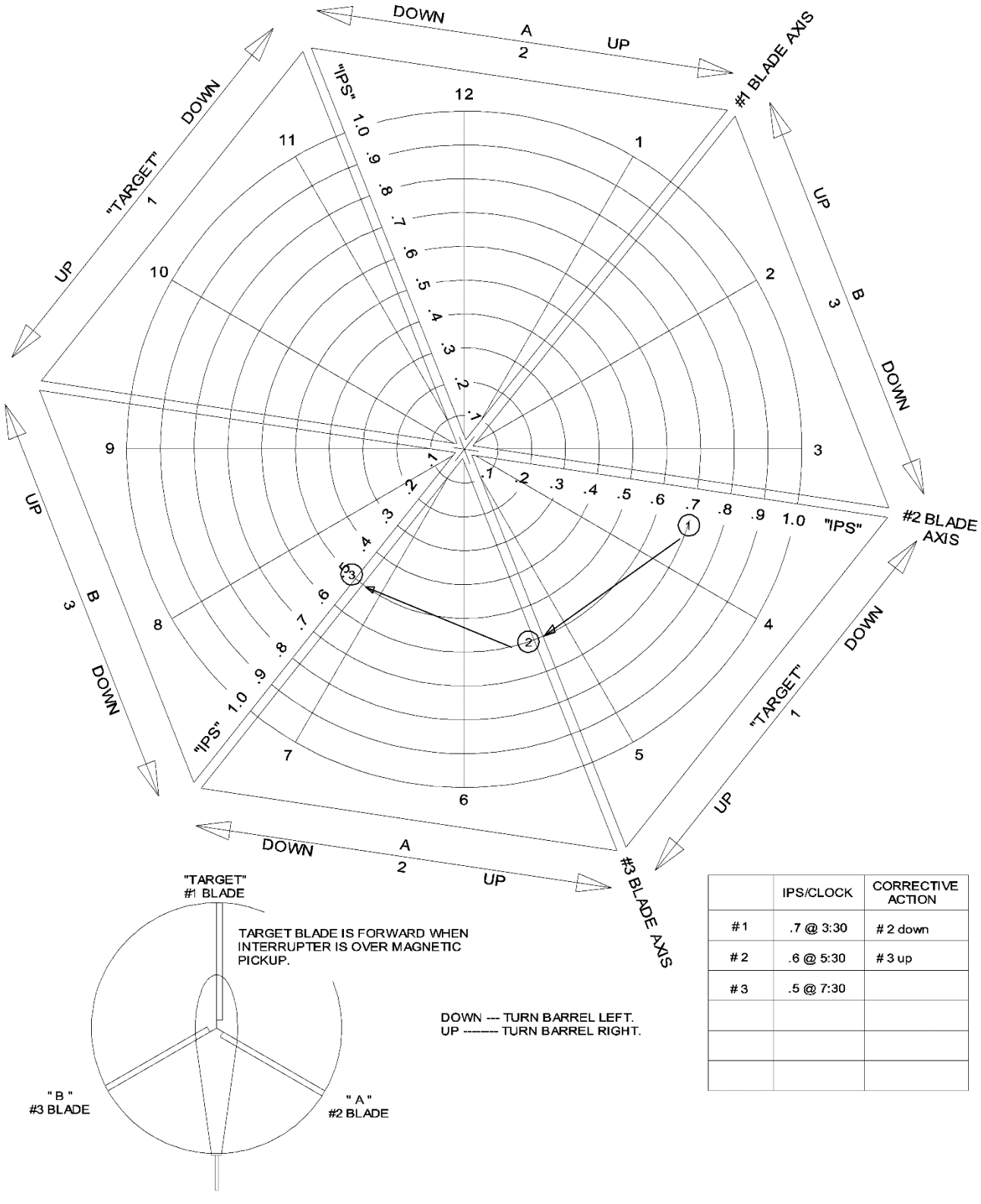
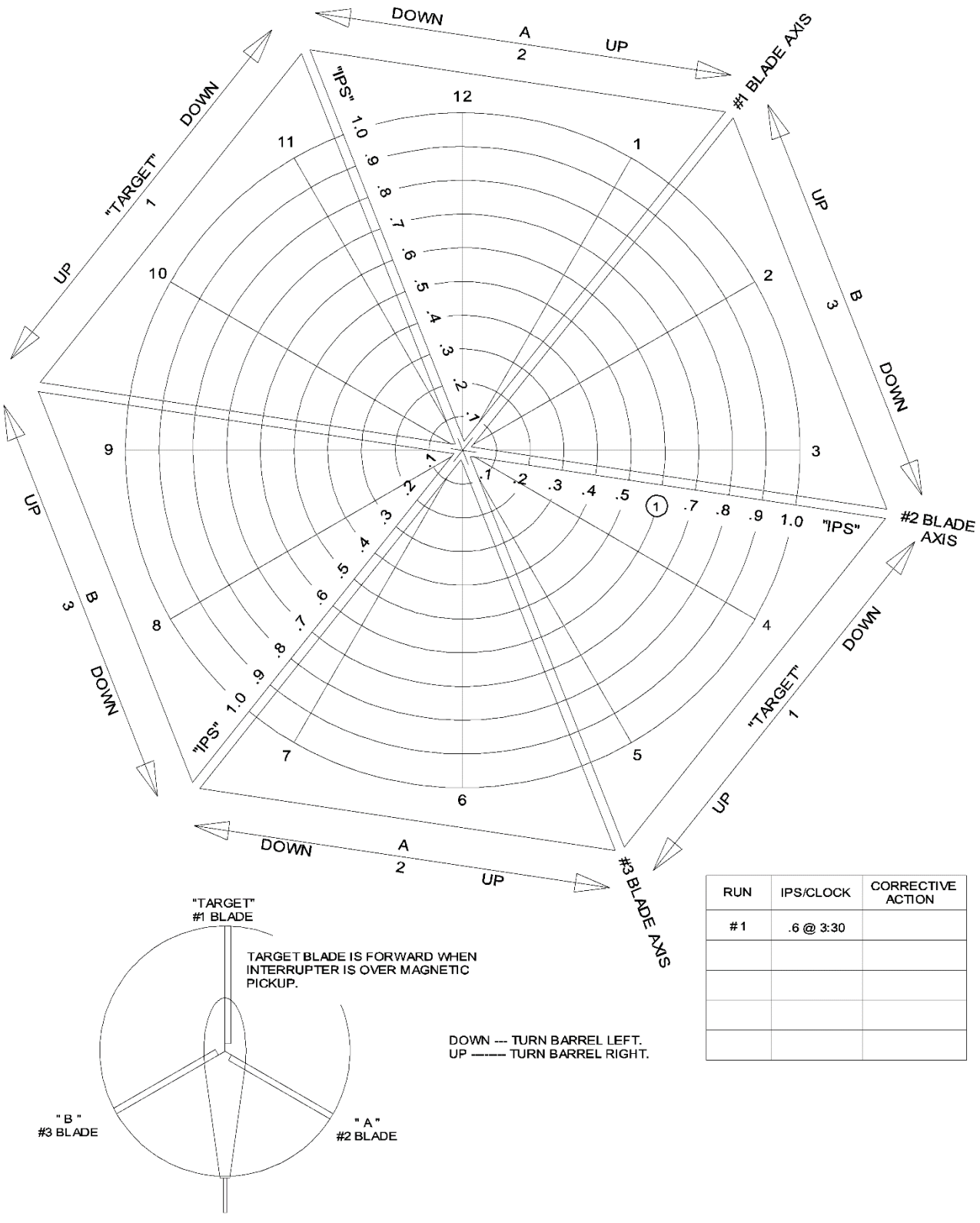


Figure 9-2. Main Rotor Vertical Velocimeter Chart



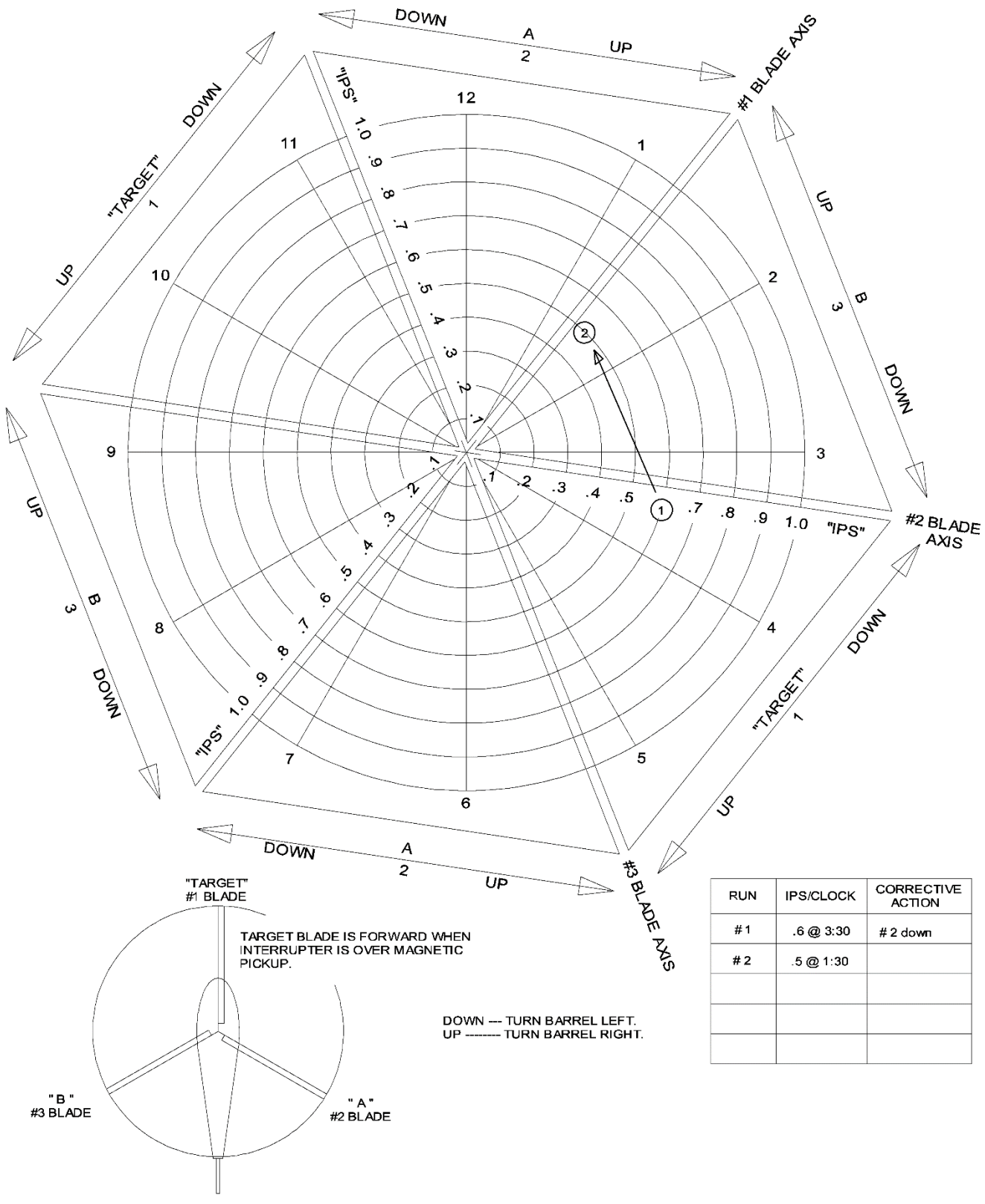
	IPS/CLOCK	CORRECTIVE ACTION
#1	.7 @ 3:30	# 2 down
#2	.6 @ 5:30	# 3 up
#3	.5 @ 7:30	

Figure 9-2.1. Main Rotor Circular Blade Track Example



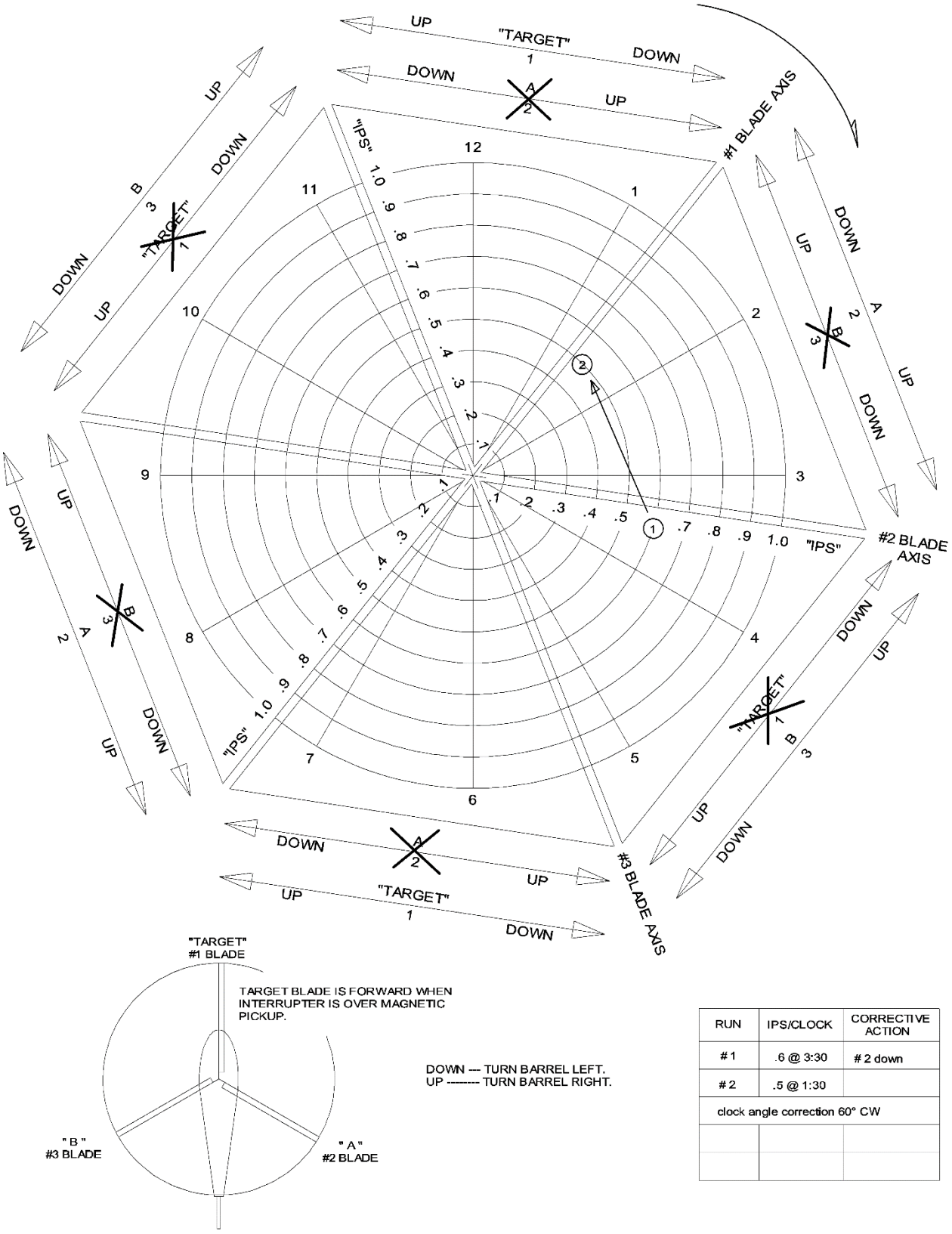
RUN	IPS/CLOCK	CORRECTIVE ACTION
#1	.6 @ 3:30	

Figure 9-2.2. Main Rotor Clock Angle Correction Example



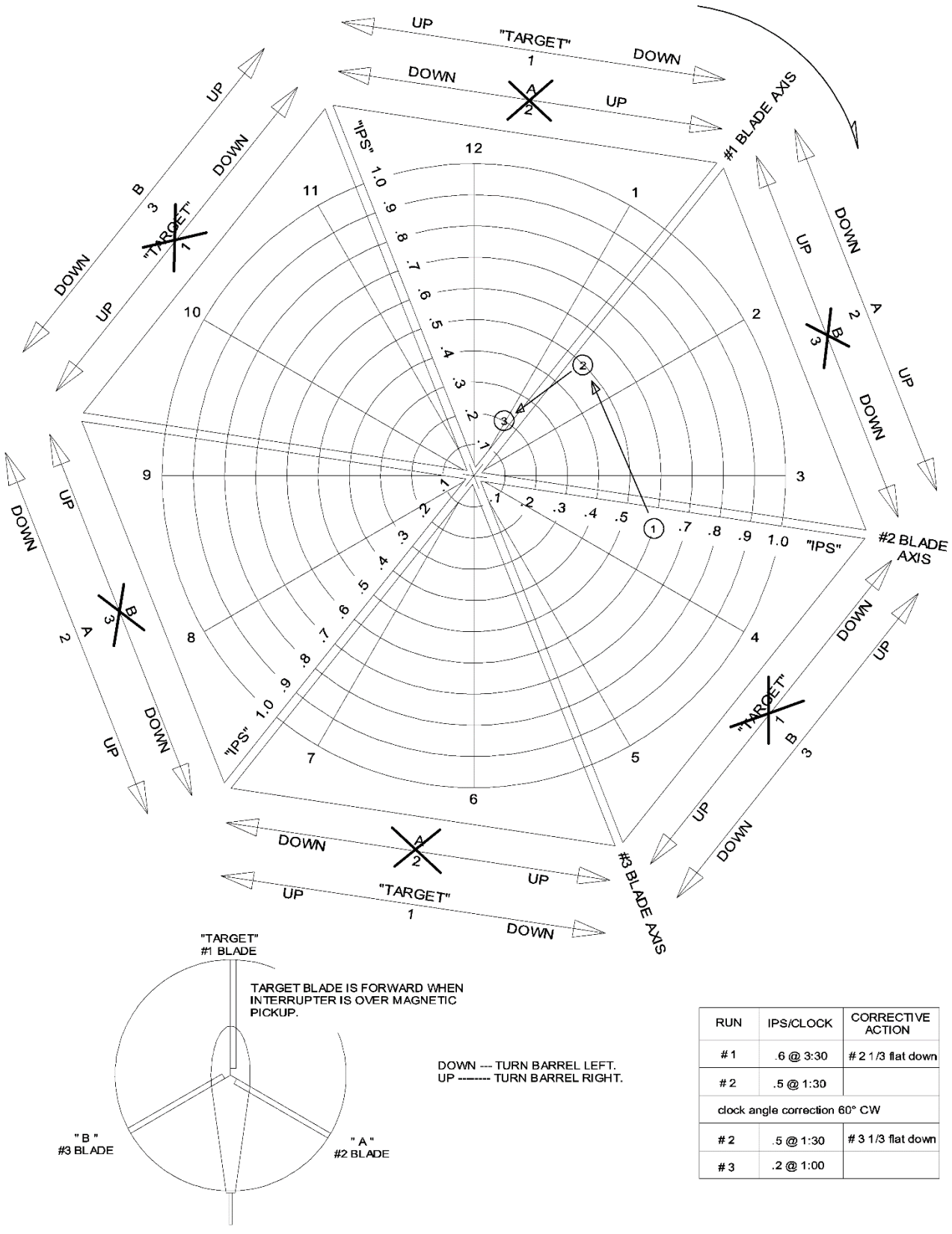
RUN	IPS/CLOCK	CORRECTIVE ACTION
# 1	.6 @ 3:30	# 2 down
# 2	.5 @ 1:30	

Figure 9-2.3. Main Rotor Clock Angle Correction Example



RUN	IPS/CLOCK	CORRECTIVE ACTION
#1	.6 @ 3:30	# 2 down
#2	.5 @ 1:30	
clock angle correction 60° CW		

Figure 9-2.4. Main Rotor Clock Angle Correction Example



RUN	IPS/CLOCK	CORRECTIVE ACTION
# 1	.6 @ 3:30	# 2 1/3 flat down
# 2	.5 @ 1:30	
clock angle correction 60° CW		
# 2	.5 @ 1:30	# 3 1/3 flat down
# 3	.2 @ 1:00	

Figure 9-2.5. Main Rotor Clock Angle Correction Example

I

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9-6. Main Rotor Hub

9-7. Removal – Main Rotor Hub

A. Remove the main rotor blades (para. 9-34).

CAUTION

Foreign objects dropped down the mast must be immediately removed to prevent damaging the flight controls.

B. Remove the hardware securing the pitch change bellcranks to the push-pull rods in the mast.

C. Remove the center pivot bolts from the pitch change bellcranks. Lift the bellcranks from the mounting brackets and allow to hang free on the pitch change links.

NOTE

Install tie wraps to hold the pivot spacers in the bellcranks and the push-pull rods.

D. Remove the safeties from the mast nut and install tool (T-0048).

WARNING

Use extreme caution when removing the mast nut.

E. Remove the mast nut and the washer from the mast using the torque multiplier tool T-0197-7. If this is not available, install T-0048 tool and use a 3/4” drive electric impact wrench. If a 3/4” drive electric impact wrench is not available, install one main rotor blade and pull the breaker bar against the blade while using a large (2 kg) hammer to shock the tool (T-0048).

F. Install the hoist sling (T-0011) so the arms are between the pitch arm and the blade retention assembly, over the lead/lag retaining nut, and outboard of the main rotor damper rod-end. The sling arms are long enough to be double wrapped if preferred (Figure 4-14).

NOTE

Install the left side ground handling wheel and extend to aid in removing the hub assembly.

G. Attach the sling to a lifting device and slowly lift the hub assembly from the mast. The hub must be lifted exactly parallel to the mast. If there are any side loads, the hub will stick on the splines and will not come off. If the hub has been installed for a long period of time, the hub puller (T-0174-1) must be used and the control rods must be removed from inside the mast.

H. Install the hub assembly onto a hub stand.

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9-8. Disassembly – Main Rotor Hub (Figure 9-4 or 9-5)

A. Remove main rotor hub from the aircraft (para. 9-7).

NOTE

Mark all parts for reassembly in the same respective positions.

B. Remove the pitch change links and the pitch change bellcranks from the pitch horns (para. 12-93).

C. Remove the dampers (para. 9-26).

D. Remove the retention assemblies (para. 9-14).

E. Remove the hardware from the pitch change bellcrank brackets and remove the brackets (3).

F. Remove the dust covers (4). If the main rotor hub assembly is equipped with oil lubricated flapping bearings, also remove the reservoir (Figure 9-5, 29).

CAUTION

The reservoir may resist removal due to the O-rings installed at the bottom. Pull up and carefully twist the reservoir until it slips out of the universal block. To prevent damage to the reservoir, do not pry on the reservoir bottom plate.

G. Bend the locking tabs (6) out of the recesses in the retaining nuts (5). Install tool (T-0051-1 (preferred) or T-0051-3) on the nuts and remove the nuts and the washers.

H. Turn the hub assembly over and remove the locking keys (10) from the retaining nuts (9).

I. Using tool T-0003, remove the nuts, shims (8), and DU washers (7).

J. Turn the hub assembly over and remove the hardware (11) from the center hub adapter.

K. Remove the upper and lower spline adapters (12 & 18) by tapping them from the hub plates with a nylon drift.

L. Remove the dowel pins (13) from the hub plates (14 & 17) and the center spacer (16) by tapping them through with an aluminum drift.

WARNING

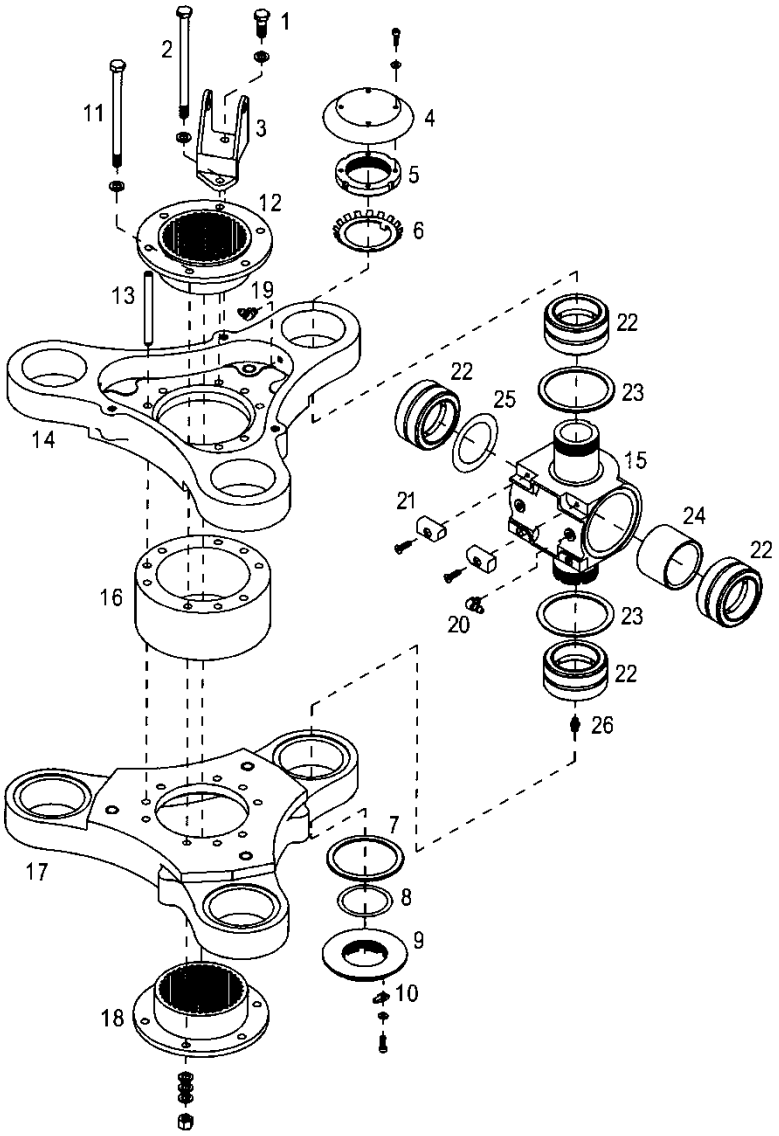
Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

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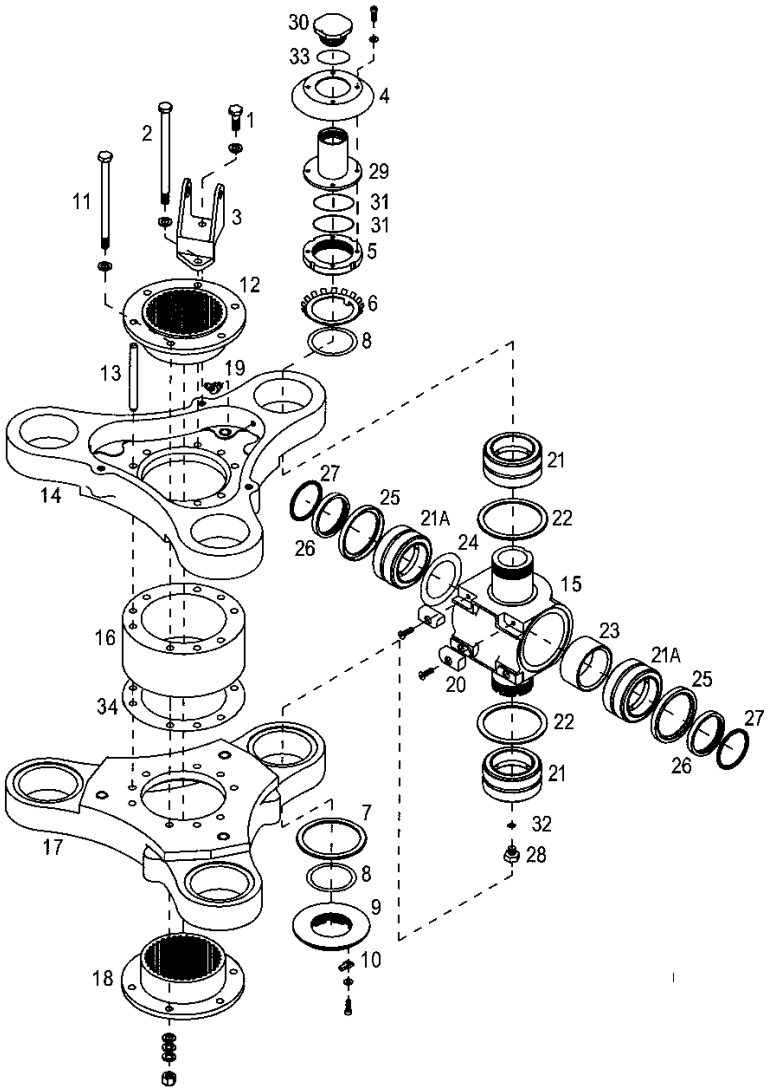


1.	Bolt	14.	Upper Hub Plate
2.	Bolt	15.	Universal Block
3.	Bracket	16.	Center Spacer
4.	Dust Cover	17.	Lower Hub Plate
5.	Retaining Nut	18.	Lower Spline Adapter
6.	Lock Washer	19.	Grease Fitting
7.	DU Washer	20.	Grease Fitting
8.	Shim	21.	Stop Pad
9.	Retaining Nut	22.	Bearing
10.	Lock Key	23.	DU Washer
11.	Bolt	24.	Spacer
12.	Upper Spline Adapter	25.	Shim
13.	Dowel Pin	26.	Grease Fitting

Figure 9-4. Main Rotor Hub Assembly with Grease Lubricated Flapping Bearings

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1.	Bolt	19.	Grease Fitting
2.	Bolt	20.	Stop Pad
3.	Bracket	21.	Bearing
4.	Dust Cover	21A.	Bearing
5.	Retaining Nut	22.	DU Washer
6.	Lock Washer	23.	Spacer
7.	DU Washer	24.	Shim
8.	Shim	25.	Seal
9.	Retaining Nut	26.	Sleeve
10.	Lock Key	27.	O-Ring
11.	Bolt	28.	Plug
12.	Upper Spline Adapter	29.	Reservoir
13.	Dowel Pin	30.	Reservoir Cap
14.	Upper Hub Plate	31.	O-Ring
15.	Universal Block	32.	O-Ring
16.	Center Spacer	33.	Seal
17.	Lower Hub Plate	34.	Shim
18.	Lower Spline Adapter		

Figure 9-5. Main Rotor Hub Assembly with Oil Lubricated Flapping Bearings

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M. Heat the upper hub plate to approximately 250°F/121°C and lift the hub plate from the universal blocks (15). Tap with a plastic mallet if necessary.

N. Heat the lower hub plate to approximately 250°F/121°C and tap the universal blocks from the hub plate.

(1) Remove center spacer (16) and shim (34), if installed.

O. Remove the grease fittings (19) from the hub plates.

9-9. Inspection – Main Rotor Hub

A. See Table 9-1 for detailed inspection of the main rotor hub assembly.

9-10. Repair – Main Rotor Hub

A. Repair or replace components of the main rotor hub as indicated in Table 9-1.

9-11. Assembly – Main Rotor Hub (Figure 9-4 or 9-5)

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

NOTE

The upper hub plate has heli-coil inserts in the outer bosses for the walking beam mount brackets. The lower hub plate bosses are solid.

A. Heat the upper hub plate (14) and the lower hub plate (17) to approximately 250°F/121°C.

B. Place the lower hub plate on 2" X 4" wood blocks. Lubricate the bearing bores with MIL-PRF-81322.

NOTE

Ensure the DU washers have been installed on the U-blocks with the chamfered side facing the hub plates. The DU washers must be seated in the recessed area of the hub plate.

C. Install the U-block (universal block) assemblies (15) into the bearing bore of the hub plate with the threaded notched end of the U-blocks down (3 places).

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Table 9-1. Main Rotor Hub Assembly

P/N	Fig. 9-4, 9-5 Item #	Part Name	Inspection Requirements: Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
28-14202-1	3	Walking Beam Bracket	Deformed or cracked ears	None Allowed	Not Repairable	Replace Bracket
			Security of the bushings in the bracket	No Play Allowed	Not Repairable	Replace Bracket
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
28-14227-1, -11	5 Fig. 9-6, 6	Nut	Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut
W-09	6	Lockwasher	Tangs (deformed or cracked)	None Allowed	Not Repairable	Replace Lockwasher
28-14236-1	7	DU Washer	Flatness	.005	Not Repairable	Replace Washer
			Thickness .090 to .093	-.003	Not Repairable	Replace Washer
28-14256-1	9	Nut	Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut
28-14224-1, -3, -5	12 & 18	Spline Adapters	Inboard face of adapter perpendicular to the O.D.	.0025 FIM	Not Repairable	Replace Adapter
			O.D. 3.6235 to 3.6245	-.0005	Not Repairable	Replace Adapter
			Spline pitting	.003 deep	Not Repairable	Replace Adapter
			Spline corrosion	None Allowed	Surface corrosion	Remove with wire brush

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Table 9-1. Main Rotor Hub Assembly

P/N	Fig. 9-4, 9-5 Item #	Part Name	Inspection Requirements: Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
28-14224-1, -3, -5	12 & 18	Spline Adapters (Cont'd)	Spline wear	.0015 on side	Not Repairable	Replace Adapter
			Nicks, scratches, or corrosion	.010 deep	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Adapter
28-14280-1, -3, -5	14	Upper Hub	Spline Adapter Bore 3.624 to 3.625	+.0005	Not Repairable	Replace Upper Hub
			U Block Bearing Bores 2.4986 to 2.4994	+.0008	Not Repairable	Replace Upper Hub
			Recesses for the DU washers parallel to the upper surface within .001	+.0005	Not Repairable	Replace Upper Hub
			Damper Bolt Bushing Dia. .3747 to .3757	+.0005	Not Repairable	Replace Bushing
			Threads for walking beam brackets (crossed or missing)	None Allowed	Not Repairable	Replace Heli coil
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Upper Hub

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Table 9-1. Main Rotor Hub Assembly

P/N	Fig. 9-4, 9-5 Item #	Part Name	Inspection Requirements: Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
28-14223-1	16	Spacer	Dowel Hole Dia. .3125	+.0005	Not Repairable	Replace Spacer
			Bolt Hole Dia. .313 to .318	+.002	Not Repairable	Replace Spacer
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Spacer
28-14281-1, -3, -5	17	Lower Hub	Spline Adapter Bore 3.624 to 3.625	+.0005	Not Repairable	Replace Lower Hub
			U Block Bearing Bores 2.4986 to 2.4994	+.0008	Not Repairable	Replace Lower Hub
			Recesses for the DU washers parallel to the lower surface within .001	+.0005	Not Repairable	Replace Lower Hub
			Damper Bolt Bushing Dia. .3747 to .3757	+.0005	Not Repairable	Replace Bushing
			Nicks, scratches, or corrosion	None Allowed	≤ 0.10 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Lower Hub

* All dimensions are in inches.

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D. Place the spacer (16) and shim (34), if installed, on the lower hub plate and align the bolt holes.

NOTE

Ensure the DU washers are seated in the recessed areas of the upper hub plate.

E. Lubricate the bearing bores of the upper hub plate and install the upper hub plate onto the U-blocks.

F. Lubricate the dowel pins (13) and install by tapping them into the center hole of the 3-hole bolt pattern. Install the pins until they are slightly recessed from the surface of the hub plate.

NOTE

The upper spline adapter has the wider flat surface on top side of the splines while the lower adapter has a rib extending from the lower end of the splines.

CAUTION

The phasing marks on the upper spline adapter must be aligned with one of the pitch change bellcrank mount brackets. Using a felt marker, mark a line on the outboard edge of the hub plates in line with the spline phasing marks to aid in installing the lower spline adapter.

G. Insert bolts in the upper spline adapter (12) as guides and install the adapter onto the upper hub plate.

H. Carefully turn the hub assembly over and position on wood blocks.

I. Install the lower spline adapter (18) and align the phasing mark with the upper adapter phasing marks.

J. Turn the hub assembly over and install the center hub bolts (11) in the holes adjacent to the pitch change bellcrank mount bracket holes. Install the washers and nuts and torque the hardware.

K. Install the pitch change bellcrank mount brackets (3). Torque the through bolts (2). Torque and lockwire (.032) the other bolts (1).

L. Set the rotational drag of the U-blocks as follows:

(1) Place the hub assembly on a hub stand with the lower end of the U-blocks up.

(2) Install a DU washer (7) into the recess of the hub plate with the chamfer in board toward the hub plate.

(3) Install shims (8) approximately .025 inch/0.6 mm thick and the lower U-block nut (9). Tighten the nut using tool (T-0003).

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(4) Rotate the U-block to one of the stops and install a hinge pin into the retention pin hole until the inside edge of the flange is 7.1 inches/18 cm from the center of the universal block.

(5) Place a wire loop around the hinge pin against the flange. Attach a spring scale to the wire loop and pull to check the drag. The drag tolerance with the nut torqued is 4-10 pounds/1.8-4.5 kg.

(6) Add or subtract shims as required to obtain the proper drag.

(7) Place the locking key (10) into the slot on the nut that is aligned with the notch in the U-block and secure with the washer and screw.

M. Turn the hub assembly over on the stand.

N. Install the upper U-block nuts (5) as follows:

NOTE

If the hub is equipped with oil lubricated flapping bearings, shims may be required between the bearing and the lock washer to prevent the universal block from protruding above the nut. The oil reservoir flange must seat flush against the nut.

(1) Install the lock washer (6) and nut on the U-block.

(2) Torque the nut to 20 ft-lbs/27.3 Nm using tool (T-0051).

(3) Tap down on the upper nut with a plastic mallet and re-torque the nut to seat the bearing. Repeat the process until the nut will not move while being re-torqued.

(4) Bend the tab on the lock washer that aligns with the recess in the nut into the nut.

(5) If the main rotor hub assembly is equipped with grease lubricated flapping bearings, install the dust cover (4) and secure.

(6) If the main rotor hub assembly is equipped with oil lubricated flapping bearings:

a. Install new O-rings (31) on the reservoir (29). Lubricate the O-rings with MIL-PRF-23699 and (Figure 9-5, 29).

b. Install the reservoir (29) onto the universal block (15) using a twisting motion until the base of the reservoir seats flat against the universal block.

CAUTION

Ensure the reservoir is fully seated into the universal block before installing the screws. Do not attempt to seat the reservoir into the universal block by using the screws. The reservoir will distort and crack.

c. Install the dust cover (4) and secure.

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d. Install the O-ring (32) and drain plug (28).

O. Install the grease fittings (19) into the upper and lower hub plates (6 places).

P. Install the retention assemblies (para. 9-19).

Q. Install the dampers (para. 9-31).

R. Connect the pitch change links and pitch change bellcranks to the pitch horns (para. 12-96). Torque the hardware and cotter pin.

9-12. Installation – Main Rotor Hub

A. Locate the spline with the phasing mark at the top of the main rotor mast and mark it with a black felt marker for alignment ease. Apply Aeroshell 22 to the remaining splines.

B. Install the hoist sling (T-0011) so the arms are between the pitch arm and the blade retention assembly, over the lead/lag retaining nut, and outboard of the main rotor damper rod-end. The sling arms are long enough to be double wrapped if preferred (Figure 4-10).

NOTE

Install the left side ground handling wheel and extend to aid in installing the hub assembly.

C. Attach the sling to a lifting device and position the hub assembly over the main rotor mast.

D. Align the phasing marks on the hub assembly with the phasing mark on the mast and lower the hub assembly onto the mast. Remove the hoist sling.

CAUTION

Verify the phasing mark on the mast is between the two phasing marks on the hub assembly.

WARNING

Use extreme caution when torquing the mast nut.

E. Install the mast washer with the chamfered side toward the hub assembly. Install the mast nut and torque to 450 ft-lbs/613.6 Nm using tool (T-0048). Lockwire (.041) the nut in 3 places and apply as a minimum one torque stripe (Torque-Seal® or equivalent).

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NOTE

The pitch change bellcranks must be installed with the grease fitting trailing the direction of rotation.

CAUTION

Foreign objects dropped down the mast must be immediately removed to prevent damaging the flight controls.

H. Connect the pitch change bellcranks to the mount brackets and to the push-pull rods in the mast. Torque the hardware to 40 in-lbs/4.5 Nm and cotter pin.

I. Operate the flight controls and check for any binding or interference.

J. Install the main rotor blades (para. 9-38).

K. Check main rotor blade track (para. 9-5).

L. Perform a post maintenance test flight (para. 4-61).

9-13. Retention Assembly

9-14. Removal – Retention Assembly (Figure 9-6)

NOTE

The retention assemblies can be removed from hub assembly while the hub assembly still installed on the aircraft.

A. Remove the main rotor blade (para. 9-34) from the retention assembly if the hub assembly is installed on the aircraft.

B. Remove the main rotor dampers (para. 9-26).

C. Disconnect the pitch change link from the pitch change bellcrank (para. 12-93).

D. Drain the oil from the universal block (para. 4-22) if equipped with oil lubricated flapping bearings.

E. Bend the lock washer tab (5) away from the hinge pin retaining nut (6). Remove the nut using tool (T-0051-3).

F. Lift the retention assembly off of the down stop and rotate the blade grip slightly to allow removal of the hinge pin. Slide or tap the hinge pin (2) from the retention assembly and remove the retention assembly from the hub.

G. Remove the DU washers (3) and shims (4), if any are installed, from both recesses in the U-block. Note the shim position(s) and retain the order for reassembly.

H. Remove the sleeves from the seals if equipped with oil lubricated flapping bearings.

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9-15. Disassembly – Retention Assembly (Figure 9-7)

NOTES

If replacing the tension-torsion straps only, proceed to paragraph 9-19.1.

For Lamiflex equipped aircraft, the blade grip, lamiflex bearing, and lamiflex bearing shims can be removed with the retention assembly installed on the hub assembly.

Lamiflex bearings are discontinued. If the Lamiflex bearings must be replaced, the aircraft must be switched to a T-T strap retention assembly. Refer to Table 9-2 or Enstrom TH-28/480 Series Illustrated Parts Catalog, Figure 8-3 for parts.

A. Lamiflex equipped aircraft:

(1) Remove the main rotor blade (para. 9-34) and disconnect the pitch change link from the pitch change bellcrank (para. 12-93) if the retention assembly is installed on a hub assembly.

CAUTION

Use brass protector plates in the vise jaws to prevent from damaging the retention assembly.

(2) Clamp the retention assembly vertically in a vise if removed from the hub assembly.

(3) Remove the dust cover (18) from the blade end of the retention assembly. Inspect for brass residue (chips or flakes) from the lamiflex bearing, if equipped.

(4) Remove the cotter pin (17) from the retention nut (16) and remove the nut. Use tool (T-0013) if the nut cannot be removed by hand.

(5) Remove the shims (15), lamiflex bearing (14), and nylatron strap (5), if not bonded to the spindle, from the spindle (3).

(6) Pull the blade grip (13) from the spindle. If required, tap the grip with a plastic mallet to aid in removal.

CAUTION

If the lamiflex bearing wears through the nylatron strap, inspect the spindle for damage. The maximum depth allowed is .020"/0.51 mm. Blend the damage out before installing a new nylatron strap.

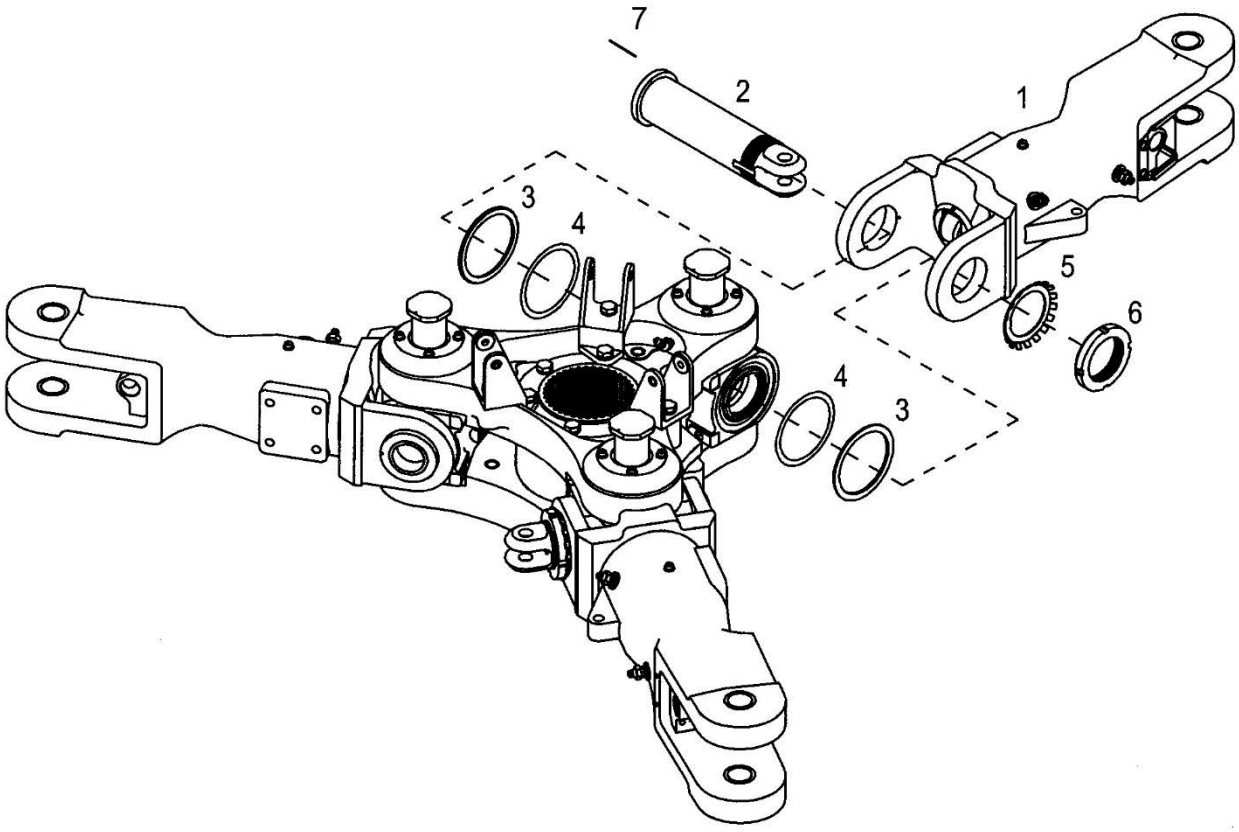
(7) Peel the nylatron strap (5) from the spindle if bonded to the spindle.

(8) Remove the O-ring (12) and DU washer (11) from the spindle.

(9) Remove the retaining ring (10) from the spindle.

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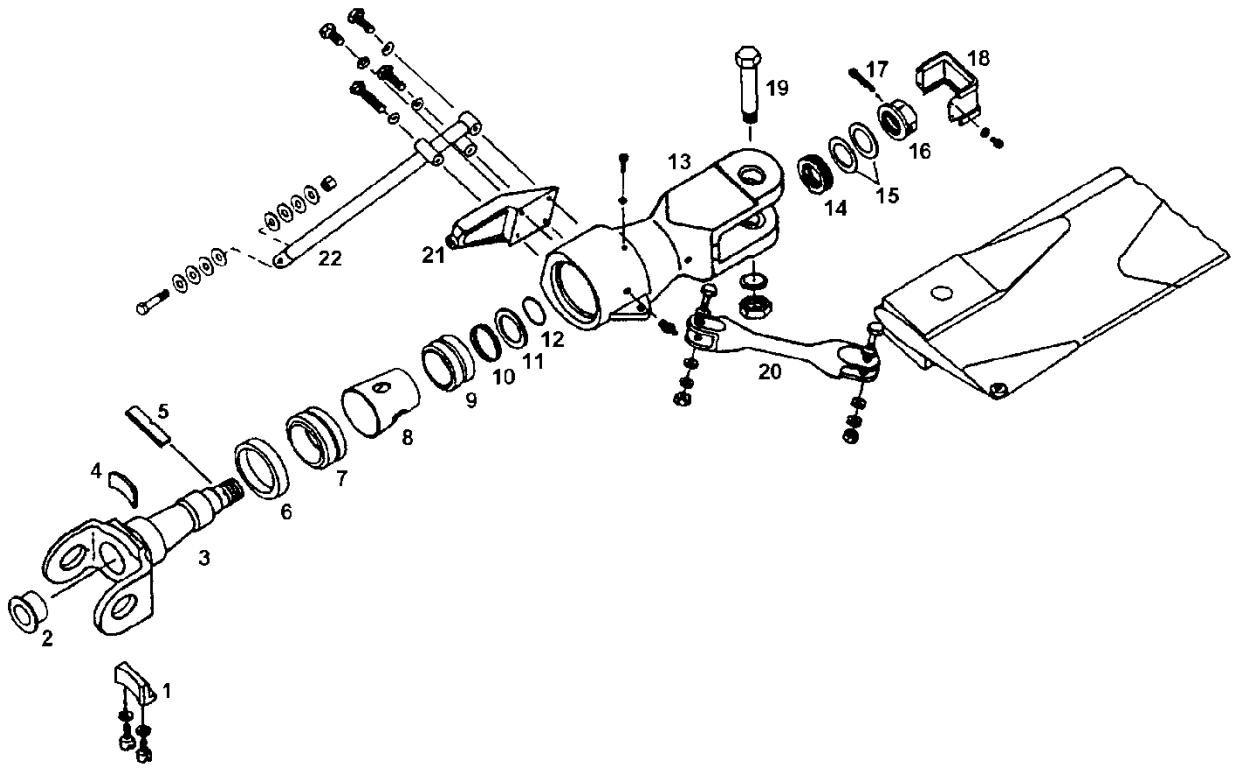
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1.	Retention Assembly	5.	Lock Washer
2.	Flapping Hinge Pin	6.	Nut
3.	DU Washer	7.	Pin
4.	Shim		

Figure 9-6. Retention Assembly Installation

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NOTE

Lamiflex bearings are discontinued.

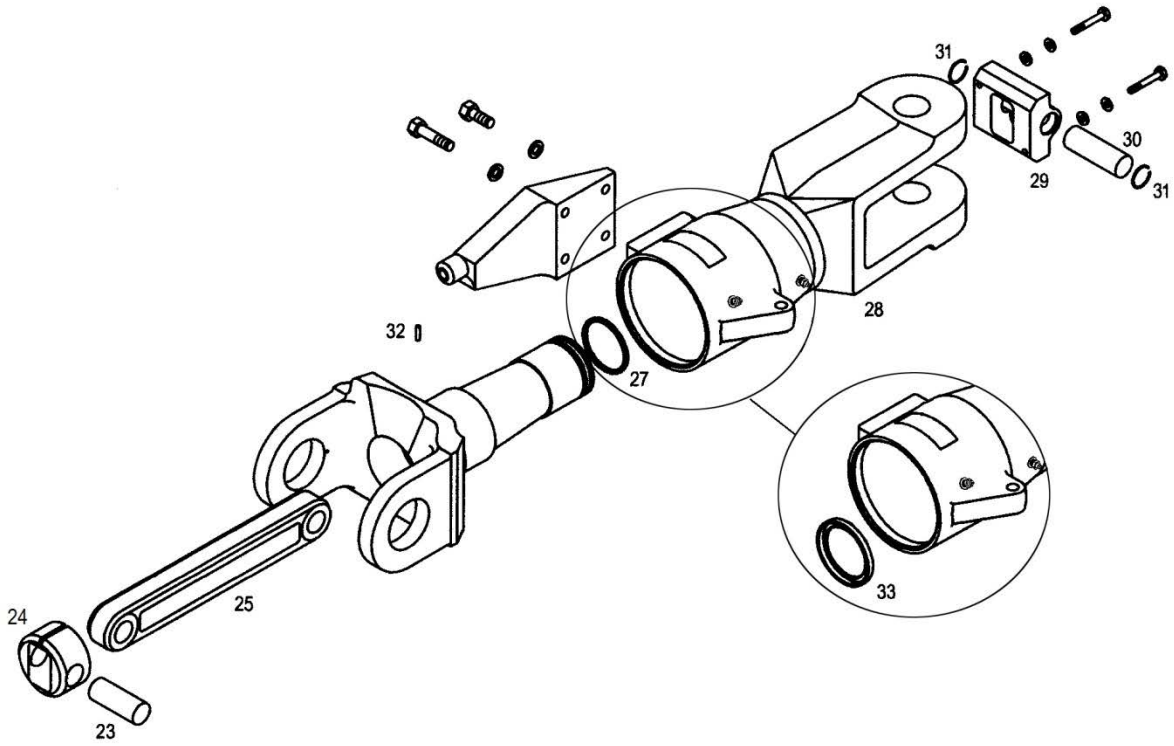
1.	Droop Stop	12.	O-Ring
2.	Dust Cap	13.	Blade Grip
3.	Spindle	14.	Lamiflex Bearing
4.	Flapping Stop	15.	Shim
5.	Nylatron Strap	16	Retaining Nut
6.	Seal	17.	Cotter Pin
7.	Bearing	18.	Dust Cover
8.	Spacer	19.	Blade Retention Pin
9.	Bearing	20.	Drag Link
10.	Retaining Ring	21.	Pitch Horn
11.	DU Washer	22.	Planipetal Weight

Sheet 1 of 2

Figure 9-7. Retention Assembly

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23.	Pin	29.	Lug
24.	Cylinder	30.	Pin
25.	Tension-Torsion Strap	31.	Retaining Ring
26.	Spindle	32.	Indexing Pin
27.	O-Ring (omitted if (33) is used)	33.	Seal (omitted if (27) is used)
28.	Blade Grip		

Sheet 2 of 2

Figure 9-7. Retention Assembly

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(10) Remove the hinge pin alignment pin from the ear of the spindle using a small punch.

(11) Install a press tool between the seal (6) and the bearing (7) on the spindle. Using a hydraulic press, press the bearings (7 & 9) and spacer (8) from the spindle.

(12) Remove the seal (6).

NOTE

Removal/replacement of the retention stops are necessary only if the stops are damaged or the adhesive has loosened.

(13) Remove the retention stops (1 & 4).

(14) Remove the cap from the bore of the spindle (2).

(15) Remove the planipetal weight (22) and the pitch horn (21) from the blade grip.

B. Tension-Torsion Strap equipped aircraft:

NOTE

There are two different Tension-Torsion Strap Retention Assemblies used on the TH-28/480 Series. The 28-14381-1 Retention Assembly uses an O-ring at the outboard end of the spindle assembly to prevent grease leakage from the retention assembly. The 28-14381-3 Retention Assembly uses a seal installed in the blade grip to prevent grease leakage from the retention assembly.

NOTE

If equipped with STC SH03465CH tension-torsion straps, refer to Table 2-2 for manufacturer installation instructions and instructions for continued airworthiness.

(1) Remove the retention assembly from the main rotor hub (para. 9-14).

CAUTION

Use brass protector plates in the vise jaws to prevent from damaging the retention assembly.

(2) Clamp the retention assembly vertically in a vise.

(3) Remove the dust cover (18) from the blade end of the retention assembly.

(4) Remove one of the retaining rings (31) securing the pin in the lug at the outboard end of the retention assembly. Remove the pin (30) and the remaining retaining ring.

(5) Pull the blade grip (28) from the spindle.

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NOTE

Only remove the seal from the blade grip if replacing a defective seal or blade grip.

(6) Remove the O-ring (27) from the spindle (28-14381-1 Retention Assembly). Remove the seal (33) from the grip (28-14381-3 Retention Assembly).

NOTE

The pin used to secure the tension-torsion strap at the inboard end is not secured with retaining rings.

(7) Remove the spindle from the vise and push the tension-torsion strap (25) back through the spindle.

(8) Remove the pin (23) from the cylinder (24) and separate the tension-torsion strap from the cylinder.

(9) Remove the retaining ring (10) from the spindle.

NOTE

Do not remove the cylinder alignment pin from the spindle unless required.

(10) If required, remove the flapping pin alignment pin from the ear of the spindle and the cylinder alignment (32) pin using a small punch.

(11) Install a press tool between the seal (6) and the bearing (7) on the spindle. Using a hydraulic press, press the bearings (7 & 9) and spacer (8) from the spindle.

(12) Remove the seal (6).

NOTE

Removal/replacement of the retention stops are necessary only if the stops are damaged or the adhesive has loosened.

(13) Remove the retention stops (1 & 4).

(14) Remove the hardware securing the lug to the blade grip and remove the lug (29).

(15) Remove the pitch horn (21) from the blade grip.

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9-16. Inspection - Retention Assembly

CAUTION

Do not submerge the lamiflex bearing in any type of cleaning fluid while cleaning the parts for inspection. Clean the bearing by hand using alcohol.

A. See Table 9-2 for detailed inspection requirements of the retention assembly.

9-17. Repair - Retention Assembly

A. Repair or replace the components of the retention assembly as required in accordance with Table 9-2.

9-18. Assembly - Retention Assembly (See Figure 9-7)

NOTE

Grease bearings (grease lubricated) prior to installation through the small hole in the bearing. When reinstalling removed bearings, purge old grease and refill the bearings with new grease.

A. Lamiflex equipped aircraft

(1) If installing new retention stops (1 & 4), use the following procedures:

a. Clean the blocks and the spindle with acetone or equivalent.

b. Apply the adhesive (DP420 or equivalent) to the bonding surface of the stop and install the stop into position on the spindle. Install the screws to secure the droop stop (1).

c. Allow the adhesive to dry until hard.

(2) Apply zinc chromate to the bore of the spindle (3) and install the plug (2) in the bore.

CAUTION

Use brass protector plates in the vise jaws to prevent from damaging the retention assembly.

(3) Clamp the spindle in a vise in the vertical position.

(4) Lubricate (MIL-PRF-81322) the seal surface of the spindle and install the seal (6) with the spring side facing toward the ears of the spindle.

(5) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (7) using a plastic mallet.

(6) Install the spacer (8).

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Table 9-2. Retention Assembly

			Inspection Requirements*			
P/N	Fig. 9-7 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14240-1	1	Droop Stop	General Condition	.003 wear	Not Repairable	Replace Stop
28-14282-13	3	Spindle	Lamiflex bearing tab slot width .187 to .189	+.002	Not Repairable	Replace Spindle
			Small bearing surface Dia. 1.9996 to 2.0003	-.0003	Not Repairable	Replace Spindle
			Large bearing surface Dia. 2.4996 to 2.5002	-.0003	Not Repairable	Replace Spindle
			Seal surface Dia. 2.872 to 2.878	-.002	Not Repairable	Replace Spindle
			Flapping pin bore Dia. 1.7495 to 1.7500	+.0005	Not Repairable	Replace Spindle
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Spindle
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Spindle
28-14231-1	4	Up Stop	General condition	.003 wear	Not Repairable	Replace Stop
			Cracks	None Allowed	Not Repairable	Replace Stop
28-14311-1	5	Nylatron Strap	Cracks or worn through	None Allowed	Not Repairable	Replace Strap

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Table 9-2. Retention Assembly

P/N	Fig. 9-7 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
40NBC20-52YZP	7	Bearing	O.D. 3.2492 to 3.2500	No Tolerance Allowed	Not Repairable	Replace Bearing
			I.D. 2.4993 to 2.5000	No Tolerance Allowed	Not Repairable	Replace Bearing
			Ratcheting or roughness	None Allowed	Not Repairable	Replace Bearing
28-14261-1	8	Spacer	Length 3.061 to 3.062	-.001	Not Repairable	Replace Spacer
			Ends parallel	Within .0012 FIM	Not Repairable	Replace Spacer
32NBC20-44YZP	9	Bearing	O.D. 2.7494 to 2.7500	No Tolerance Allowed	Not Repairable	Replace Bearing
			I.D. 1.9993 to 2.0000	No Tolerance Allowed	Not Repairable	Replace Bearing
			Ratcheting or roughness	None Allowed	Not Repairable	Replace Bearing
28-14313-1	11	DU Washer	Thickness .090 to.093	-.003	Not Repairable	Replace Washer
28-14279-3	13	Blade Grip	Blade retention bolt bore Dia. .875 to .876	+.0005	Not Repairable	Replace Blade Grip
			Large bearing bore Dia. 3.2512 to 3.2522	+.0018	Not Repairable	Replace Blade Grip
			Small bearing bore Dia. 2.7511 to 2.7519	+.0011	Not Repairable	Replace Blade Grip

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Table 9-2. Retention Assembly

			Inspection Requirements*			
P/N	Fig. 9-7 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14279-3	13	Blade Grip (Cont'd)	Thru bore Dia. 1.5145 to 1.5165	+.0015	Not Repairable	Replace Blade Grip
			Drag link ear width .745 to .747	-.001	Not Repairable	Replace Blade Grip
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Blade Grip
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Blade Grip
28-14320-15	14	Lamiflex Bearing	Thickness .770 to .790	(See Note 1)	Not Repairable	(See Note 3)
			External to internal tab angle 15°	±.5°	Not Repairable	(See Note 3)
			Column separations (see Note 2 and also SDB T-054)	None Allowed	Not Repairable	(See Note 3)
28-14335-1	16	Nut	Thrust face for flatness	.0015	Not Repairable	Replace Nut
			Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut

Notes:

1. Lamiflex bearings that are found swelled from grease contamination should be cleaned with denatured alcohol and checked for delamination. If the bearing is swelled beyond the limits (.790” thick), they may still be serviceable if they can be reinstalled in accordance with para. 9-18 and do not cause binding in the controls.
2. Any bearing that shows evidence of bulging around the outer circumference of the elastomer segments, excessive axial swelling, visual delamination of the segments or the expulsion of shim fragments on the outside diameter, should be replaced by an airworthy bearing prior to the next flight.
3. Lamiflex bearings are discontinued. If the Lamiflex bearings must be replaced, the aircraft must be switched to a T-T strap retention assembly. Refer to Enstrom TH-28/480 Series Illustrated Parts Catalog, Figure 8-3 for parts.

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Table 9-2. Retention Assembly

P/N	Fig. 9-7 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14007-1 &-3	19	Blade Retention Bolt	O.D. .8738 to .8745	-.0002	Not Repairable	Replace Bolt
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Bolt
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Bolt
28-14283-1	20	Drag Link	Distance between blade grip ears .748	∀ 001	Not Repairable	Replace Link
			Distance between blade root ears .564 to .566	± .0005	Not Repairable	Replace Link
			Retention bolt hole Dia. (2 places) .3745 to .3750	+.0002	Not Repairable	Replace Link
			Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Link

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Table 9-2. Retention Assembly

P/N	Fig. 9-7 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14278-1	21	Pitch Arm	Pitch change link bolt and mount bolt hole Dia. (5 places) .312 to .315	+.001	Not Repairable	Replace Arm
			Nicks, scratches, or corrosion	None Allowed	≤ 0.10 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Arm
4143010-5	22	Planipetal Weight	Nicks, scratches, or corrosion	None Allowed	≤ .010 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Planipetal Weight
28-14382-19,& -21	23, 30	Retention Pin	O.D. .747 to .749	-.002	Not Repairable	Replace Pin
			Nicks, scratches, or corrosion	None Allowed	≤ .005 deep	Blend and polish out smooth
			Cracks	None Allowed	None Allowed	Replace Pin

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Table 9-2. Retention Assembly

Inspection Requirements*

P/N	Fig. 9-7 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14383-13, & -15	24	Cylinder	O.D. 2.101 to 2.100	-.002	Not Repairable	Replace Cylinder
			Pin bore .750 to.751	-.002	Not Repairable	Replace Cylinder
			Index groove width .125 to .129	+.005	Not Repairable	Replace Cylinder
			Nicks, scratches, or corrosion	None Allowed	≤ .005 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Cylinder
ECD084-1	25	Tension-Torsion Strap	Broken wires	None Allowed Notify Enstrom	Not Repairable	Replace Strap
			Strap bulge	Notify Enstrom		
			Cracks in urethane coating	Notify Enstrom		
			Delamination of urethane coating	Notify Enstrom		
			Swelling from grease contamination	None Allowed	Not Repairable	Replace strap if swollen. Clean strap with denatured alcohol
			Cracks in strap bushings	None Allowed	Not Repairable	Replace Strap

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Table 9-2. Retention Assembly

			Inspection Requirements*			
P/N	Fig. 9-7 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
ECD084-1	25	Tension-Torsion Strap (Cont'd)	Fretting corrosion on bushing flange	.002 deep over 25% of total flange area	Not Repairable	Replace Strap
			Fretting corrosion in bushing bore	.002 deep over 25% of bore area	Not Repairable	Replace Strap
AA-ECD-084-480	25	Tension-Torsion Strap	Refer to manufacturer's instructions for continued airworthiness (ref. Table 2-2)			
28-14385-11, -13 & -15	26	Spindle	Cylinder bore Dia. 2.102 to 2.106	+.003	Not Repairable	Replace Spindle
			Inspect remainder of spindle following the inspection criteria listed earlier in this table			
28-14386-1 & -3	28	Blade Grip	O-ring bore Dia. 2.016 to 2.018	+.002	Not Repairable	Replace Blade Grip
			Inspect the remainder of the blade grip following the inspection criteria listed earlier in this table			
28-14386-5	28	Blade Grip	Seal bore Dia. 2.249 to 2.250	+.002	Not Repairable	Replace Blade Grip
			Inspect the remainder of the blade grip following the inspection criteria listed earlier in this table			
28-14384-13	29	Lug	Pin bore Dia. .750 to .751	+.002	Not Repairable	Replace Lug
			Nicks, scratches, or corrosion	None Allowed	≤ .005 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Lug

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Table 9-2. Retention Assembly

P/N	Fig. 9-7 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14384-15	29	Lug	Pin bore Dia. .750 to .751	+.002	Not Repairable	Replace Lug
			Nicks, scratches, or corrosion	None Allowed	≤ .005 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Lug

* All dimensions are in inches.

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(7) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (9) using a plastic mallet.

NOTE

Ensure the bearings are seated firmly against the spindle shoulders.

(8) Install the retaining ring (10).

(9) Install the DU washer (11) with the chamfered side of the washer facing the bearings.

(10) Install the O-ring (12) on the spindle and seat against the DU washer.

(11) Install tool (T-0036) behind the seal with the chamfered side of the tool toward the large radius of the spindle.

(12) Lubricate (MIL-PRF-81322) the bore of the blade grip and install the grip (13) on the spindle. Tap the grip onto the spindle with a plastic mallet until the seal in seated in the grip.

(13) Remove tool (T-0036) and tap the blade grip until fully seated on the spindle.

(14) Install the nylatron strap (5) inside the lamiflex bearing (14). Ensure that the ends of the nylatron do not overlap.

(15) Install the lamiflex bearing (14) and nylatron strap (5) onto the spindle. Install the tabs on the bearing into the notches in the spindle and the grip.

(16) Install the nut (16) and torque until the grip is fully seated on the spindle. Release the torque on the nut.

(17) Shim (15) the nut until the cotter pin hole in the nut aligns with the hole in the spindle when the nut is tightened (5-15 in-lbs/0.6-1.7 Nm).

NOTE

Add or subtract shims until the cotter pin hole in the nut aligns with the hole in the spindle when the nut is tightened finger tight. Do not under tighten the nut to align the holes. Do not over tighten the nut to align the holes.

CAUTION

The shims must be installed with the O.D. of the shims concentric to the O.D. of the nut and the lamiflex bearing. Improper alignment of these shims can cause wear to the inner surfaces of the main rotor blade grip (Figure 9-9).

(18) Install the nut on the spindle and tighten until finger tight.

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(19) Install the cotter pin after the nut has been properly shimmed and torqued. Bend the cotter pin ends to secure.

CAUTION

To prevent lamiflex bearing damage, do not over-rotate the grip with the pitch change links disconnected.

(20) Install the dust cover (18).

(21) Install the flapping pin alignment pin into the spindle ear if it was removed.

(22) Install the pitch arm and Planipetal weight onto the blade grip. Install the hardware and torque to 75 in-lbs/8.5 Nm. Lockwire the hardware (.032) in horizontal pairs.

(23) If the retention assembly is installed on the hub assembly, connect the pitch change link to the pitch change bellcrank (para. 12-96) and install the main rotor blade (para. 9-38).

(24) Perform a maintenance test flight (para. 4-61).

B. Tension-Torsion Retention Assembly, P/N 28-14381-1

(1) If installing new retention stops (1 & 4), follow the procedures in paragraph 9-18,A,1.

CAUTION

Use brass protector plates in the vise jaws to prevent from damaging the retention assembly.

(2) Clamp the spindle in a vise in the vertical position.

(3) If removed, apply a small amount of Loctite 635 (green) to the alignment pin (32) and press the alignment pin into the spindle until the end is slightly recessed from the seal surface.

(4) Lubricate (MIL-PRF-81322) the seal surface of the spindle and install the seal (6) with the spring side facing toward the ears of the spindle.

(5) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (7) using a plastic mallet.

(6) Install the spacer (8).

(7) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (9) using a plastic mallet.

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NOTE

Ensure the bearings are seated firmly against the spindle shoulders.

(8) Install the retaining ring (10).

(9) Install the tension-torsion strap (25) into the cylinder (24) so that the chamfer on the cylinder is facing inboard (center of main rotor hub) and install the retention pin (23).

(10) Install the tension-torsion strap into the spindle and ensure the groove in the cylinder engages the pin in the spindle.

(11) Install the O-ring (27) on the spindle.

(12) Install tool (T-0036) behind the seal with the chamfered side of the tool toward the large radius of the spindle.

(13) Install the lug (29) onto the end of the blade grip. Apply Loctite 222MS to the threads of the hardware and install the hardware and torque.

(14) Lubricate (MIL-PRF-81322) the bore of the blade grip and install the grip (28) on the spindle. Tap the grip onto the spindle with a plastic mallet until the seal in seated in the grip.

(15) Remove tool (T-0036) and tap the blade grip until fully seated on the spindle.

(16) Install one of the retaining rings (31) into the lug. Align the tension-torsion strap to the lug and install the retention pin (30). Install the other retaining ring.

(17) Install the dust cover (18).

(18) Apply a bead of silicone sealant (732-RTV) around the perimeter of the cylinder assembly (24) to form a seal between the cylinder and the spindle.

(19) Install the flapping pin alignment pin into the spindle ear if it was removed.

(20) Install the retention assembly onto the main rotor hub assembly (para. 9-19).

(21) Install the pitch arm onto the blade grip. Install the hardware and torque to 75 in-lbs/8.5 Nm. Lockwire the hardware (.032) in horizontal pairs.

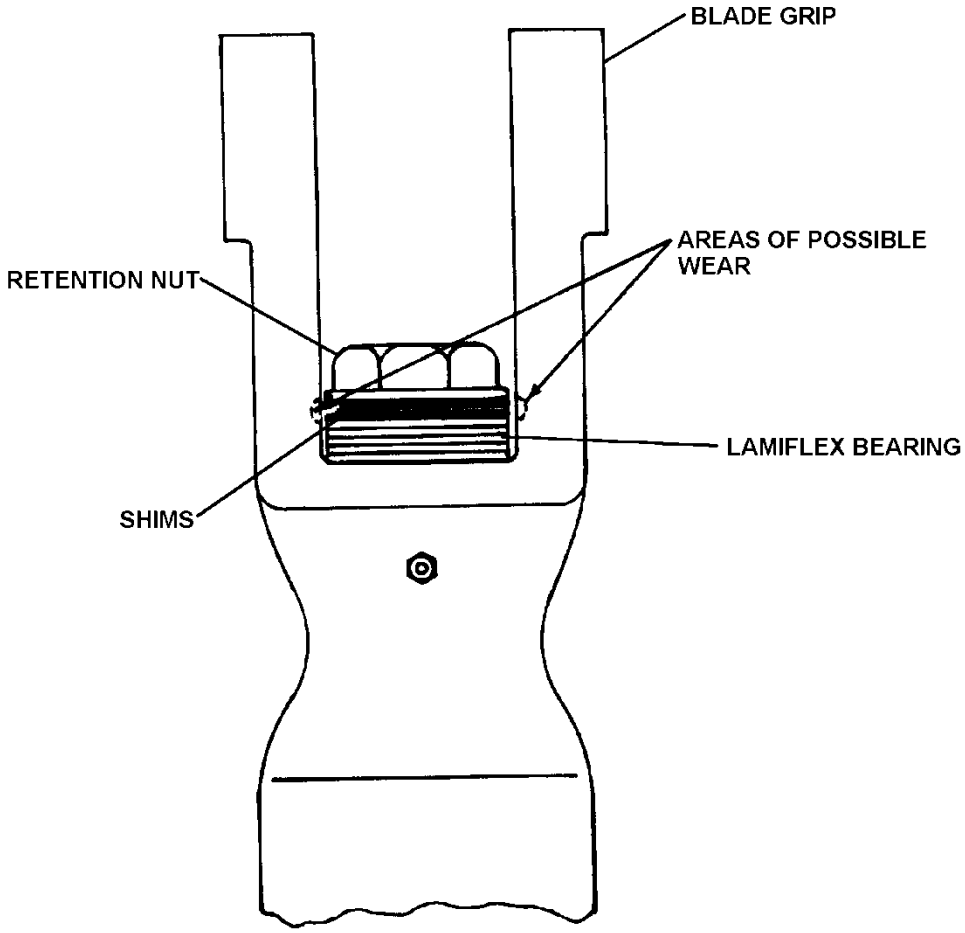
C. Tension-Torsion Retention Assembly, P/N 28-14381-3

(1) If removed, install the grease seal (33) into the blade grip using the following procedure:

a. Place the replacement seal on the seal installation tool (T-0149-13) with the open face against the tool.

b. Place the blade grip over the seal installation tool.

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NOTE

Lamiflex bearings are discontinued.

Figure 9-9. Lamiflex Bearing Shim Installation

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c. Place tool T-0149-11 onto the blade grip and using a press or other suitable device, press the seal into the blade grip seal bore.

d. Remove the installation tools.

(2) If required, bond the covers for the cylinder (24) and lug (29) using the following procedure (Figure 9-7):

a. Remove residual adhesive from the cover and cylinder/lug as required.

b. Slightly abrade the bonding surfaces of the cover and cylinder/lug.

NOTE

Follow the mixing and application instructions for the DP420 adhesive or the DP420 will not cure or adhere properly.

c. Bond the cover to the cylinder/lug using DP420 adhesive. Allow the DP420 adhesive to cure for 24 hours.

d. Apply a light bead of silicone sealant (732-RTV) around the cover.

(3) If installing new retention stops (1 & 4), follow the procedures in paragraph 9-18,A,1.

CAUTION

Use brass protector plates in the vise jaws to prevent from damaging the retention assembly.

(4) Clamp the spindle in a vise in the vertical position.

(5) If removed, apply a small amount of Loctite 635 (green) to the alignment pin (32) and press the alignment pin into the spindle until the end is slightly recessed from the seal surface.

(6) Lubricate (MIL-PRF-81322) the seal surface of the spindle and install the seal (6) with the spring side facing toward the ears of the spindle.

(7) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (7) using a plastic mallet.

(8) Install the spacer (8).

(9) Lubricate (MIL-PRF-81322) the bearing surface and install the bearing (9) using a plastic mallet.

NOTE

Ensure the bearings are seated firmly against the spindle shoulders.

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(10) Install the retaining ring (10).

(11) Install tool (T-0036) behind the seal with the chamfered side of the tool toward the large radius of the spindle.

(12) Remove the spindle from the vise and insert the grip installation pilot tool (T-0149-12) into the spindle.

(13) Lubricate (MIL-PRF-81322) the seal surface on the adapter in the outboard end of the spindle.

(14) Lubricate (MIL-PRF-81322) the bore of the blade grip and install the grip (28) on the spindle. Tap the grip onto the spindle with a plastic mallet until the seal in seated in the grip. Remove the pilot tool (T-0149-12) and the seal tool (T-0036) from the spindle.

(15) Install the lug (29) onto the end of the blade grip. Apply Loctite® 222MS to the threads of the hardware and install the hardware and torque.

(16) Install the tension-torsion strap (25) into the cylinder (24) so that the chamfer on the cylinder is facing inboard (center of main rotor hub) when the tension-torsion strap is installed in the spindle and install the retention pin (23).

(17) Lubricate (MIL-PRF-81322) the portion of the inner spindle bore (3) that contacts the O.D. of the cylinder (24).

(18) Install the tension-torsion strap into the spindle and ensure the groove in the cylinder engages the pin in the spindle.

(19) Install one of the retaining rings (31) into the lug. Align the tension-torsion strap to the lug and install the retention pin (30). Install the other retaining ring.

(20) Install the dust cover (18).

(21) Apply a bead of silicone sealant (732-RTV) around the perimeter of the cylinder assembly (24) to form a seal between the cylinder and the spindle.

(22) Install the flapping pin alignment pin into the spindle ear if it was removed.

(23) Install the retention assembly onto the main rotor hub assembly (para. 9-19).

(24) Install the pitch arm onto the blade grip. Install the hardware and torque to 75 in-lbs/8.5 Nm. Lockwire the hardware (.032) in horizontal pairs.

(25) Service the blade grip.

a. Purge lubricate the retention assembly (para. 4-35).

b. Ensure the seal (6) is not dislocated from the blade grip. If it has moved, remove the purge screw from the top of the blade grip. Insert the blade of a flathead screwdriver between the seal and the spindle. Carefully work the seal back into the grip. It is normal if grease is displaced out of the purge hole as the seal is pushed back into place. Reinstall the purge screw.

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9-19. Installation – Retention Assembly (Figure 9-6)

NOTES

Grease bearings (grease lubricated) prior to installation through the small hole in the bearing. When reinstalling removed bearings, purge old grease and refill the bearings with new grease.

480, S/N 5003, 5014 and subsequent, have flapping bearings installed in the universal blocks using the shimming procedure in paragraph 9-24, B or C.

A. Use the following procedure to install a retention assembly if the flapping bearings are installed in the universal blocks using the shimming procedure in paragraph 9-24, B or C.

NOTE

Installing a pilot (Refer to Figure 9-13) will keep the spacer and shims in the proper location while installing the hinge pin.

(1) Lubricate the O.D. of the hinge pin (2) (MIL-PRF-81322, grease lubricated flapping bearings; MIL-PRF-23699, oil lubricated flapping bearings).

(2) Install the sleeves into the seals if equipped with oil lubricated flapping bearings.

NOTE

Install the shims (if installed) behind the DU washers in the same position as previously installed.

NOTE

If new parts are installed in the flapping axis, begin with a 0.005” shim and follow the shimming procedure in para. (7)a.

(3) Install the shims (4) and DU washers (3) on each side of the U-block with the chamfered side inboard toward the U-block.

NOTE

Ensure that the correct retention assembly is being installed on the universal block.

(4) Carefully slide the retention assembly into position over the DU washers and U-block.

NOTE

The pilot tool (Figure 9-13) will be pushed out as the hinge pin is pushed into the assembly while keeping the shims in the correct place.

(5) Install the hinge pin through the spindle and U-block. Align the roll pin slot in the hinge pin with the roll pin and seat the hinge pin. Tap the roll pin flush with the hinge pin if it protrudes from the hinge pin.

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(6) Lightly lubricate (MIL-PRF-81322; MIL-PRF-23699) the back of nut (6) and install the lock washer (5) and nut (6) on the hinge pin.

CAUTION

Install the nut (6) with the chamfered side of the nut toward the lock washer (5). If the nut is installed with the chamfered side opposite the lock washer, the lock washer tabs may be damaged when the nut is tightened.

CAUTION

Excessive torque could shear the roll pin installed in the head of the hinge pin.

(7) Insert a long punch into the damper-rod end attach holes in the flapping pin. Torque the nut (6) using tool (T-0051-3) to 150 ft-lb/204.5 Nm. The nut may be torqued to 175 ft-lb/238.6 Nm for aligning one of the lock washer tabs. While torqueing the nut, pull against the punch to avoid shearing off the roll pin that locates the head of the pin against the spindle arm side of the retention assembly.

NOTE

If new parts are installed in the flapping axis, follow the shimming procedure in para. (7)a below.

a. Check the flapping bearing drag resistance at the flapping pin. Initially, the grip should not stay up. If the retention assembly stays up, remove shims in 0.005-inch increments until the retention assembly will drop with no resistance when nut is torqued.

(8) Bend one of the tabs on the lock washer into a slot in the nut.

(9) Install the main rotor damper (para. 9-31), connect the pitch change link to the pitch change bellcrank and the pitch horn (para. 12-96), and install the main rotor blade (para. 9-38).

(10) Lubricate the U-block lead lag and flapping bearings (if the flapping bearings are grease lubricated) (para. 4-31).

(11) Lubricate the retention assembly (para. 4-35).

(12) Service the flapping bearing reservoir if equipped with oil lubricated flapping bearings (para. 4-21).

(13) Perform a maintenance test flight (para. 4-61).

B. Use the following procedure to install a retention assembly **until** the flapping bearings are installed in the universal blocks using the shimming procedure in paragraph 9-24,B or C.

(1) Lubricate the O.D. of the hinge pin (2) (MIL-PRF-81322, grease lubricated flapping bearings; MIL-PRF-23699, oil lubricated flapping bearings).

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(2) Install the DU washers (3) on each side of the U-block with the chamfered side inboard toward the U-block.

(3) Carefully slide the retention assembly into position over the DU washers and U-block.

(4) Install the hinge pin through the spindle and U-block. Align the roll pin slot in the hinge pin with the roll pin and seat the hinge pin. Tap the roll pin flush with the hinge pin if it protrudes from the hinge pin.

(5) Install the lock washer (5) and nut (6) on the hinge pin.

CAUTION

Excessive torque could shear the roll pin installed in the head of the hinge pin.

(6) Torque the nut to 50-100 ft-lbs/68.2-136.4 Nm using tool (T-0051-3). Ensure the retention assembly does not remain in the up-stop position.

a. Check the flapping bearing drag resistance at the flapping pin. Initially, the grip should not stay up. If the retention assembly stays up, remove shims in 0.005-inch increments until the retention assembly will drop with no resistance when nut is torqued.

NOTE

Shims may be installed as required on the inboard side of the DU washers to avoid excessive torque in obtaining the flapping preload. All three retention assemblies should have an equal flapping preload.

(7) Lubricate the U-block lead lag and flapping bearings (para. 4-35) and re-check the retention assembly in accordance with para. 9-19, B, (6). Reshim and retorque the nut, if required.

(8) Bend one of the tabs on the lock washer into a slot in the nut when the proper preload has been obtained.

(9) Install the main rotor damper (para. 9-31), connect the pitch change link to the pitch change bellcrank and the pitch horn (para. 12-96), and install the main rotor blade (para. 9-38).

(10) Lubricate the retention assembly (para. 4-35).

(11) Perform a maintenance test flight (para. 4-61).

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9-19.1 Tension-Torsion Strap (Figure 9-7)

9-19.2 Tension-Torsion Strap – Removal

NOTE

The following procedure is performed for changing the tension-torsion straps. The blade grip does not need to be removed from the spindle when changing the tension-torsion straps.

A. Remove the retention assembly from the main rotor hub (para. 9-14).

B. Remove the dust cover (18) from the blade end of the retention assembly.

C. Remove one of the retaining rings (31) securing the pin in the lug at the outboard end of the retention assembly. Remove the pin (30) and the remaining retaining ring.

D. Using a non-metallic scraper remove the silicone sealant from the cylinder (24) and the spindle.

NOTE

The pin used to secure the tension-torsion strap at the inboard end is not secured with retaining rings.

E. Push the tension-torsion strap (25) back through the spindle.

F. Remove the pin (23) from the cylinder (24) and separate the tension-torsion strap from the cylinder.

9-19.3 Tension-Torsion Strap – Installation

A. Install the tension-torsion strap (25) into the cylinder (24) so that the chamfer on the cylinder is facing inboard (center of main rotor hub) when the tension-torsion strap is installed in the spindle and install the retention pin (23).

B. Lubricate (MIL-PRF-81322) the portion of the inner spindle bore (3) that contacts the O.D. of the cylinder (24).

C. Install the tension-torsion strap into the spindle and ensure the groove in the cylinder engages the pin in the spindle.

D. Install one of the retaining rings (31) into the lug. Align the tension-torsion strap to the lug and install the retention pin (30). Install the other retaining ring.

E. Verify proper installation of both retaining rings (31) Install the dust cover (18).

F. Apply a bead of silicone sealant (732-RTV) around the perimeter of the cylinder assembly (24) to form a seal between the cylinder and the spindle. Reinstall Retention assembly (para. 9-19).

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9-20. Universal Block

9-21. Disassembly – Universal Block (Figure 9-4 or 9-5)

A. Remove the upper and lower bearings and DU washers from the universal block (U-block).

B. Remove the sleeves and seals from the flapping bearing bore if equipped with oil lubricated flapping bearings.

NOTE

Flapping bearings can be removed from the universal blocks using the Flapping Bearing Removal/Installation Tool (Grease Lubricated), T-0151-1, or Flapping Bearing Removal/Installation Tool (Oil Lubricated), T-0162-1, when the universal blocks are installed on the aircraft.

C. Press the flapping bearings, spacer, and shims from the bore of the U-block.

D. Remove the screws and stop pads if visual damage appears on the blocks.

E. Remove the grease fittings if equipped with grease lubricated flapping bearings.

F. Remove the drain plug if equipped with oil lubricated flapping bearings.

9-22. Inspection – Universal Block

A. See Table 9-3 for the detailed inspection requirements of the universal block assemblies.

9-23. Repair – Universal Block

A. Repair or replace the components of the universal block assembly as required in accordance with Table 9-3.

9-24. Assembly – Universal Block (Figure 9-4 or 9-5)

A. If removed, install the stop blocks (21).

NOTE

Index mark the universal blocks and retention assemblies (spindles) as sets.

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Table 9-3. Universal Block Assembly

			Inspection Requirements*			
P/N	Fig. # Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14251-1 & -2	Fig. 9-4, 21 Fig. 9-5, 20	Stop Pad	Visual damage (cracks, chips, etc.)	None Allowed	Not Repairable	Replace Stop(s)
ECD092-1 ECD092-3	Fig. 9-4, 22 Fig. 9-5, 21 Fig. 9-5, 21A	Bearing	O.D. 2.4994 to 2.5000	No Tolerance Allowed	Not Repairable	Replace Bearing
			I.D. 1.7493 to 1.7500	No Tolerance Allowed	Not Repairable	Replace Bearing
			Ratcheting or roughness	None Allowed	Not Repairable	Replace Bearing
28-14236-1	Fig. 9-4, 23 Fig. 9-5, 22	DU Washer	Flatness	.005	Not Repairable	Replace Washer
			Thickness .090 to.093	-.003	Not Repairable	Replace Washer
28-14117-11 or -13	Fig. 9-4, 15 or Fig. 9-5, 15	U-Block	Bore Dia. 2.4996 to 2.4998	+.0002	Not Repairable	Replace U-Block
			Bearing Surface O.D. 1.7492 to 1.7498	-.0002	Not Repairable	Replace U-Block
			Bearing Surfaces concentric	.001 FIM	Not Repairable	Replace U-Block
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace U-Block
			Nicks, scratches, or corrosion	None allowed at the radius of the bearing spindle	≤ .030 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace U-Block

Table 9-3. Universal Block Assembly

			Inspection Requirements*			
P/N	Fig. # Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14235-1	Fig. 9-4, 24	Spacer	Ends parallel	.0015 FIM	Not repairable	Replace Spacer
28-14233-2	Fig. 9-6, 2	Flapping Pin	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Pin
			Damper bolt hole Dia. .5005 to .5015	+.0015	Not Repairable	Replace Pin
			O.D. 1.7486 to 1.7492	-.0005	Not Repairable	Replace Pin
			Longitudinal scores or scratches	.011 deep	≤ .011 deep	Blend and polish out smooth
			Radial Scores	None Allowed	Not Repairable	Replace Pin
28-14233-3	Fig. 9-6, 2	Flapping Pin	O.D. 1.7483 to 1.7493	-.0005	Not Repairable	Replace Pin
			Inspect the remainder of the flapping pin following the inspection criteria listed for the -2 flapping pin			
W-09	Fig. 9-6, 5	Lock Washer	Tangs (deformed or cracked)	None Allowed	Not Repairable	Replace Washer
N-09	Fig. 9-6, 6	Nut	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Nut
4143011-11	Fig. 9-5, 23	Spacer	Ends parallel	.0015 FIM	Not Repairable	Replace Spacer
4143011-13	Fig. 9-5, 26	Sleeve	Ends parallel	.0015 FIM	Not Repairable	Replace Spacer

* All dimensions are in inches.

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B. Install grease lubricated flapping bearings using the following procedure:

(1) Measure the stack up of two (2 Ea.) Bearings, P/N 28NBC2040YZP, and one (1 Ea.) Spacer, P/N 28-14235-1 and measure the distance between the spindle fork (See Figure 9-10).

(2) If the bearing and spacer stack up (DIM. X) is less than the distance between the spindle fork (DIM. Y), add shims, P/N 28-14009-XX, between the bearings and the spacer to create a zero tolerance fit.

NOTE

Use an arbor press to install the flapping bearings if the main rotor hub is disassembled. If the main rotor hub is assembled, use the Universal Block Bearing Tool, T-0151-1, to install the flapping bearing. Refer to Figures 9-11 and 9-12 for use of tool T-0151-1.

(3) Lubricate (MIL-PRF-81322) the bore of the U-block (24). Install a DU washer (23) in the recessed area on the "forward" side of the U-block and place the U-block in an arbor press with the "forward side" and DU washer up. Press a flapping bearing (22) into the U-block until it is flush with the DU washer.

NOTE

If desired, an alignment/installation pilot (included with the tool, T-0151-1) can be fabricated to aid in the installation of the bearing, spacer, and shims into the universal block (See Figures 9-12 and 9-13).

(4) Rotate the U-block in the press and install the spacer (25) and shims (if required). Press the other flapping bearing into the bore until seated against the spacer.

C. Install oil lubricated flapping bearings using the following procedure (See Figure 9-14):

NOTE

If the universal block is not installed in the main rotor hub and an arbor press is used to install the oil lubricated flapping bearings, use the bearing pilots from the removal/installation tool, T-0162-1, to install the bearings into the universal block to the proper depth.

(1) Measure the stack up of two (2 Ea.) Bearings, P/N 28NBC2040YZP, one (1 Ea.) Spacer, P/N 4143011-11, and two (2 Ea.) Sleeves, P/N 4143011-13 and measure the distance between the spindle fork (See Figure 9-10).

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(2) If the bearing, spacer, and sleeve stack up (DIM. X) is less than the distance between the spindle fork (DIM. Y), add shims, P/N 28-14009-XX, between the bearings and the spacer to create a zero tolerance fit.

(3) Lubricate (MIL-PRF-23699) the bore of the U-block. Install a flapping bearing on a bearing pilot from the installation tool set (T-0162-1) and install the bearing until the bearing pilots are bottomed on the universal block. Remove the installation tool keeping the bearing pilot of installed bearing in place.

(4) Install the spacer and shims (if required) into the universal block and onto the bearing pilot. Install the other flapping bearing onto the bearing pilot and install the bearing until the bearing pilots are bottom on the universal block. Remove the installation tool.

(5) Install a pilot (See Figure 9-13) to keep the spacer and shims in position.

(6) Position the seals on both sides of the universal block and using installation tool (T-0161-1) install the seals until the seating plugs are bottomed against the universal block (See Figure 9-15).

D. Lubricate (MIL-PRF-81322) the O.D. of the upper and lower bearing surfaces. Install the DU washers with the chamfered side toward the hub plates onto the U-block.

E. Press the upper and lower bearings onto the U-block.

F. Install the grease fittings or drain plug.

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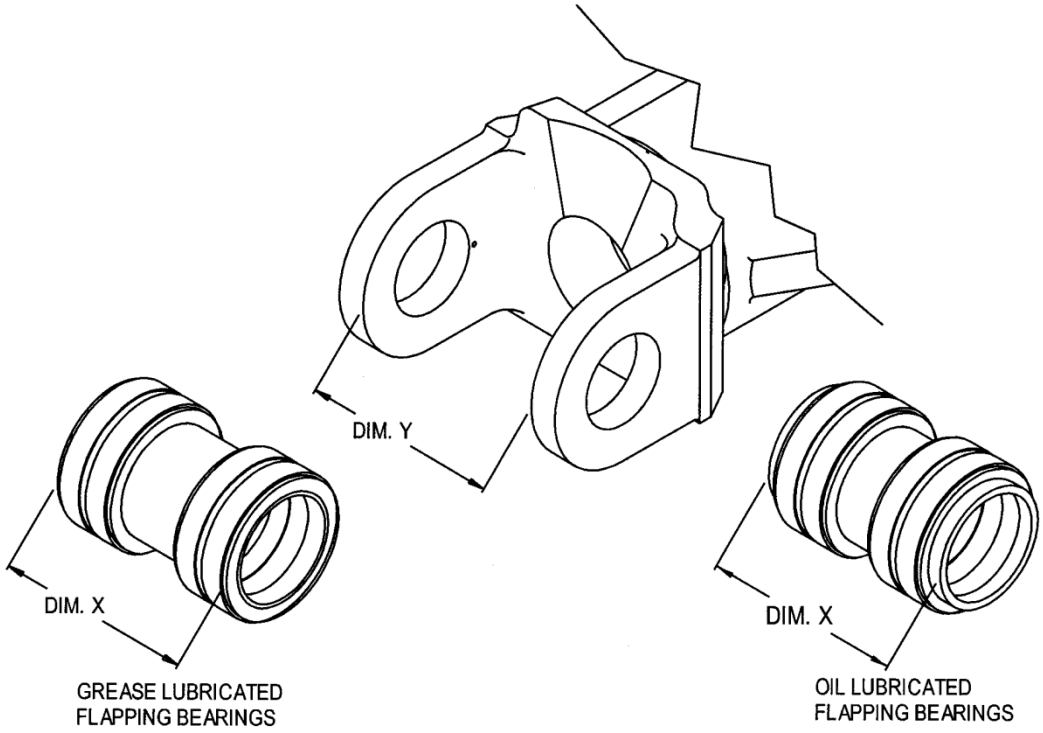


Figure 9-10. Flapping Bearing & Spindle Dimension Check

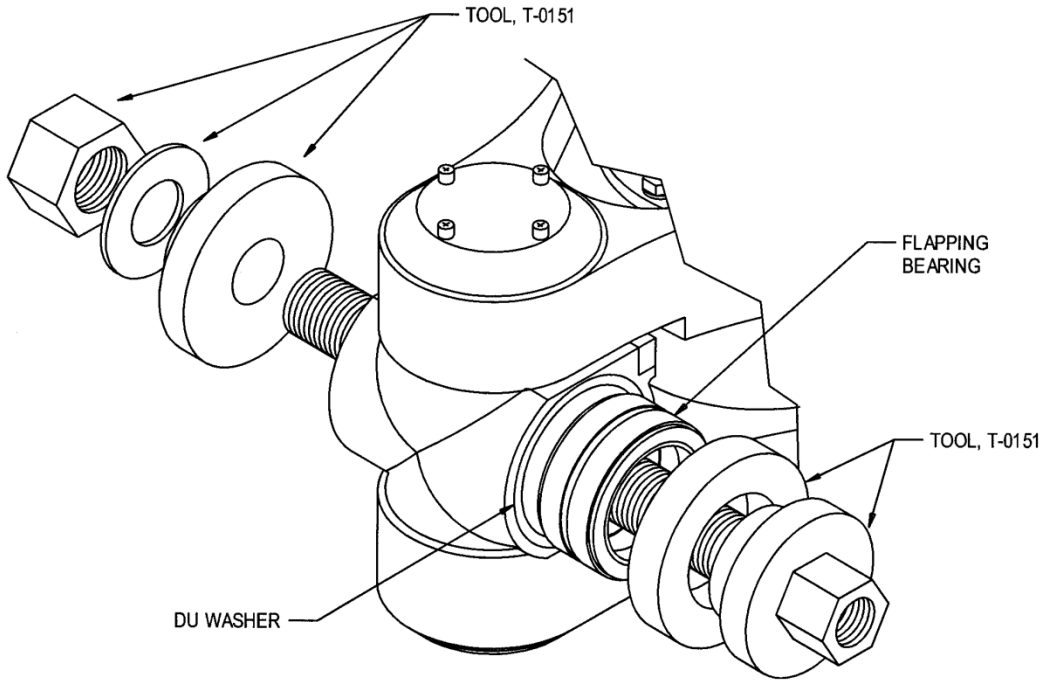


Figure 9-11. "Forward Flapping Bearing Installation (Grease Lubricated)

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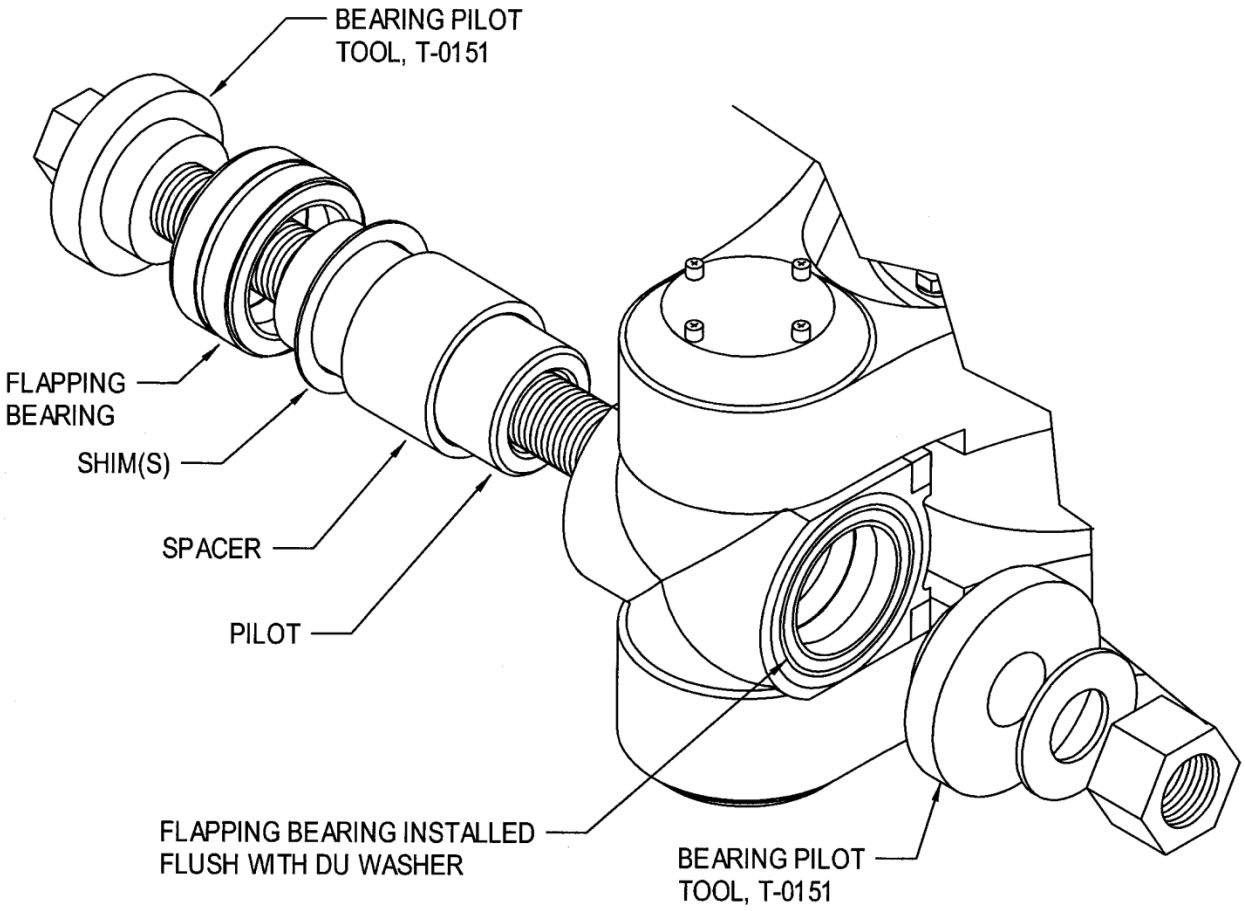


Figure 9-12. “Aft” Flapping Bearing & Spacer Installation (Grease Lubricated)

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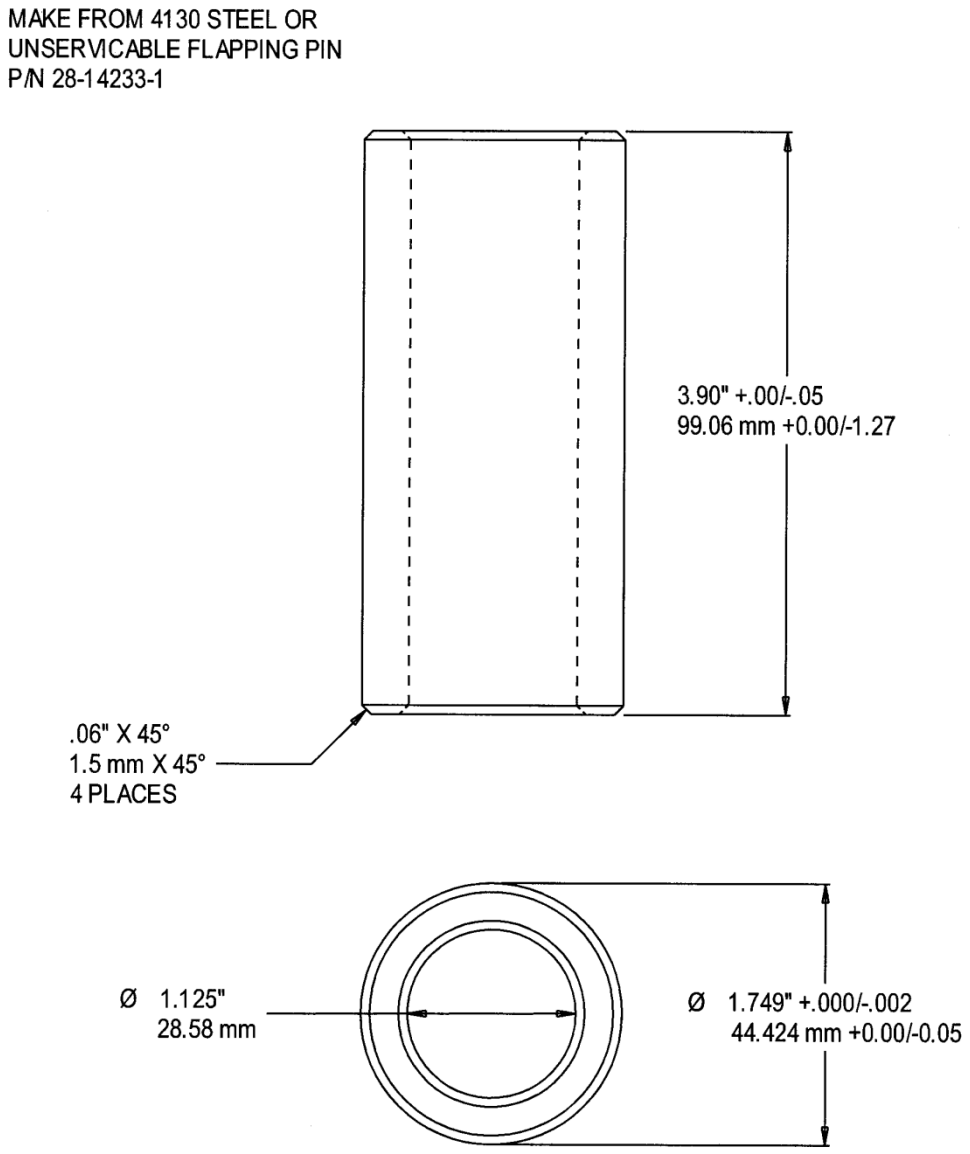


Figure 9-13. Alignment/Installation Port

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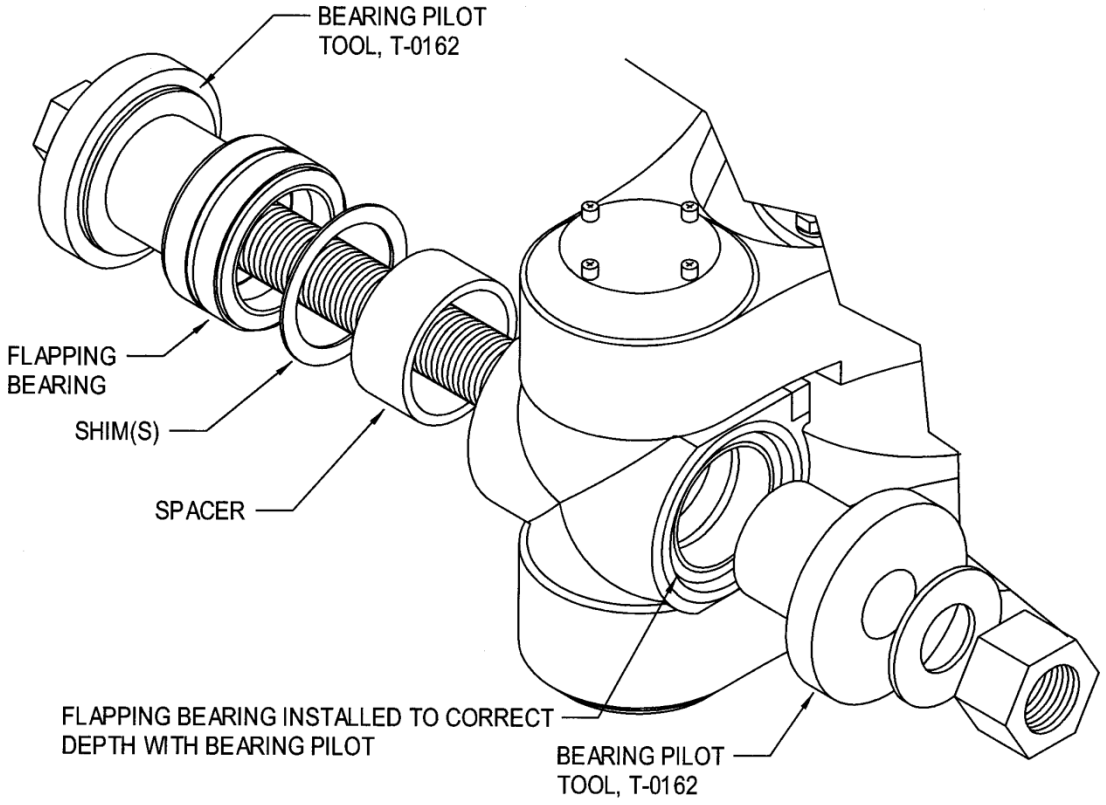


Figure 9-14. Oil Lubricated Flapping Bearing Installation

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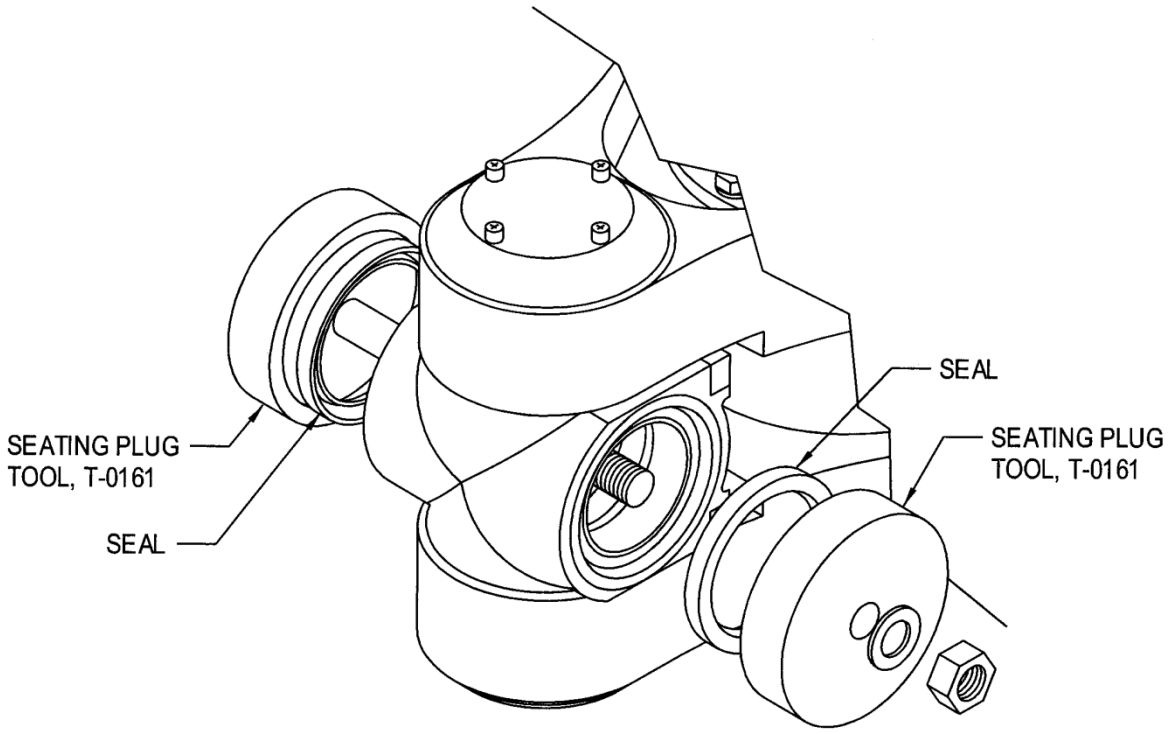


Figure 9-15. Flapping Bearing Seal Installation

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9-25. Dampers

9-26. Removal – Dampers (Figure 9-16)

A. Remove the bolt (5) connecting the damper to the retention assembly.

B. Pivot the damper and remove the spacers (7) from between the damper bearing and the hinge pin.

NOTE

If the center bolt head in the pitch change bellcrank is orientated over the inboard pivot bolt, hardware removal is not necessary.

C. If required, remove the nut and washers from the pitch change bellcrank center pivot bolt. Remove the bolt until the end is flush with the mounting bracket.

D. Remove the inboard pivot bolt (1) from the hub and remove the damper.

9-27. Disassembly – Dampers (Figure 9-17)

NOTE

The following procedure only applies to the hydraulic main rotor dampers, P/N 28-14375-“X”.

A. Secure the damper assembly in a vise.

B. Insert a punch through the rod end (20) hole. Pull on the punch to pull the rod end assembly to expose 1.0 inch/25 mm of the piston shaft (6) and install tool T-0005.

C. Reposition the damper in the vice so that the vice jaws grip tool T-0005.

D. Remove the lockwire from the locking tab (18) and loosen the jam nut (19) and back it out as far as the threads on the rod end (20) will allow which will withdraw the locking tab from the piston shaft (6).

NOTE

If the rod end was <u>not</u> previously assembled with epoxy, but there is evidence of threadlocker (Loctite Red 271, or equivalent) it may be necessary to heat the rod end assembly to remove the jam nut.

<u>WARNING</u>

Use protective gloves when handling heated parts.

D. If required, heat the rod end assembly (250°F/121°C). Remove the rod end.

E. Remove the damper from the vice.

F. Remove the reservoir plugs (26) and pour the fluid from the reservoir (21).

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G. Remove the hardware (16) and (28) securing the reservoir to the damper and remove the reservoir.

H. Remove the sleeves (27) and O-rings (25).

CAUTION

The relief valves are adjusted and set at the factory. Return defective valves to the factory.

I. If removal of the valve assemblies (22) is required, place the reservoir back in a vise. Remove the valve caps (23) and remove the valves.

CAUTION

Remove all burrs from the piston shaft to prevent damage to the brass sleeve and seals during end cap removal.

J. Remove the hardware (16) and (17) that secures the end cap (10) to the damper housing (1). Rotate the end cap approximately 45° using a plastic mallet and remove the end cap by tapping outward on its corners.

K. Pour the fluid from the damper housing.

L. Tap the piston (6) out of the housing using a nylon drift and remove the O-ring or Seal Pack (9) from the piston.

CAUTION

Do not damage the I.D. of the sleeves during seal and wiper removal.

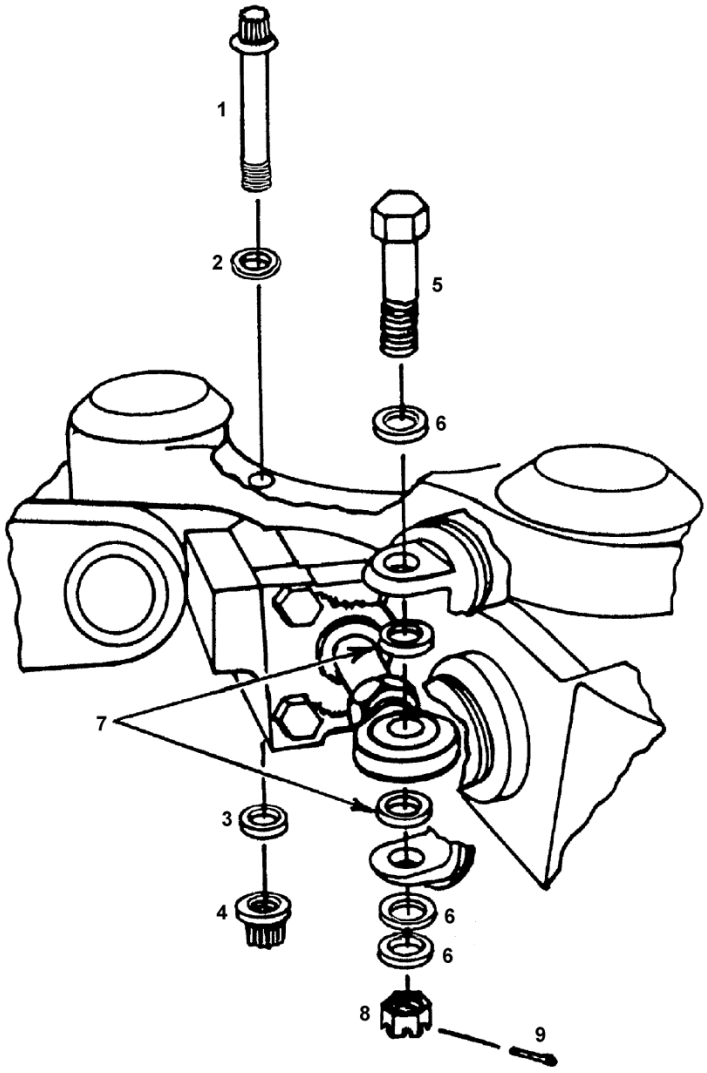
M. Remove the seals (14) and wipers (15) from the brass sleeves (5 & 12) in the end cap and damper housing.

N. Install tool (T-0095) between the ears of the damper housing and press the bushing (3) out using a suitable size drift.

O. Inspect the bushing faces (2) for fretting and wear. Do not remove the bushings (2) unless replacement is required.

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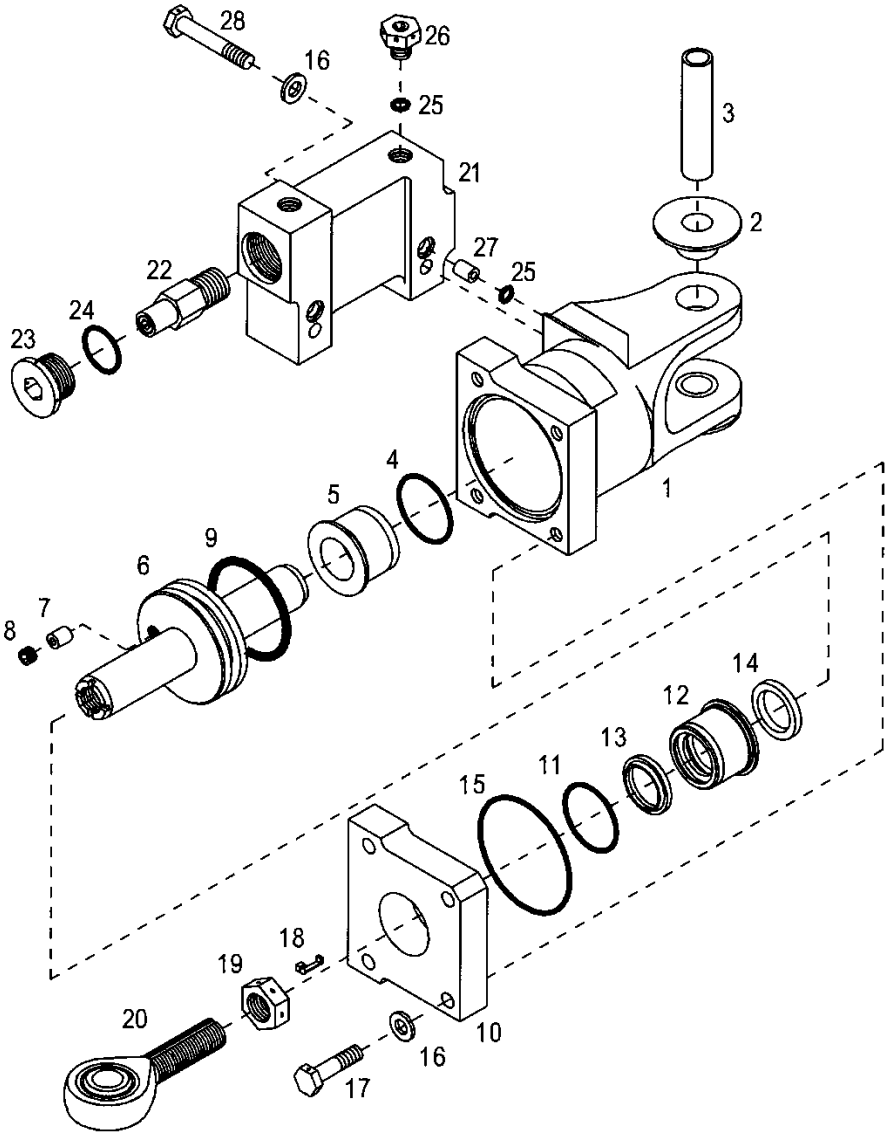


1. Inboard Pivot Bolt
2. Chamfered Washer
3. Washer
4. Nut
5. Bolt
6. Washer
7. Spacer
8. Nut
9. Cotter Pin

Hydraulic Damper, P/N 28-14375-“X”

Figure 9-16. Hydraulic Damper Assembly

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1.	Damper Housing	15.	O-Ring
2.	Bushing	16	Washer
3.	Bushing	17.	Bolt
4.	O-Ring	18.	Lock Key
5.	Sleeve	19.	Nut
6.	Piston	20.	Damper Bearing
7.	Restrictor Sleeve	21.	Reservoir
8.	Set Screw	22.	Valve Assembly
9.	O-Ring or Seal Pack	23.	Cap Plug
10.	End Cap	24.	O-Ring
11.	O-Ring	25.	O-Ring
12.	Sleeve	26.	Plug
13.	Wiper	27.	Sleeve
14.	Seal	28.	Bolt

Figure 9-17. Hydraulic Damper Assembly

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9-28. Inspection – Dampers

A. See Table 9-4 for the detailed inspection requirements for the damper assemblies.

9-29. Repairs – Dampers

A. Replace leaking seals or O-rings on hydraulic dampers as required.

B. Repair or replace the detailed parts of the hydraulic damper assembly as required in accordance with Table 9-4.

9-30. Assembly – Dampers (Figure 9-17)

NOTE

The following procedure only applies to the hydraulic main rotor dampers, P/N 28-14375-"X".

CAUTION

Do not damage the I.D. of the sleeves during seal and wiper installation.

A. Install the seals (14) and wipers (13) into the end cap and damper housing as follows:

(1) Install the seals in the inboard groove of the brass sleeves (5 &12) with the O-ring side toward the piston. Ensure the seal has the O-ring installed in it.

(2) Install the wiper in the outboard groove of the brass sleeves with the lip of the wiper facing outboard.

B. If the bushings (2) where removed, install tool (T-0095) between the ears of the damper housing (1). Using an arbor press, install the bushings into the housing. If new bushings are installed, they must be line reamed with a ½ in. line reamer.

C. Lubricate (L-45/SF96-20) the O.D. of the bushing (3). With tool (T-0095) installed, press the bushing into the housing.

D. Place the damper housing in a vise with the bore up.

NOTE

Ensure the components are free of dirt and contamination prior to assembly.

CAUTION

Do not damage the O-rings or seals during the assembly process.

E. Lubricate (L-45/SF96-20) the bore of the housing.

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F. Install the O-ring or Seal Pack using the following procedure:

(1) If O-ring is installed, lubricate (L-45/SF96-20) the O-ring (9) and install on the piston (6).

(2) If seal pack is installed, install the seal pack onto the piston using tool T-0160-1. Using wood blocks or other suitable devices to protect the piston shaft from damage, clamp the piston vertically in a vise. Install the installation sleeve (T-0160-3) onto the piston. Lubricate (L-45/SF96-20) the seal ring and install on the piston using the expanding sleeve and pilot (T-0160-9). Remove the tools.

G. Install the piston into the damper housing (1) using the following procedure:

(1) Clamp the damper housing vertically in a vice. Install the installation collar tool T-0610-7 onto the damper housing. Install the piston into the collar with the threaded end up and tap with a plastic mallet until the seal pack is into the damper housing. Remove the collar and tap the piston with the plastic mallet until the piston is bottomed in the housing.

H. Fill the housing with damper oil (L-45/SF96-20) and install the O-ring (9) into the recess in the damper housing.

I. Lubricate (L-45/SF96-20) the seal and wiper in the end cap (10). Install the end cap on the piston shaft and gently tap the cap to seat it onto the damper housing.

J. Install the hardware (16 & 17) securing the end cap to the housing. Torque the bolts in a cross pattern.

K. If the relief valves (22) have been removed for cleaning or replacement, install the valves in the reservoir and torque to 350 in-lbs/39.8 Nm.

L. Install new O-rings (24) onto the valve caps (23) and install the valve caps.

M. Reposition the damper to the horizontal position with the reservoir ports up.

N. Install new O-rings (25) on the sleeves and install the sleeves (27) into the reservoir ports in the damper housing.

O. Align the ports in the reservoir (21) with the sleeves in the damper housing and install the reservoir. Install the securing hardware and torque.

P. Temporarily install the damper bearing (20) and place the damper in the damper fixture (T-0057). Position the piston approximately .5 inches/13 mm. from the bottomed position.

Q. Fill the reservoir with damper oil (L-45/SF96-20). Install the servicing/bleeding tools (T-2896) (Refer to Figure 4-5) and cycle the tools until the entrapped air is removed. Remove the servicing/bleeding tools and install the reservoir plugs (26) with new O-rings (25) installed.

R. Remove the damper from the fixture and wipe down to remove the damper oil.

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S. Install the damper rod end bearing assembly.

NOTE

The rod end bearing assembly may have been previously treated with ACF-50 or MIL-PRF-23377 Type I Class 2C or Class N epoxy primer corrosion inhibitor per SDB T-058. If continuing use of ACF-50, removal of prior ACF-50 application is unnecessary. If changing from ACF-50 to epoxy primer, ACF-50 residue must be removed before reinstallation. For helicopters S/N 5242 and subsequent, the rod ends are treated with epoxy primer at the time of manufacture.

(1) Remove the nut.

(2) For new epoxy primer application, remove any ACF-50 residue from the threads of the rod end and the interior threads of the piston with a suitable solvent.

(3) If applying a touch-up of epoxy primer, remove any loose epoxy primer residue from the threads of the rod end and the interior threads of the piston with a brush and a small amount of solvent.

CAUTION

Do not allow the epoxy primer to dry prior to assembly of the rod end.

CAUTION

Mask the bearing area prior to applying epoxy primer to avoid damaging the bearing.

NOTE

Follow the manufacturer's instructions for corrosion inhibitor application.

(4) Apply the applicable corrosion inhibitor to the entire thread length of the rod end, as required.

NOTE

Installing the nut will tend to wipe away corrosion inhibitor that was freshly applied. Re-apply to ensure complete coverage.

(5) Install the jam nut.

(6) Re-apply corrosion inhibitor to the threads below the jam nut, as required.

(7) Install the damper rod end bearing assembly until the distance between the outboard edge of the jam nut (19) and the center line of the damper bearing equals 1.050 in. ± .005 in./26.7 mm ± .13 mm (Figure 9-20).

(8) Re-apply corrosion inhibitor to the threads above the jam nut, as required.

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NOTE

The locking key must be aligned with the piston slots for the jam nut to seat against the piston shaft.

T. Hold the damper bearing with a wrench and tighten the jam nut when the correct position is set. Lockwire (.032) the jam nut to the locking key (18). Position the locking key towards the top of the damper.

U. Lockwire (.032) the end cap bolts (17) in pairs and the valve caps (23) to the reservoir bolts (28) in pairs. Lockwire (.025) the bleed plugs (26) in a pair.

9-31. Installation – Dampers (Figure 9-16)

A. Install the damper onto the main rotor hub.

B. Install the chamfered washer (3) onto the inboard pivot bolt (2) with the chamfer against the bolt head.

C. Install the inboard pivot bolt through the hub plates and damper. Install the washer (3) and nut (4) but do not torque.

CAUTION

On hydraulic dampers, the locking key in the piston shaft must be on the top side to prevent interference with the hinge pin.

D. Install the spacers (7) on each side of the damper bearing and slide the damper bearing into the hinge pin.

E. Align the damper bearing and spacers with the hinge pin. Install a washer (6) on the bolt (5) and install the bolt. Install two washers (6) and the nut (8). Torque to 450-500 in-lbs/45.5-56.8 Nm and install a cotter pin (9).

F. Torque the inboard pivot bolt to 190 in-lbs/21.6 Nm.

G. If the washers and nut were removed from pitch change bellcrank center bolt in accordance with step C, remove the center pivot bolt, turn the bolt 180°, and reinstall the bolt and install washers and nut. Torque to 40 in-lbs/4.5 Nm and cotter pin.

H. Perform a maintenance test flight (para. 4-61).

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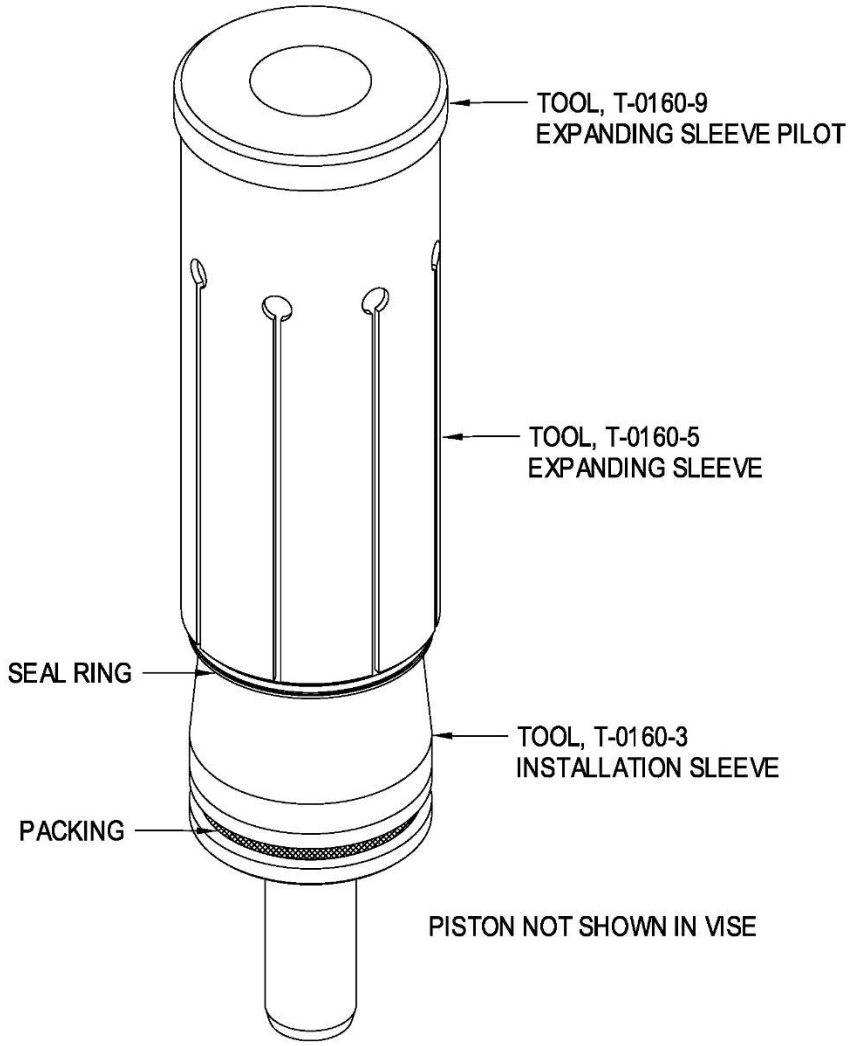


Figure 9-18. Seal Ring Installation

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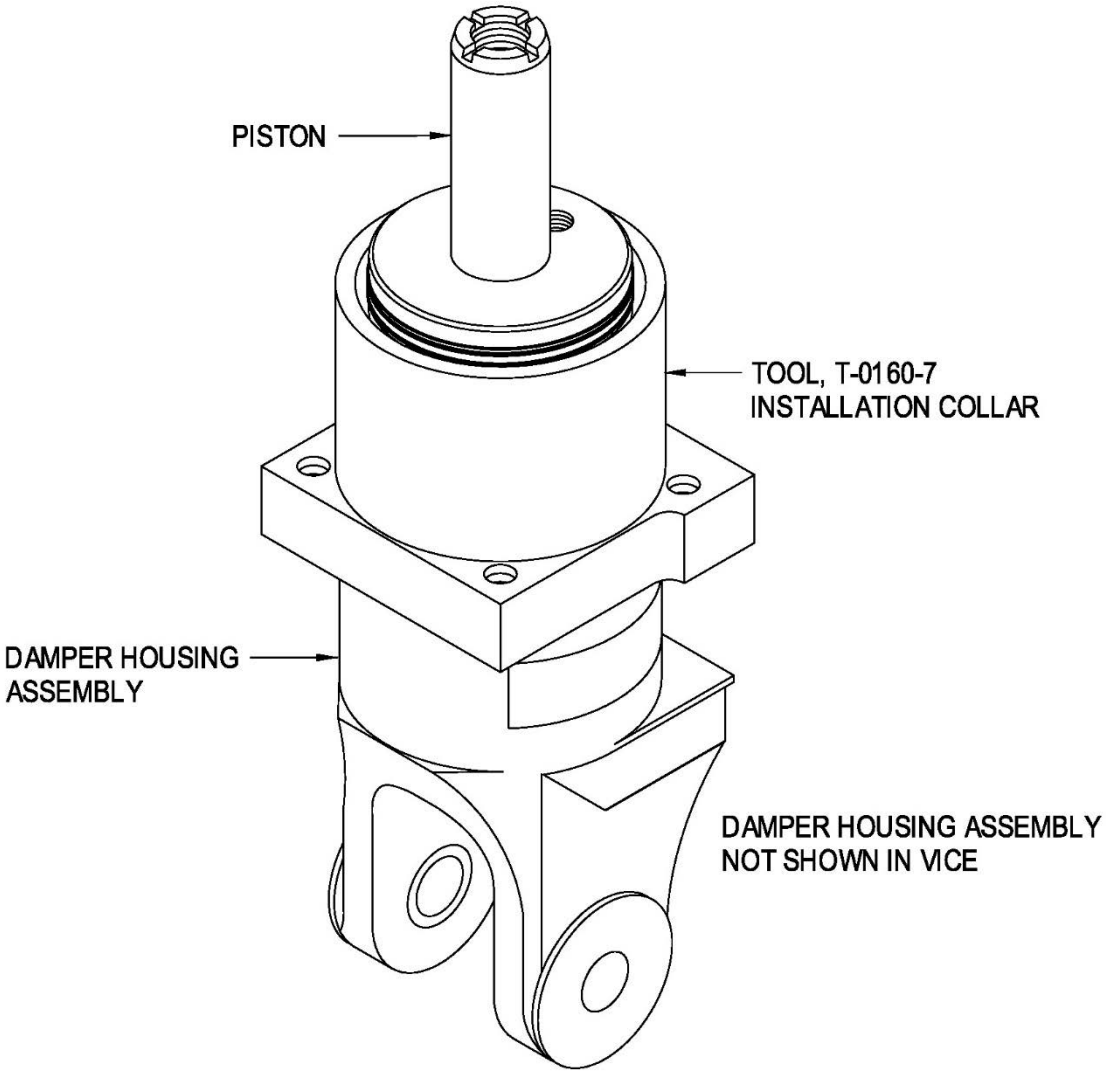


Figure 9-19. Piston Installation

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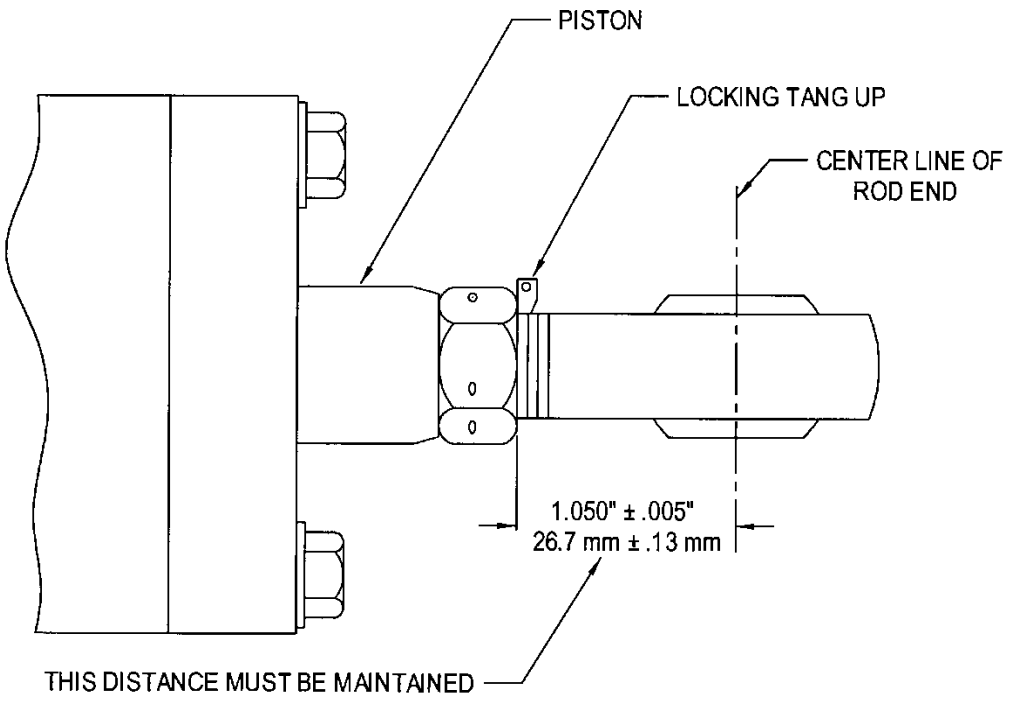


Figure 9-20. Damper Rod End Installation

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Table 9-4. Hydraulic Damper Assembly

Inspection Requirements*

P/N	Fig. 9-17 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14357-3 or -5	1	Housing	Sleeve bore Dia. 1.1250 to 1.1255	+.0002	Not Repairable	Replace Housing
			Flanged bushings in the ears for excessive fretting	1/3 of total face light fretting	2 of total face light fretting	Blend and polish to remove
			Obstructions in the flow ports	None Allowed		Clear with compressed air
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Housing
			Security of the chrome sleeve in the bore of the housing	No movement allowed	Not Repairable	Replace Housing
			Surface scratches	None Allowed	≤ .020 deep	Blend and polish out smooth
28-14277-1 or 28-14359-17	3	Bushing	O.D. .4995 to .5005 (28-14277-1) O.D. .4994 to .4999 (28-14359-17)	-.0005	Not Repairable	Replace Bushing
			I.D. .3747 to .3757 (28-14277-1) I.D. .3765 to .3775 (28-14359-17)	+.0005	Not Repairable	Replace Bushing
			Nicks and scratches	.005 deep	≤ .005 deep	Blend and polish out smooth

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Table 9-4. Hydraulic Damper Assembly

Inspection Requirements*

P/N	Fig. 9-17 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-14356-3 or -5	5 & 12	Sleeve	O.D. 1.1260 to 1.1265	-.0002	Not Repairable	Replace Sleeve
			Piston shaft bore Dia. .749 to .751	+.002	Not Repairable	Replace Sleeve
28-14356-3 or -5	5 & 12	Sleeve (Cont=d)	O.D. to I.D. concentricity	.002 FIM	Not Repairable	Replace Sleeve
28-14370-15, -17	6	Piston	Piston shaft O.D. .746 to .748	-.001	Not Repairable	Replace Piston
			Nicks or scratches in surface	None Allowed	≤ .5" long and ≤ .005 deep	Blend and polish out smooth
			Obstruction in the flow restrictor	None Allowed		Clear with compressed air
			Concentricity	.001 FIM	Not Repairable	Replace Piston
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Piston
28-14265-3	10	End Cap	Sleeve bore Dia. 1.1250 to 1.1255	+.0002	Not Repairable	Replace Cap
			Obstructions in the fluid port	None Allowed		Clear with compressed air
			Nicks, scratches, or corrosion	None Allowed	≤ .020 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Cap
ECD091-1	20	Damper Bearing	Radial Play	.007	Not Repairable	Replace Bearing
			Axial Play	.005	Not Repairable	Replace Bearing

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Table 9-4. Hydraulic Damper Assembly

			Inspection Requirements*			
P/N	Fig. 9-17 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
ECD091-1	20	Damper Bearing (Cont'd)	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Rod End
			Threads (damage or corrosion)	None Allowed	Not Repairable	Replace Rod End
28-14366-1	21	Reservoir	Obstructions in the flow ports	None Allowed		Clear with compressed air
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Reservoir
			Nicks, scratches, or corrosion	.020 deep	≤ .020 deep	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Reservoir
			If the valves are removed, valve threads and ports for contamination	None Allowed		Flush with cleaning solvent and dry with compressed air
28-14368-1, -2	23	Plug	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Plug
28-14369-1	27	Sleeve	O.D. and I.D. for nicks or scratches	None Allowed	Not Repairable	Replace Sleeve
AN814-2DL	26	Plug	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Plug
		O-Rings, Wiper, and Seals	Inspect for obvious defects	None Allowed	Not Repairable	Replace as required

* All dimensions are in inches.

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9-32. Main Rotor Blades

9-33. Description – Main Rotor Blades (Figure 9-21)

The main rotor blades are of hollow construction. Upper and lower skins are bonded to the extruded leading edge spar which is twisted 7.25°. Doublers are bonded to the root end of the blade for retaining the blades to the main rotor hub. The blades are retained by a single retention pin to the blade grip and a non-adjustable drag brace connected to the trailing edge of the blades. Provisions for spanwise and chordwise balance weights are provided in the tip caps that are bonded in the tip end of the blades. Two tracking tabs are riveted to the trailing edge of each blade.

9-34. Removal – Main Rotor Blades (Figure 9-22)

NOTE

Lifting the tip of the blade until the blade is parallel to the retention assembly will allow the retention bolt and the drag brace bolt to be easily removed and will allow the blade to be removed from the blade grip without spreading the ears of the grip.

A. Remove the bolt (1) securing the drag link to the rotor blade.

B. Remove the blade retention bolt (2).

C. Carefully slide the blade from the grip.

D. Place the blade into a blade rack or on a suitable device that will prevent the blades from being damaged.

E. Repeat the process for the other 2 blades.

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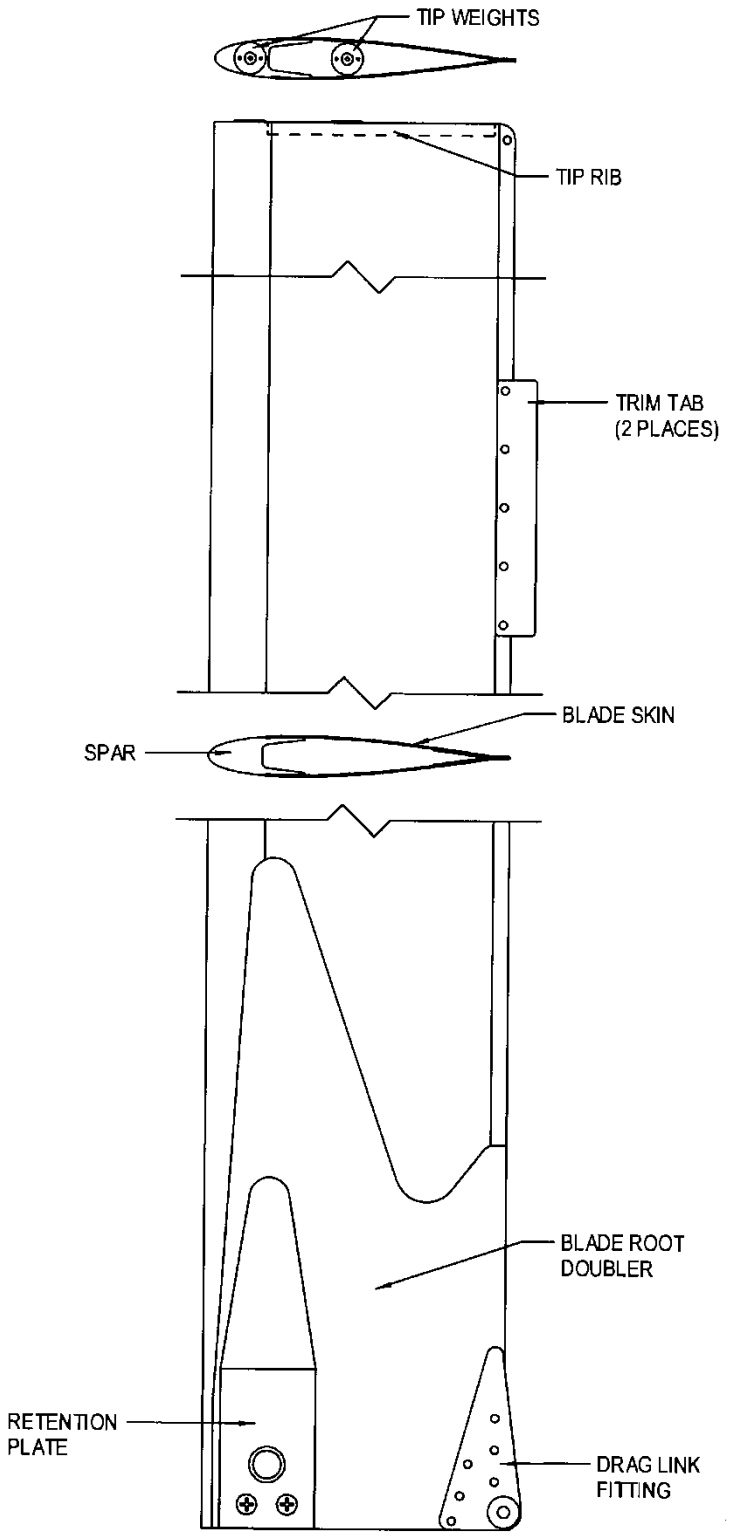


Figure 9-21. Main Rotor Blade

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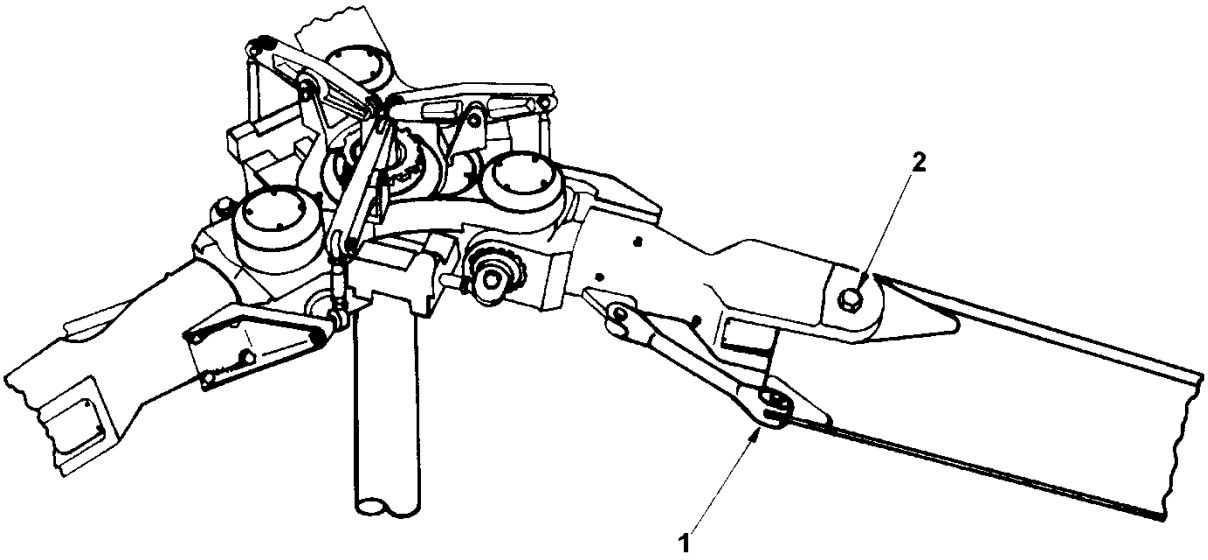


Figure 9-22. Main Rotor Blade Installation

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9-35. Inspection – Main Rotor Blades

A. Inspect the paint finish of the blades for blistering, erosion, cracking, chipping, peeling, and overall oxidation.

B. Inspect the main rotor blade spar (especially on blades that have erosion of the paint finish) for slivering or flaking of the exposed spar surface, and for a grainy surface appearance (Figure 9-24).

C. Inspect the spar bond lines for raised sections or voids, dark deposits, corrosion, and bubbly or scaly paint (Figure 9-25). Use the coin tap method to inspect suspect areas for voids.

D. Inspect the trailing edge bond lines for voids or openings, dark deposits, corrosion, and bubbly or scaly paint (Figure 9-25). Use the coin tap method to inspect suspect areas for voids. Use only plastic shim stock (.001"/.025 mm) for determining the depth of voided areas.

E. Inspect the bond lines at the root doubler and retention plate edges for paint cracking or scaling, dark deposits, corrosion, and void in the fairing compound (Figure 9-25). Use the coin tap method to inspect suspect areas for voids. Use only plastic shim stock (.001"/.025mm) for determining the depth of the voided areas.

F. Inspect the main rotor blade spar (Figure 9-26 and Figure 9-27), skins, trim tabs, retention plates, drag link fittings, and root doublers for nicks, scratches, dents, and cracks.

G. Inspect the blade tip rib, trim tabs and drag link fittings for loose rivets.

NOTE

Normal service life for the blade tape is 200 - 300 hours: however, if the aircraft is operated in rain, service life for the tape can be considerably shortened.

NOTE

Visually inspect the blade tape for security and damage after the aircraft is operated in rain.

H. If installed, inspect the main rotor leading edge blade tape (Figure 9-30.1) for security of installation, tears or punctures, and bubbles or lumpy surface.

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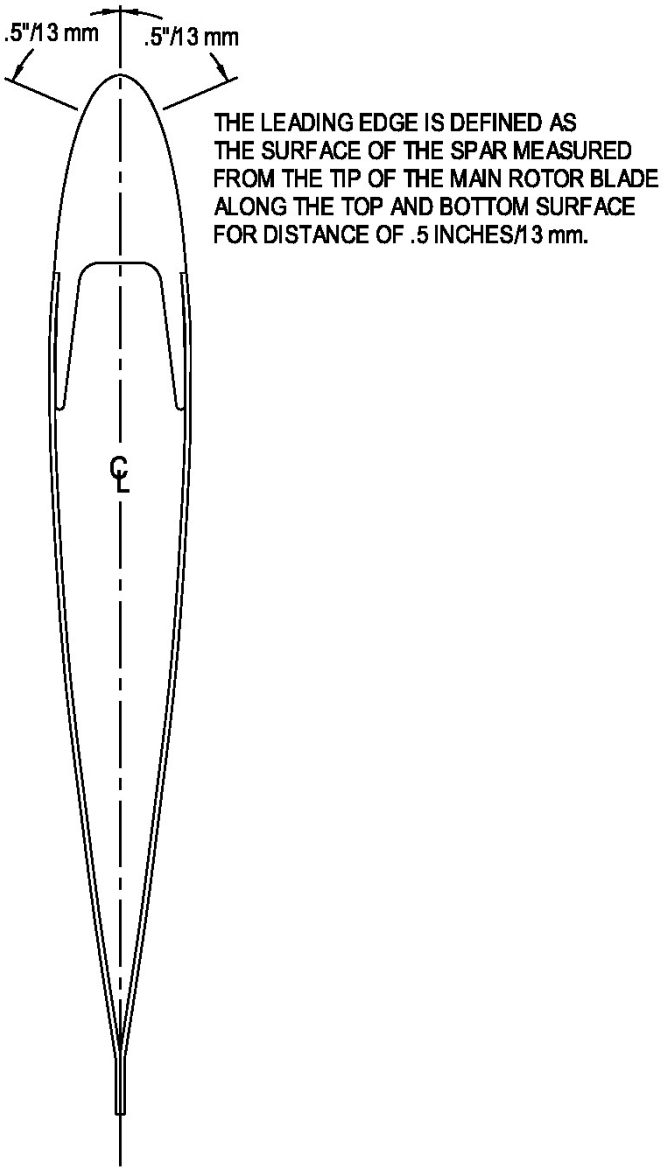


Figure 9-23. Main Rotor Blade Leading Edge Definition

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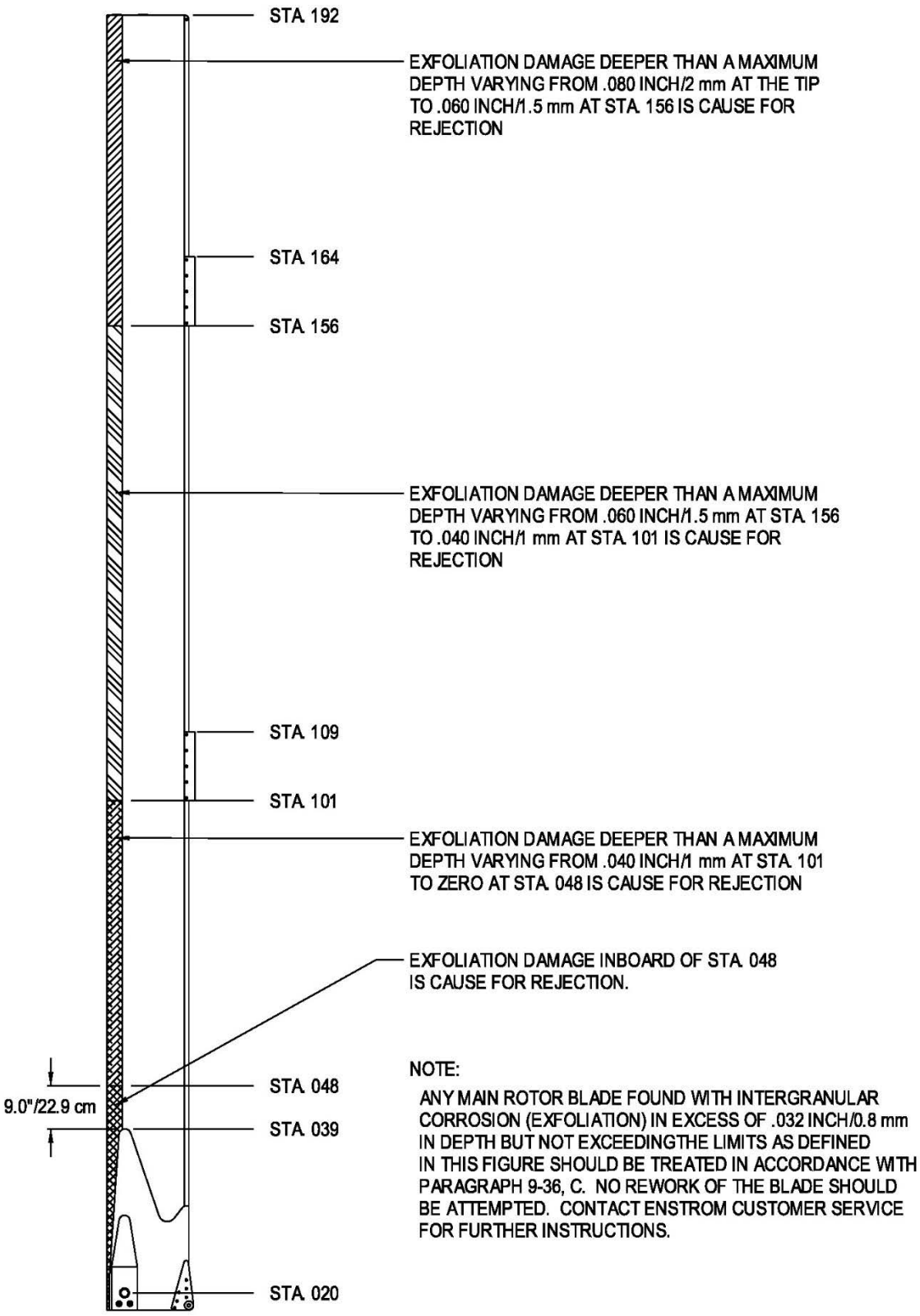


Figure 9-24. Main Rotor Blade Spar Corrosion Limits

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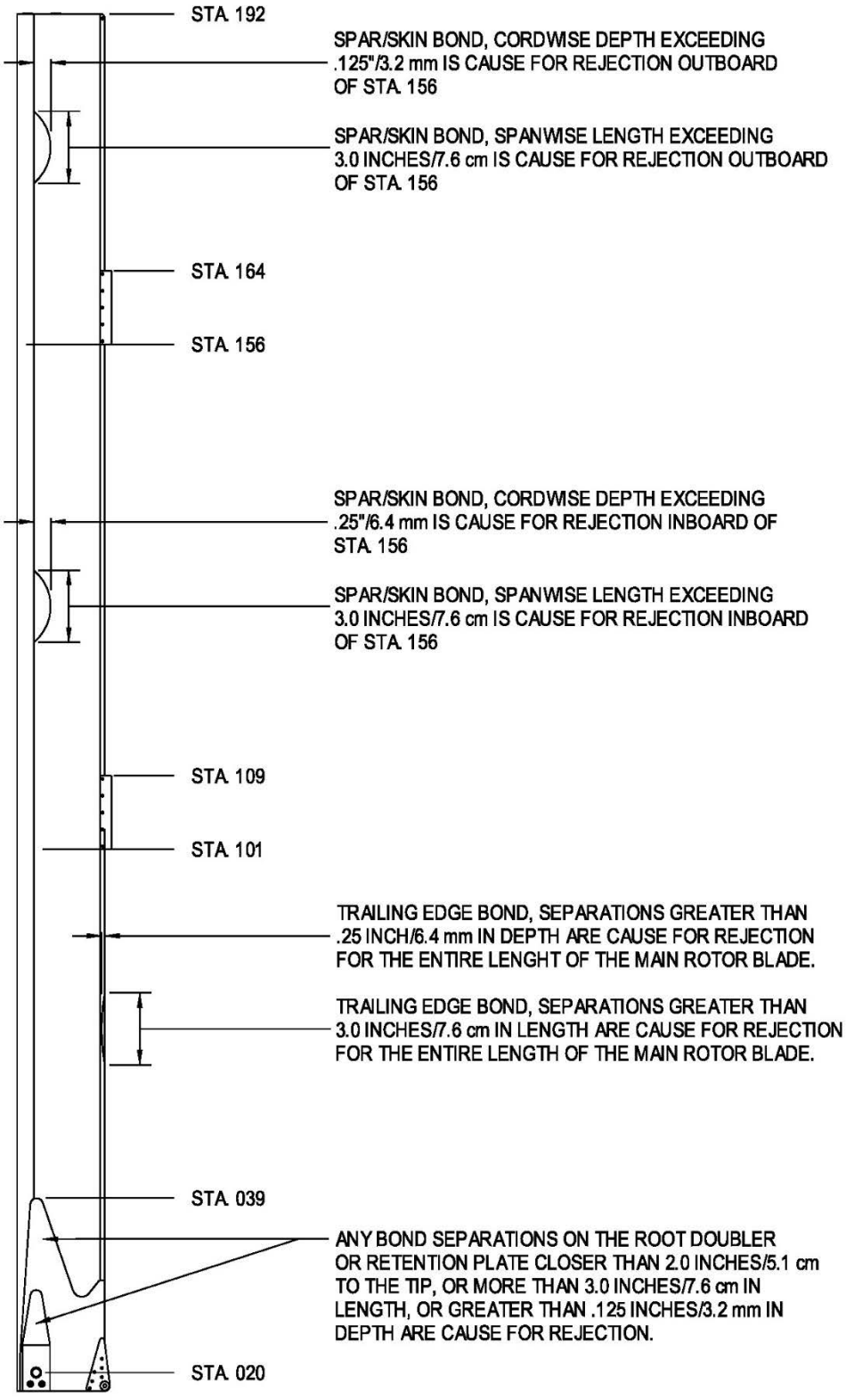
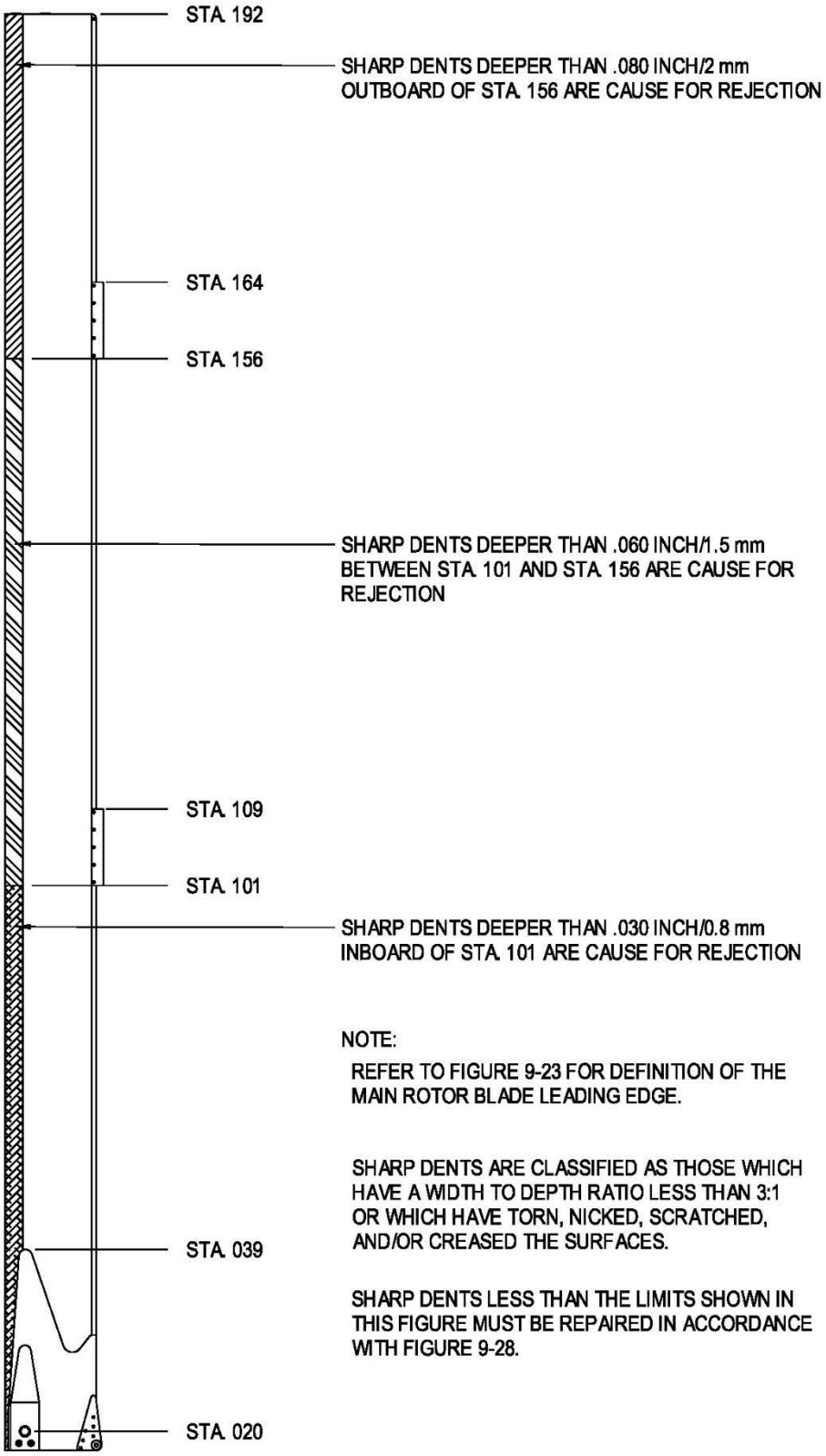


Figure 9-25. Main Rotor Blade Bond Separation Limits

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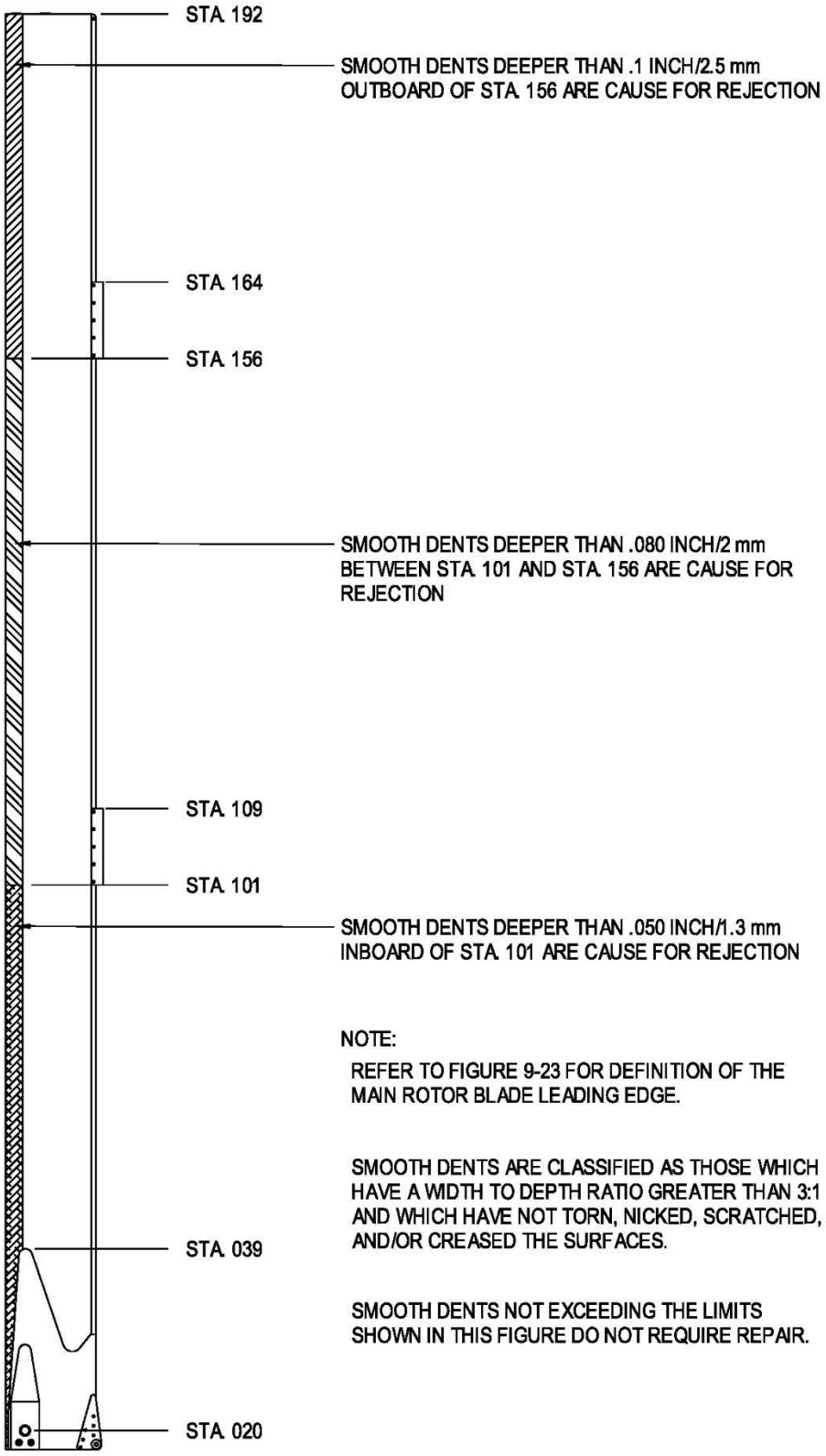


Sheet 1 of 2

Figure 9-26. Main Rotor Blade Leading Edge Damage Limits

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Sheet 2 of 2

Figure 9-26. Main Rotor Blade Leading Edge Damage Limits

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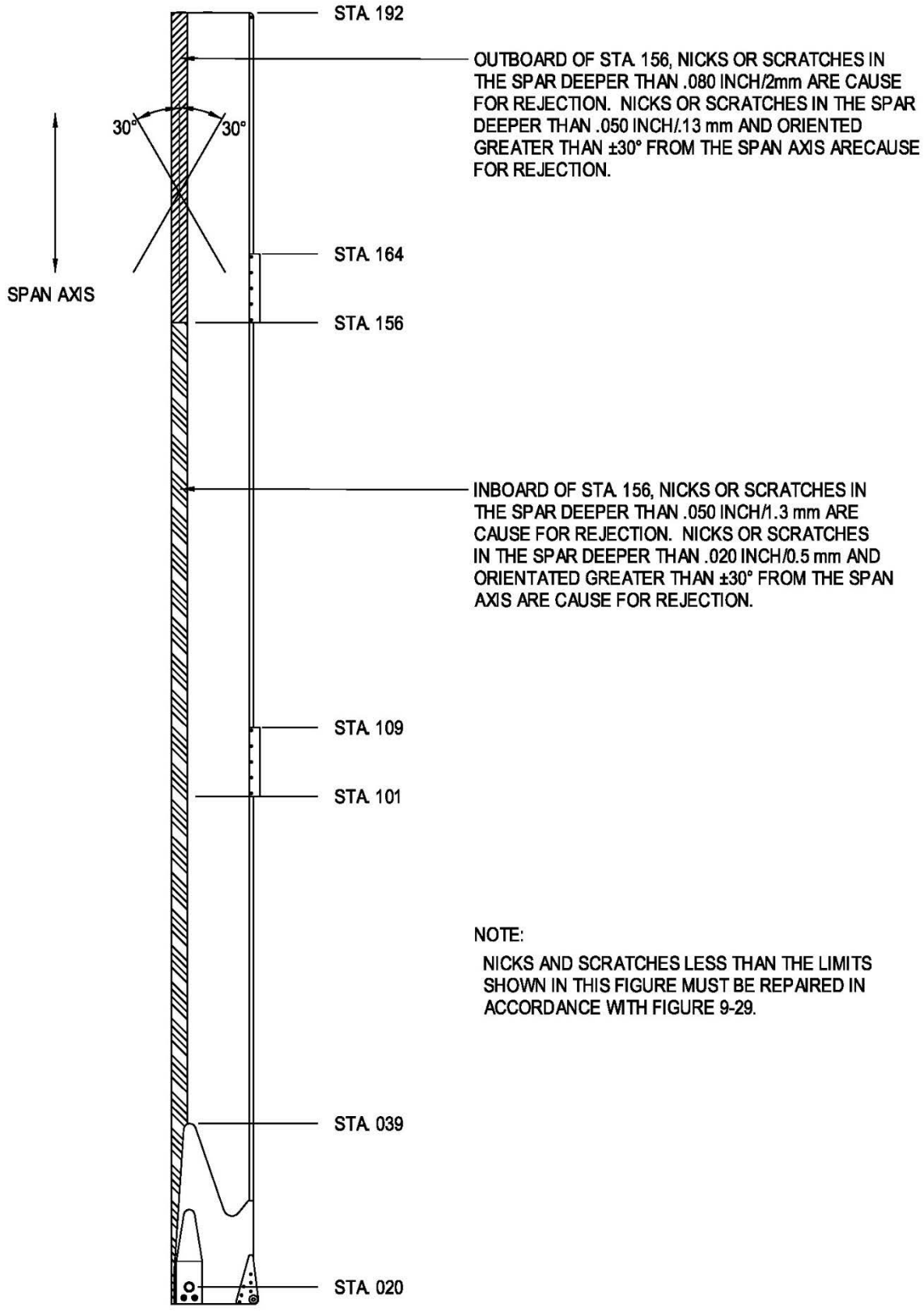


Figure 9-27. Main Rotor Blade Spar Damage Limits

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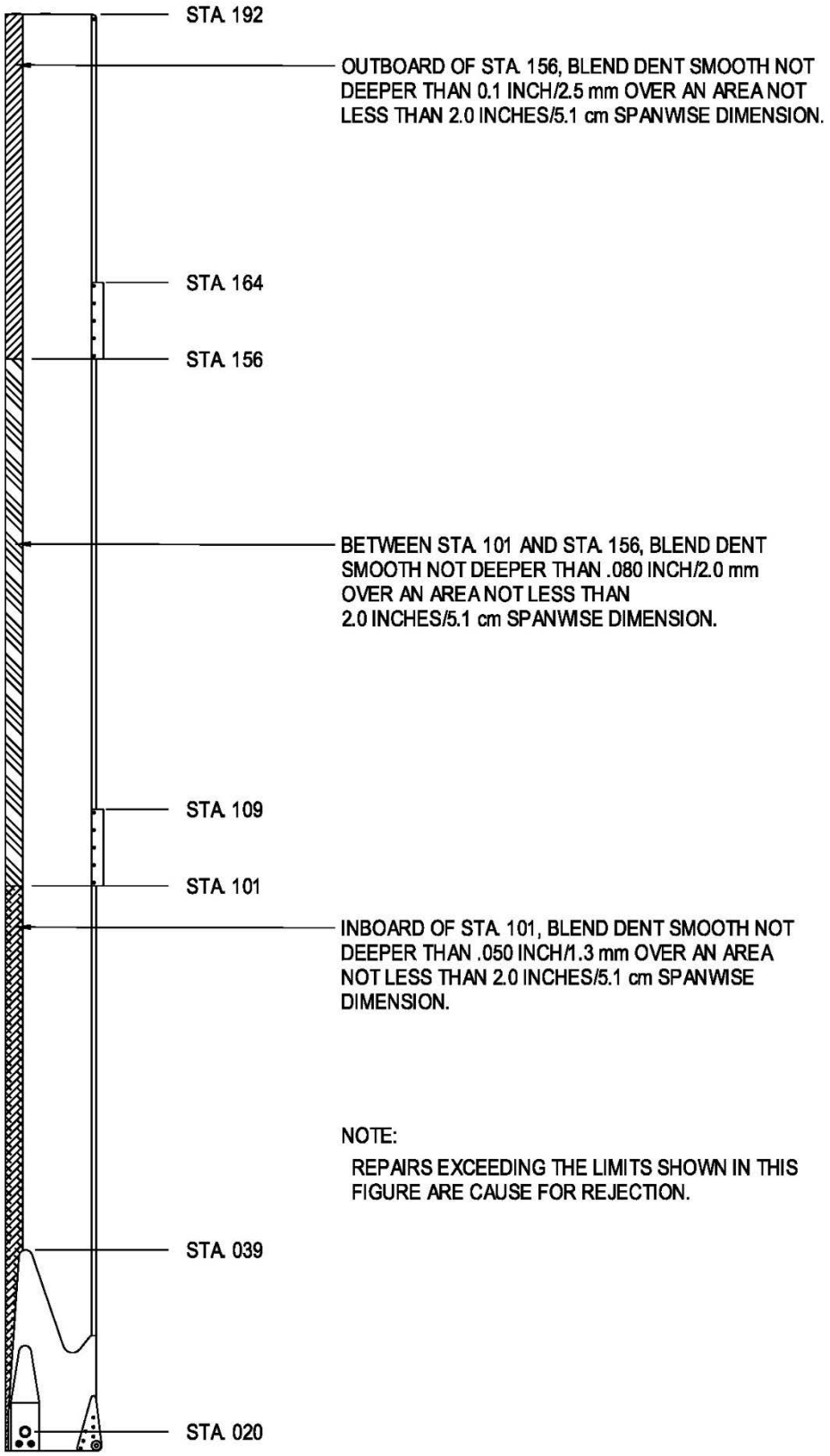


Figure 9-28. Main Rotor Blade Leading Edge Repair Limits

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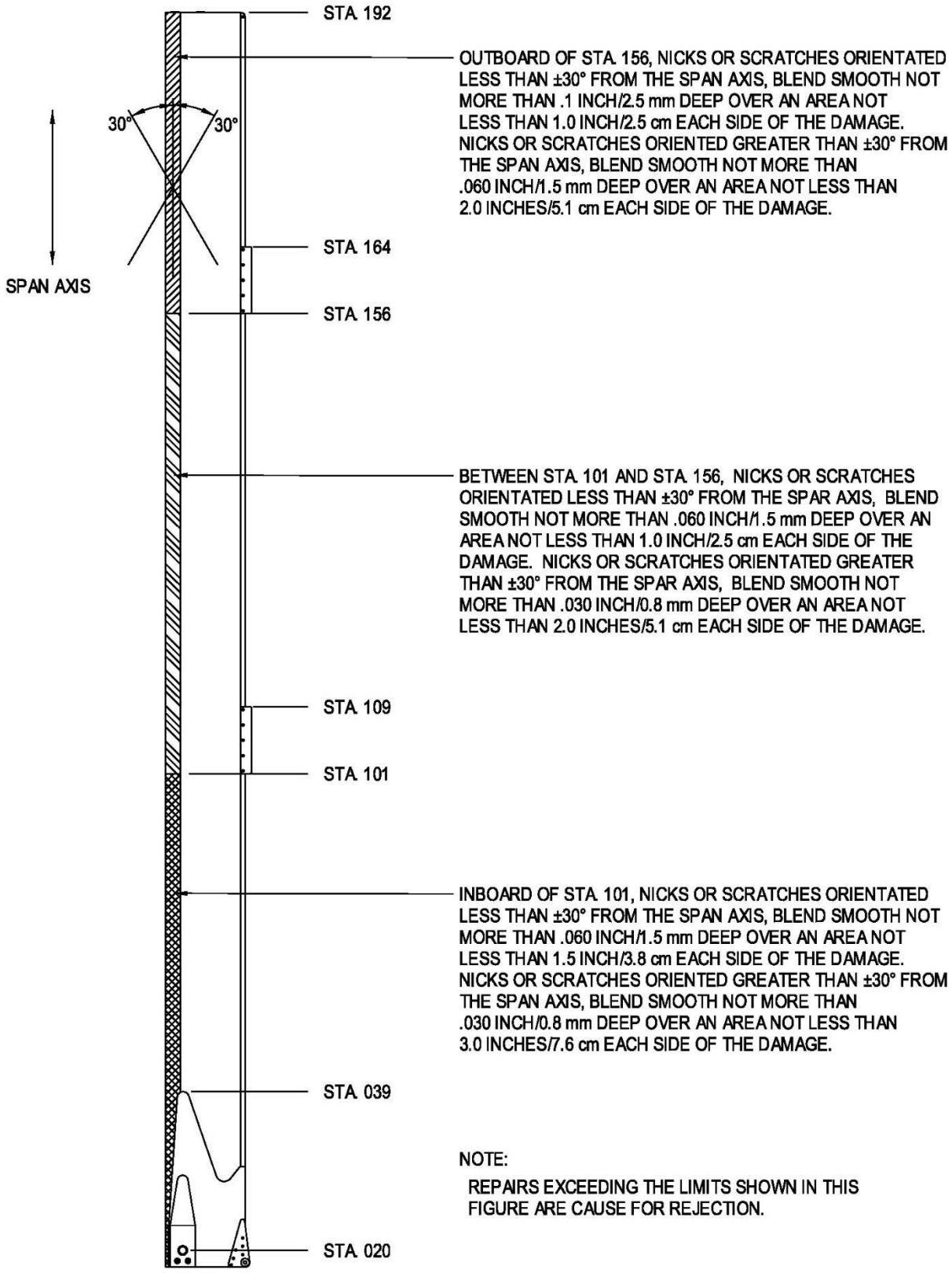


Figure 9-29. Main Rotor Blade Spar Repair Limits

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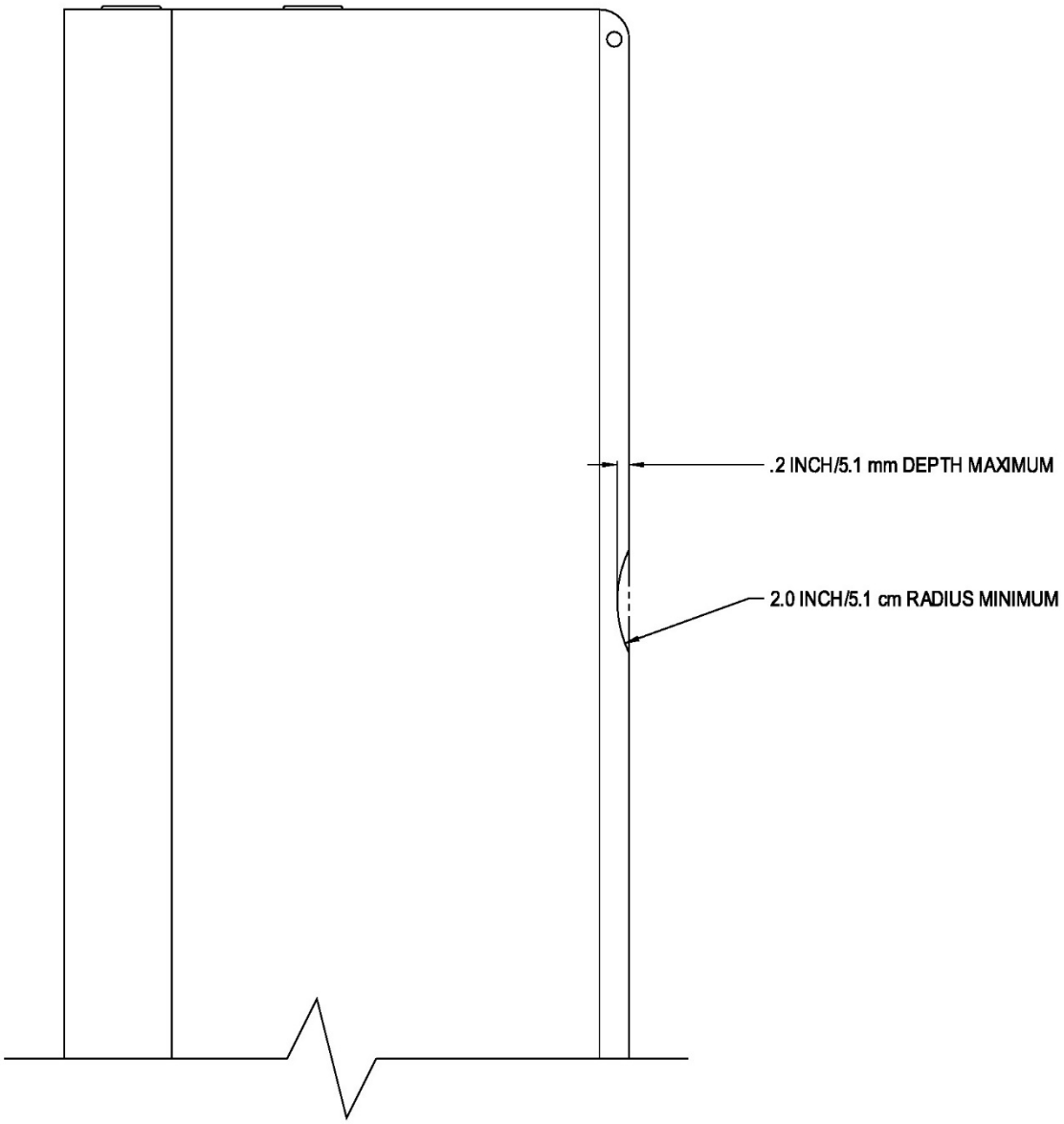
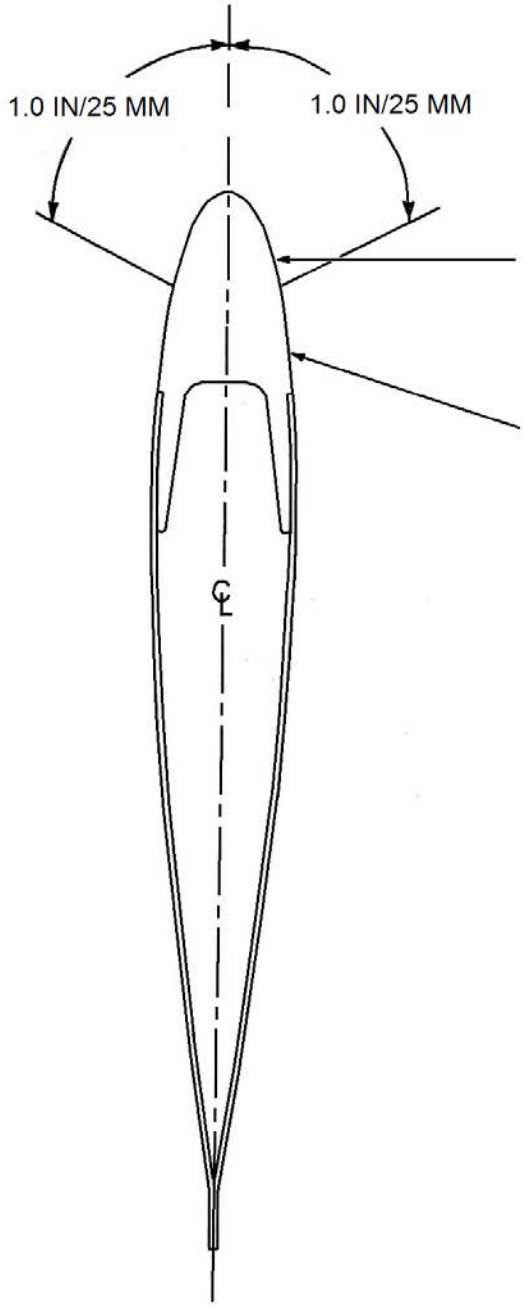


Figure 9-30. Main Rotor Blade Trailing Edge Repair Limits

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DEFECTS IN THE TAPE SURFACE WITHIN 1.0 IN/25 MM OF THE LEADING EDGE REQUIRE REPAIR PRIOR TO THE NEXT FLIGHT.

BUBBLE-TYPE DEFECTS IN THE TAPE SURFACE OUTSIDE THE 1.0 IN/25 MM OF THE LEADING EDGE MAY BE ALLOWED IF THE SURFACE OF THE TAPE IS INTACT AND NOT TORN.

THE FOLLOWING REPAIR LIMITS APPLY:

- BUBBLES OR OTHER DEFECTS UP TO 0.1 IN/3 MM DIAMETER DO NOT NEED TO BE REPAIRED.
- BUBBLES OR OTHER DEFECTS 0.1 IN/3 MM TO 0.2 IN/6 MM DIAMETER REQUIRE REPAIR WITHIN 10 HOURS.
- BUBBLES OR OTHER DEFECTS LARGER THAN 0.2 IN/6 MM TO 0.4 IN/10 MM DIAMETER REQUIRE REPAIR WITHIN 5 HOURS.
- BUBBLES OR OTHER DEFECTS LARGER THAN 0.4 IN/10 MM DIAMETER REQUIRE REPAIR PRIOR TO THE NEXT FLIGHT.

NOTE: REFER TO PARAGRAPH 9-36.S FOR BLADE TAPE REPAIRS (8681HS TAPE).

NOTE

The repair criteria in Figure 9-30.1 apply to main rotor blades with 8681HS blade tape.

Figure 9-30.1. Blade Tape Repair Limits

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9-36. Repair – Main Rotor Blades

A. Repair small areas of the paint finish using the following:

NOTE

Refinish the blades equally if refinishing a larger area (outboard leading edge for example) to maintain the continuity of the weight between the blades.

(1) Work the area lightly with medium grit aluminum oxide abrasive paper/cloth.

(2) Wash the area with mild soap and water.

WARNING

Acetone and Methylethylketone (MEK) are toxic and must be used with extreme caution. Make sure adequate ventilation is provided. Repeated or prolonged contact with the skin should be avoided. A low-volatile substitute, such as Extreme Simple Green, is a preferred solvent.

(3) Degrease the area with denatured alcohol, Extreme Simple Green, or equivalent.

NOTE

Application of the chemical conversion coating is only required if the bare metal is exposed on the main rotor blade.

WARNING

Use the proper protective equipment when working with the metal prep. Observe the precautionary information and instructions provided with the metal prep.

(4) Treat the repaired area of the blade with a metal prep. Flush thoroughly with fresh water and allow to dry.

WARNING

Use the proper protective equipment when working with the chemical conversion coating. Observe the precautionary information and instructions provided with the chemical conversion coating.

(5) Treat the blade as required with a chemical conversion coating complying with MIL-DTL-5541/MIL-DTL-81706 or equivalent.

(6) Clean the area with Extreme Simple Green or equivalent.

(7) Apply a coat of MIL-PRF-23377 primer or equivalent and allow to dry.

(8) Finish the area with a flat acrylic aerosol paint.

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B. Repair blade spars with flaking or slivering less than .032"/0.8 mm in depth or a light grainy surface as follows:

NOTE

Contour the reworked area evenly along the blade and rework the blade set equally to maintain the blade weight continuity of the blade set.

NOTE

Use care when removing the corrosion contamination to prevent from contaminating other areas or blades.

(1) Remove the surface corrosion from the area using medium grit aluminum oxide abrasive paper/cloth or an aluminum oxide flapping wheel.

(2) Wash the reworked area thoroughly with mild soap and water, flush thoroughly.

WARNING

Use the proper protective equipment when working with the metal prep. Observe the precautionary information and instructions provided with the metal prep.

(3) Treat the repaired area of the blade with a metal prep. Flush thoroughly with fresh water and allow to dry.

WARNING

Use the proper protective equipment when working with the chemical conversion coating. Observe the precautionary information and instructions provided with the chemical conversion coating.

(4) Treat the blade as required with a chemical conversion coating complying with MIL-DTL-5541/MIL-DTL-81706 or equivalent.

(5) Refinish the area either using the small area repair in paragraph 9-36, A, or if the entire blade needs refinishing, use paragraph 9-37.

CAUTION

Refinished main rotor blades will require retracking the main rotor system. Refer to paragraph 9-5.

Refinished tail rotor blades will be required to be statically and dynamically rebalanced. Contact Enstrom Product Support about the availability of a main rotor balance tool to aid blade rebalancing if tracking problems occur after blade refinishing work.

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C. Repair blade spars with flaking or slivering exceeding .032"/0.8 mm in depth but not the limits in Figure 9-24 as follows:

(1) Apply corrosion inhibitor to the affected area daily.

(2) Contact the Enstrom Customer Service Department for further instructions.

NOTE

Main rotor blades with intergranular spar corrosion (exfoliation) exceeding the limits of Figure 9-24 must be rejected as unairworthy.

D. Repair voids in the spar to skin bond lines that do not exceed the limits of Figure 9-25 as follows:

NOTE

Bond separations (voids) in the main rotor blade bond joints cannot be repaired/rebonded. The following repair provides corrosion treatment and sealing of the voided area until the void exceeds the allowable limits and the main rotor blade must be rejected as unairworthy.

(1) Remove the paint and or surface corrosion from the voided area with aluminum oxide abrasive paper.

(2) Degrease the area with denatured alcohol, Extreme Simple Green, or equivalent.

CAUTION

Do not heat the bond line to more than 250°F/121°C.

(3) Warm the area to approximately 180°-200°F/82°-93°C to evacuate any residual moisture.

(4) Apply corrosion inhibitor and allow to dry for 30 minutes.

(5) Wipe the area with denatured alcohol, Extreme Simple Green, or equivalent.

(6) Seal the area with Hysol Type EA 9309.2NA epoxy sealant.

(7) Refinish the area in accordance with paragraph 9-36, A, above or paragraph 9-37 depending on the paint condition of the rest of the blade.

CAUTION

Refinished main rotor blades will require retracking the main rotor system. Refer to paragraph 9-5.

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CAUTION

Refinished tail rotor blades will be required to be statically and dynamically rebalanced. Contact Enstrom Product Support about the availability of a main rotor balance tool to aid blade rebalancing if tracking problems occur after blade refinishing work.

(8) Enter into the maintenance log book the main rotor blade serial number and the location of the repair.

(9) Visually inspect the repaired area for further growth of the bond separation during the preflight check or daily inspection. Inspect the repaired area for further growth of the bond separation using the coin tap method at 25 hour intervals.

E. Repair voids in the trailing edge bond lines not exceeding the limits in Figure 9-25 using the procedure in paragraph 9-36, D, except for the following:

(1) Inspect repairs outboard of Sta. 101 using the coin tap method at the normal periodic inspection interval.

(2) Inspect repairs inboard of Sta. 101 using the coin tap method at 25 hour intervals.

F. Repair voids in the root doubler and retention plate edge bond lines not exceeding the limits in Figure 9-25 using the procedure in paragraph 9-36, D.

G. Damage to the blade spar not exceeding the limits in Figures 9-26 and Figure 9-27 must be repaired I/A/W Figure 9-28 and Figure 9-29. Reject any blades that have damage exceeding the limits in Figures 9-26 and Figure 9-27.

H. Reject blades with the following blade skin damage:

(1) Punctures in the blade skin.

(2) Sharp dents with a width to depth ratio less than 3:1 and deeper than .020"/.51 mm.

(3) Smooth dents which have resulted in permanent skin deformation greater than .060"/1.5 mm in depth.

(4) Nicks and scratches in the chordwise direction greater than .010"/.25 mm in depth.

(5) Nicks and scratches orientated within ± 30° of the spanwise direction greater than .020"/.51 mm in depth.

(6) Trailing edge chordwise dents or nicks deeper than .20"/5.1 mm.

(7) Trailing edge flapwise kinks extending more than .20"/5.1 mm.

(8) Cracks.

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I. Repair blade skins with damage not exceeding the limits in paragraph 9-36, H, above as follows:

(1) Buff out all light scratches.

(2) Polish out nicks, scratches, and sharp dents and blend the area to approximately .50"/13 mm around the damaged area.

(3) Repair damage to the trailing edge in accordance with Figure 9-30.

(4) Smooth dents that do not exceed the damage limits are acceptable and no repair is required.

NOTE

Refinish the repaired area in accordance with paragraph 9-36, A, or paragraph 9-37 depending on the condition of the rest of paint finish.

J. Reject blades with the following root doubler damage:

(1) Nicks, scratches, and sharp dents in the chordwise direction greater than .010"/.25 mm in depth.

(2) Nicks, scratches, and sharp dents orientated within ± 30° of the spanwise direction greater than .020"/.51 mm in depth.

(3) Smooth dents deeper than .020"/.51 mm.

(4) Cracks.

K. Repair blade doublers with damage not exceeding the limits in paragraph 9-36, J, as follows:

(1) Buff out all light scratches.

(2) Polish out nicks, scratches, and sharp dents and blend the area to approximately .50"/13 mm around the damaged area.

(3) Smooth dents that do not exceed the damage limits are acceptable and no repair is required.

NOTE

Refinish the repaired area I/A/W paragraph 9-36, A, or paragraph 9-37 depending on the condition of the rest of paint finish.

L. Reject blades with the following blade retention plate damage:

(1) Nicks, scratches, and sharp dents greater than .050"/1.3 mm in depth.

(2) Cracks.

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M. Repair blade retention plates with damage not exceeding the limits in paragraph 9-36, L, as follows:

(1) Buff out all light scratches.

(2) Polish out nicks, scratches, and sharp dents and blend the area to approximately 2.0"/5.1 cm diameter area.

NOTE

Refinish the repaired area I/A/W paragraph 9-36, A, or paragraph 9-37 depending on the condition of the rest of paint finish.

NOTE

Do not paint the blade grip mating surface of the retention plates.

N. Repair or replace trim tabs as follows:

(1) Repair:

a. Flatten dents or kinks and polish out scratches and nicks.

b. Drill out and replace loose rivets.

(2) Replace:

a. Drill out rivets and remove the trim tab.

b. Open pilot holes in the replacement trim tab with a #40 drill.

c. Position the trim tab on the main rotor blade and install the rivets.

O. Reject blades with the following drag link fitting damage:

(1) Nicks or scratches greater than .010"/.25 mm deep.

(2) Cracks.

(3) Loose rivets.

P. Repair drag link fittings with damage not exceeding the limits in paragraph 9-36, O, as follows:

(1) Buff out all light scratches.

(2) Polish out nicks, scratches, and sharp dents.

NOTE

Refinish the repaired area I/A/W paragraph 9-36, A, or paragraph 9-37 depending on the condition of the rest of paint finish.

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NOTE

Do not paint the drag link mating surface of the drag link fittings.

Q. Reject blades that have a cracked tip rib. Replace loose rivets.

R. Install the leading edge blade tape as follows (for blade tape repairs, go to step S):

NOTE

Prior to installation of the blade tape, the spar should be inspected according to paragraph 9-35, B.

CAUTION

New blade tape should not be installed without proper leading edge preparation and paint cover (paragraph 9-36, A or B). Do not install blade tape on blades with leading edge/spar corrosion without first treating the corrosion.

(1) Clean the blade with a mild soap and water solution, and rinse with fresh water.

(2) Allow the blade to dry.

(3) Coat the area to be taped with MIL-PRF-23377 epoxy primer or equivalent or quality top coat paint such as Sherwin-Williams “Acry Glo” or similar.

(4) Mark and mask the non-blade tape area as follows:

NOTE

The blade surface area adjacent to the taped area must be masked to avoid sanding the non-taped area.

a Measure 108.4” from the end of the blade tip, mark with a pencil, and apply masking tape at this measurement from the spar edge to at least 0.100” beyond the spar seam. Measure, mark, and mask the bottom side of the blade as well.

b. Apply masking tape along the blade length from the blade tip to the pencil marks at a distance of 0.100” from the spar seam.

(5) Sand the exposed area to be taped with 400 grit sand paper or Scotch Brite 7447B to produce a smooth surface. Remove the masking tape after sanding is completed. Wipe blade clean.

NOTE

The blade tape is installed in three 36-inch long sections.

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(6) Mark the area for blade tape as follows:

a. Measure a distance of 0.100” from the blade tip. This marks the start of the blade tape.

b. Measure a distance of 108.4” from the blade tip. This marks the end of the blade tape.

c. Measure from the leading edge of the blade back on the topside of the airfoil ½ the distance of the width of the tape (2 ½ inches) and mark the surface with a pencil. Do this at the tip of the blade and toward the root end of the blade at the 108.4” mark.

(7) Above the marks, stretch a length of masking tape from the blade tip to the 108.4” mark to create a straight reference line.

(8) Butt the top edge of three 8681HS tape sections against the masking tape reference line applied in step (7) above and use 1 inch long tabs of masking tape to hold it in place. Maintain a 0.100” gap between each section of 8681HS tape.

(9) Apply another 1 inch wide strip of masking tape along the entire top edge of the 8681HS tape to form a soft hinge (Figure 9-31.1, a).

(10) Fold the 8681HS tape back onto the top of the blade (Figure 9-31.1, b).

(11) Apply 3M Adhesion Promoter # 86A to the entire area that will be covered by 8681HS tape. Use pre-wetted wipes or the adhesion promoter P/N 86 A and clean cheese cloth to apply the 86A and rubber gloves to protect hands. Apply only enough to wet the surface, so it appears shiny. Wipe off any excess to ensure no runs or drips. Allow to dry for 10 to 20 minutes or until the surface does not appear shiny.

(12) Spray the surface of the treated area of the blade with a previously prepared solution of water, isopropyl alcohol, and detergent.

a. Solution: Mix 70% water with 30% isopropyl alcohol in a 1 pint spray bottle. Add 4 drops of a non-ionic detergent such as Joy brand dish detergent.

(13) Beginning at the edge of the blade tape, remove a portion of the first protective liner strip from the blade tape nearest the soft hinge. Spray the sticky side of the tape with a heavy coat of solution from step 12(a). There are four protective liner strips for each 36-inch long section. Fold the tape down onto the blade and allow it to float into its favored location (Figure 9-31.1, c).

(14) Use a soft plastic squeegee to force the liquid out from behind the tape, starting at the hinge corner and working forward (Figure 9-31.1, d). Carefully work to the end of the tape section. Repeat steps (13) and (14) for the remaining three protective liner strips.

a. Avoid touching the exposed adhesive tape surface.

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b. Use a dry towel to mop up excess solution on the back edge.

c. Carefully work around the leading edge and around toward the trailing of the tape on the other side.

d. If a bubble of liquid or air is trapped under the tape, pull the tape back up to free the bubble, re-spray the area and squeegee to make it smooth and bubble free. DO NOT puncture bubbles to relieve entrapped air or liquid, especially on the leading edge.

NOTE

A smooth, continuous taped surface is necessary for optimal blade performance.

e. Repeat the process for the remaining two 36-inch long tape sections.

(15) Remove the “hinge” tape on the top edge and squeegee out excess fluid, while mopping excess up with a dry towel. Minute quantities of fluid which may be trapped, such as around fasteners, dissipate quickly.

(16) Seal the space between the ends of the sheets and the trailing edges with 3M DP190 epoxy adhesive using the following procedure:

a. Mask off both sides of the 8681HS tape approximately 1/16” from the edge with “3M Fine Line” tape.

b. Apply sealant between the masked off area and use a stiff applicator to screed off the excess. Remove the strips of masking tape within a few minutes, before complete gelling has occurred, to allow the sealant to flow to a nice tapered edge. DP190 will gel in 90 minutes at 72°F and full cure will be achieved in about 8 hours. It will cure faster in warmer temperatures, slower in cooler temperatures. In warm weather it helps to allow the top surface to cure before turning the blade over to seal the second side so that the sealer does not form a bulge.

c. After the sealant is cured, inspect the sealant bead at the tape joints and the trailing edge.

(17) Lightly sand excess sealant to match the blade contour.

NOTE

A sealant bead flush with the blade contour is necessary for optimal blade performance.

a. Mask the sealant line around the area to be sanded. Lightly sand the contour using 3M 214U 80 grit and then 3M 214U 150 grit to blend the edges.

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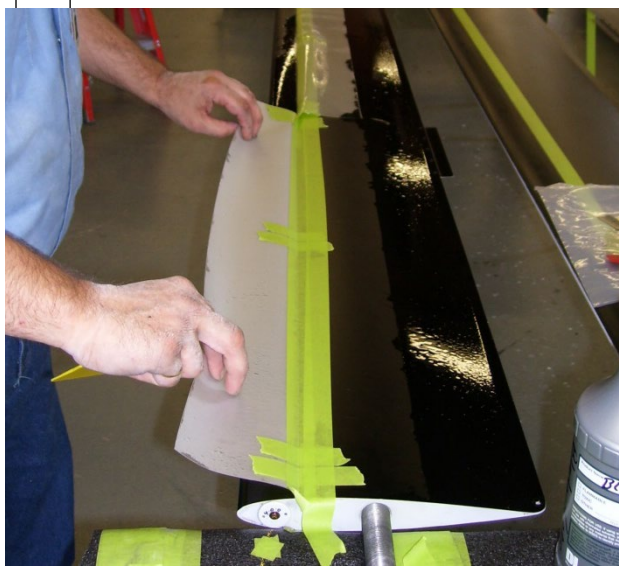
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b





c



d

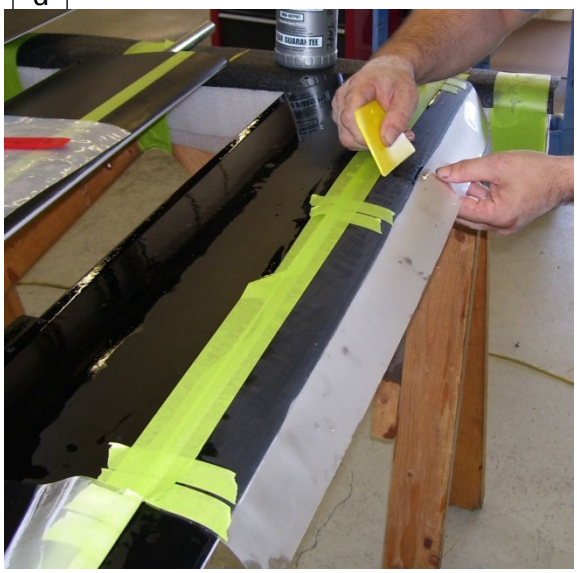


Photo a: Applying masking tape to provide the soft hinge (step 9).

Photo b: Folding the blade tape back (step 10) in preparation for blade surface treatment (steps 11 and 12).

Photo c: Positioning the blade tape for application (step 13).

Photo d: Applying blade tape to the blade top side and using a squeegee to remove liquid from under the tape as the tape is applied around the forward edge of the blade (step 14).

Figure 9-31.1. Blade Tape Installation

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S. Repair the leading edge blade tape as follows:

CAUTION

The blade must be inspected and certified to be in airworthy condition prior to installation or repair of the tape. The area where the tape will be applied must be smooth and clean. New blade tape should not be installed without proper leading edge preparation and paint cover. Refer to the paragraph 9-36, A or B, for repair and refinish instructions prior to tape application. The area to be taped will be coated with MIL-PRF-23377 epoxy primer or equivalent or quality top coat paint such as Sherman-Williams “Acry Glo” or similar.

(1) Mark a line on the blade on either side of the damaged section at right angles to the edge of the tape line (Figure 9-31.2, a).

WARNING

Use extreme care not to cut into or nick the blade under the tape when cutting out the damaged section of tape. Nicking the spar could lead to catastrophic blade failure.

(2) Use a razor blade to cut the tape along this line.

(3) Carefully remove the section of tape between the cut lines.

(4) Use a sharp blade or knife to scrape the gray epoxy edge sealer from the top and the bottom of the blade tape line. Take care not to damage the paint on the blade.

(5) Use sandpaper (400 grit) to remove any corrosion on the blade and treat as follows:

a. Coat blade tape repair area with MIL-PRF-23377 epoxy primer, or equivalent, or quality top coat paint such as Sherman-Williams “Acry Glo”, or similar, prior to application (Figure 9-31.2, b).

(6) Stretch a piece of masking tape along the forward edge of the epoxy tape sealer on the top of the blade.

(7) Cut a repair piece of tape from the 8681HS tape that is a total of 1/8 inch (.318 cm) shorter than the area of the tape that has been cut out for repair.

(8) Butt the top edge of the 8681HS tape against the forward edge of the already installed masking tape and apply a second length of masking tape along the aft edge of the patch to form a soft hinge.

(9) Fold the 8681HS tape back onto the top of the blade.

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(10) Apply the 3M adhesion Promoter #86A to the entire area of the blade that will be covered by the 8681HS tape. Use pre-wetted wipes or the adhesion promoter P/N 86A applied to clean cheese cloth (use rubber gloves for protection). Apply only enough to wet the surface so it appears shiny. Wipe off any excess to ensure no runs or drips. Allow to dry for 10 to 20 minutes or until the surface does not appear shiny.

(11) Remove the protective liner from the adhesive surface of the blade tape and spray the adhesive surface of the tape and the treated area of the blade with a heavy coat of wetting solution (step R, 12(a)).

(12) Fold the 8681HS tape down onto the blade and allow it to float into position. The top and bottom of the tape should be butted against the line where the epoxy adhesive DP190 has been scraped off. There should be approximately a 1/16 inch (.157 cm) gap between both sides of the patch and the already installed leading edge tape.

(13) Remove the “hinge tape” on the top edge and use a soft plastic squeegee to force the liquid out from behind the 8681HS tape, starting at the leading edge and working back towards the trailing edge on both the top and the bottom of the blade. Use a dry towel to mop up excess solution at the edges of the tape.

NOTE

If a bubble of liquid or air is trapped under the tape, pull the tape back up to free the bubble, re-spray the area and squeegee the tape back down to make it smooth and bubble free. DO NOT puncture bubbles to relieve entrapped air or liquid, especially on the leading edge.

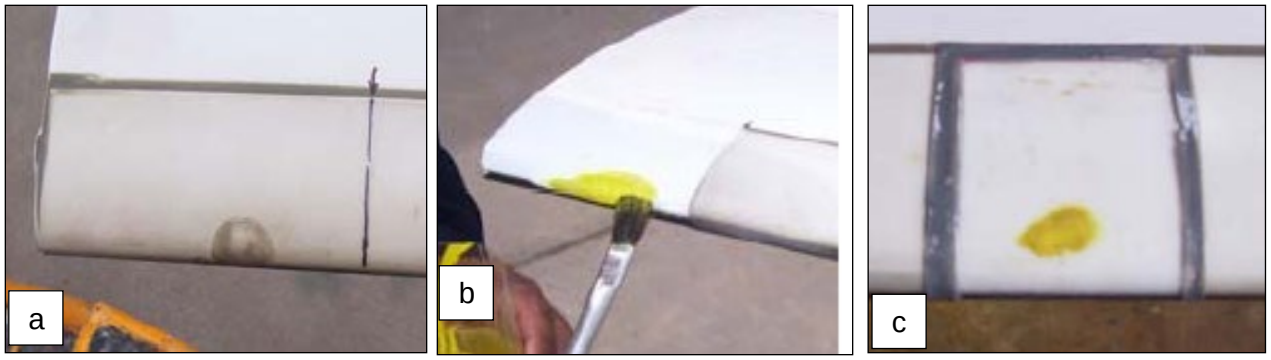


Photo a: Marking area for repair (step 1).

Photo b: Applying epoxy primer (step 5, a).

Photo c: Sealant applied to repair area (step 14).

Figure 9-31.2. Blade Tape Repair

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(14) Seal the space between the patch and the older pre-existing leading edge tape, and the trailing edges of the patch with the DP190 epoxy adhesive using the following procedure (Figure 9-31.2, c):

a. Mask off both sides of the edge of the patch, all the way around the patch, with masking tape approximately 1/16 inch (.157 cm) from the edge of the patch. Use fine line tape or equivalent.

b. Apply sealant between the masked off area and use a stiff applicator, or your finger, to screed off the excess sealant. Immediately remove the strips of masking tape to allow the sealant to flow to a nice tapered edge. DP190 will gel in 90 minutes at 72° and full cure will be achieved in about 8 hours. It will cure faster in warmer temperatures and slower in colder temperatures.

(15) After full cure, check the sealant to see how much bulge remains. If the bulge is higher than the sealer at the aft edge of the original tape, use a sharp blade to scrape the top of the bulge down so it is flush with the existing sealer.

9-37. Refinishing – Main Rotor Blades

WARNING

Use the proper protective equipment when working with the paint stripper. Observe the precautionary information and instructions provided with the paint stripper.

NOTE

The main rotor blades are treated with a chemical conversion coating (alodine) during the manufacturing process. Attempt to preserve the coating as much as possible during the paint removal process.

CAUTION

Refinished main rotor blades will require retracking the main rotor system. Refer to paragraph 9-5.

Refinished tail rotor blades will be required to be statically and dynamically rebalanced. (Tip weight changes must be made to keep 75% of the blade tip weight in the forward pocket to maintain the chordwise balance.)

A. Apply Eldorado PR-3500 paint stripper or other suitable stripper to the blade. Remove the paint residue with a plastic (body putty) spatula when the paint starts to wrinkle. Apply additional stripper as required. Finish cleaning the main rotor blade using water and a Scotch-Brite™ Pad (7447B).

B. Inspect the blade I/A/W paragraph 9-35 (tail rotor blade para. 9-47).

C. Repair the blade I/A/W paragraph 9-36 (tail rotor blade para. 9-48).

D. Wash the blade with mild soap and water and flush thoroughly.

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WARNING

Use the proper protective equipment when working with the metal prep. Observe the precautionary information and instructions provided with the metal prep.

E. Treat the repaired area of the blade with a metal prep. Flush thoroughly with fresh water and allow to dry.

WARNING

Use the proper protective equipment when working with the chemical conversion coating. Observe the precautionary information and instructions provided with the chemical conversion coating.

F. Treat the blade as required with a chemical conversion coating complying with MIL-DTL-5541/MIL-DTL-81706.

G. Wipe the blade with Extreme Simple Green or equivalent using clean rags.

NOTE

Do not paint the drag link mating surface of the drag link fittings.

H. Apply MIL-PRF-23377 primer or equivalent suitable epoxy primer as follows:

NOTE

Apply the primer in thin, even coats.

NOTE

It is important that the trailing edges of the main and tail rotor blades have good coverage.

(1) Apply two coats to the spar and feather the coats past the spar to skin bond lines. Apply two coats to the trailing edge straight on. Apply the third coat to the whole blade.

(2) The application is the same for the tail rotor blades except that the whole blade gets all three coats.

I. Paint the finish coat with any good quality flat or satin finish polyurethane paint.

J. Track the main rotor system (para. 9-5).

K. Statically and dynamically rebalance the main rotor blades. Contact Enstrom Product Support regarding the availability of a main rotor balance tool to aid blade rebalancing if tracking problems occur after blade refinishing work.

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9-38. Installation – Main Rotor Blades (Figure 9-22)

WARNING

Do not align the holes in the grip and blade by placing your finger in the retention bolt hole.

NOTE

Lifting the tip of the blade so the blade is parallel to the retention assembly will allow easy installation of the blade into the blade grip, installation of the blade bolt, and the drag brace bolt. If desired, use the main rotor blade bolt guide bullet, T-0009, to aid installation of the blade bolts.

A. If required, apply corrosion prevention compound to each blade (para. 4-88).

B. Install the root end of the blade into the blade grip.

C. Align the retention bolt hole in the grip with the hole in the blade. Install the bolt (2), washer, and nut. Torque the nut to 600 in-lbs/68.2 Nm.

D. Connect the drag link to the trailing edge of the blade and secure with the hardware (1). Torque the nut to 140 in-lbs/15.9 Nm.

E. Repeat the process for the other blades.

F. Perform a maintenance test flight if maintenance was performed on the main rotor blades.

9-39. Tail Rotor Assembly

9-40. Description – Tail Rotor Assembly (Figure 9-32)

The tail rotor assembly is a two bladed, wide cord, teetering, delta hinged rotor system. The tail rotor assembly consists of two blade and grip assemblies mounted on a common spindle by a pair of matched DT ball bearings and one needle bearing per blade and grip assembly. This assembly is teeter-mounted on a center hub by needle bearings. The center hub is splined to match the tail rotor transmission output shaft for positive mounting and driving. The control of this assembly is accomplished through cables up to a sliding pivot yoke. Pitch change links, installed between the sliding pivot yoke and the blades grips, simultaneously adjust the blade pitch of both blades.

9-41. Troubleshooting – Tail Rotor Assembly

A. High Frequency Vibration

(1) A high frequency vibration is felt in the tail rotor pedals or airframe (tail rotor frequency).

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a. Tail rotor improperly lubricated.

Properly lubricate the tail rotor.

b. Excessive axial play in the hub teeter bearings.

Reshim or replace the teeter bearings.

c. Tail rotor out of balance.

Balance the tail rotor.

d. Tail rotor transmission mounting bolts loose.

Retorque the bolts and lockwire.

e. Tail rotor guard loose at the tail rotor transmission.

Retorque the bolt at the tail rotor transmission or repair the guard if the transmission fitting is working in the tail rotor guard.

B. Controllability

(1) Tail rotor pedals are binding.

a. Pivot bolts in the pitch control assembly are over-torqued.

Loosen the nuts and retorque.

b. The pitch change links are incorrectly connected to the pitch arms.

Correctly connect the pitch change links to the pitch arms.

c. The tail rotor was incorrectly indexed to the transmission output shaft during installation.

Remove the tail rotor and correctly install.

d. The tail rotor cable tension is incorrect.

Correctly set the tail rotor cable tension.

e. The tail rotor retention bushing and output shaft spacer are worn.

Replace the bushing and the output shaft spacer.

f. The tail rotor grip bearings are worn.

Replace the tail rotor grip bearing set.

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9-42. Static Balancing – Tail Rotor Assembly

A. Remove the bolts, washers, and nuts from the pitch arms if installed.

B. Install the balance mandrel, T-0087-15, (Figure 9-33) through the hub. Align the plates of the mandrel with the flats of the spindle and with the recesses in the plates in toward the hub.

C. Rotate the blades so that the leading edge of the blades align with the teeter bearings.

D. Align the pitch arms with the mandrel and install the bolt through the pitch arms and mandrel. Install the nuts finger tight and ensure the bolt is centered when finished.

E. Install the assembly onto the balancing stand in the vertical position to obtain the chordwise balance (Figure 9-34).

F. Determine which direction the lower blade tends to rotate. Rotate the assembly 180° and repeat.

NOTE

If the trailing edge of the blade rises, this is the light blade. If the leading edge of the blade rises, this is the heavy blade.

NOTE

Use AN515-10 screws of various lengths for balancing.

G. Install a short screw in the root end of the heavy blade.

NOTE

The maximum length of the screw is 3 inches and maximum washer stack up is .5 inches.

H. Install the length of screw and as many AN960-10 or -10L washers as required in the root of the light blade until the assembly will remain stationary in the vertical position.

I. If the assembly will not balance with the maximum weight allowed, adjust the shimming of the center hub by removing a shim from under the teeter bearing end cap (Figure 9-32 item 13 or Figure 9-36 item 9) on the side of the light blade and installing it on the side with the heavy blade. Use the thinnest shim installed and repeat the chordwise balancing procedure.

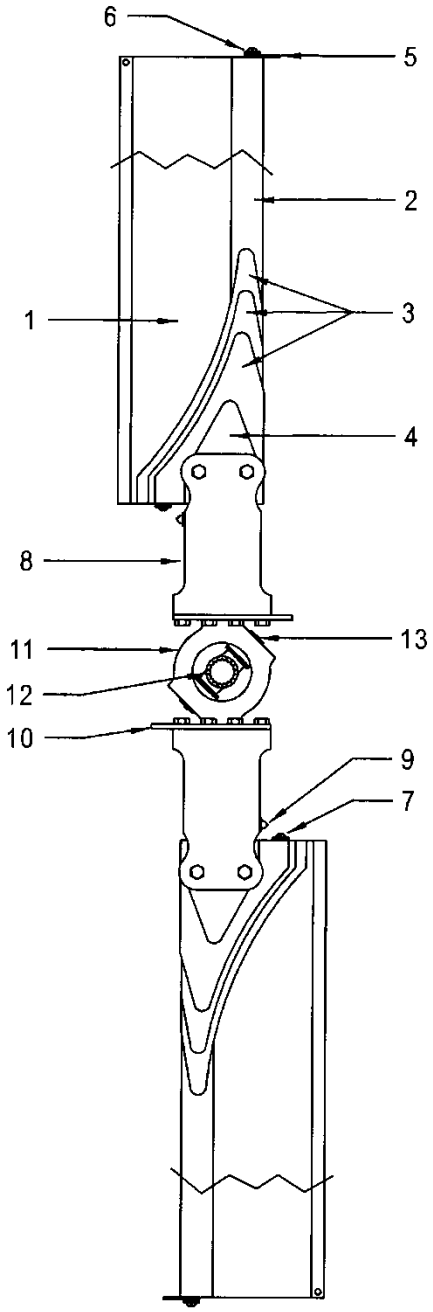
J. Place the assembly in the horizontal position to obtain the spanwise balance (Figure 9-34).

K. Install a short screw in heavy blade.

L. Install the length of screw and amount of washers required until the assembly will remain stationary in the horizontal position. Rotate the assembly 180° and recheck.

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1. Tail Rotor Blade
2. Stainless Steel Abrasion Strip
3. Tail Rotor Blade Doublers
4. Tail Rotor Blade Retention Plate
5. Strike Indicator
6. Spanwise Balance Weight
7. Chordwise Balance Weight
8. Tail Rotor Blade Grip
9. Lubrication Fitting
10. Pitch Change Plate
11. Tail Rotor Spindle
12 Tail Rotor Hub
13. Teeter Bearing End Plate

Figure 9-32. Tail Rotor Assembly

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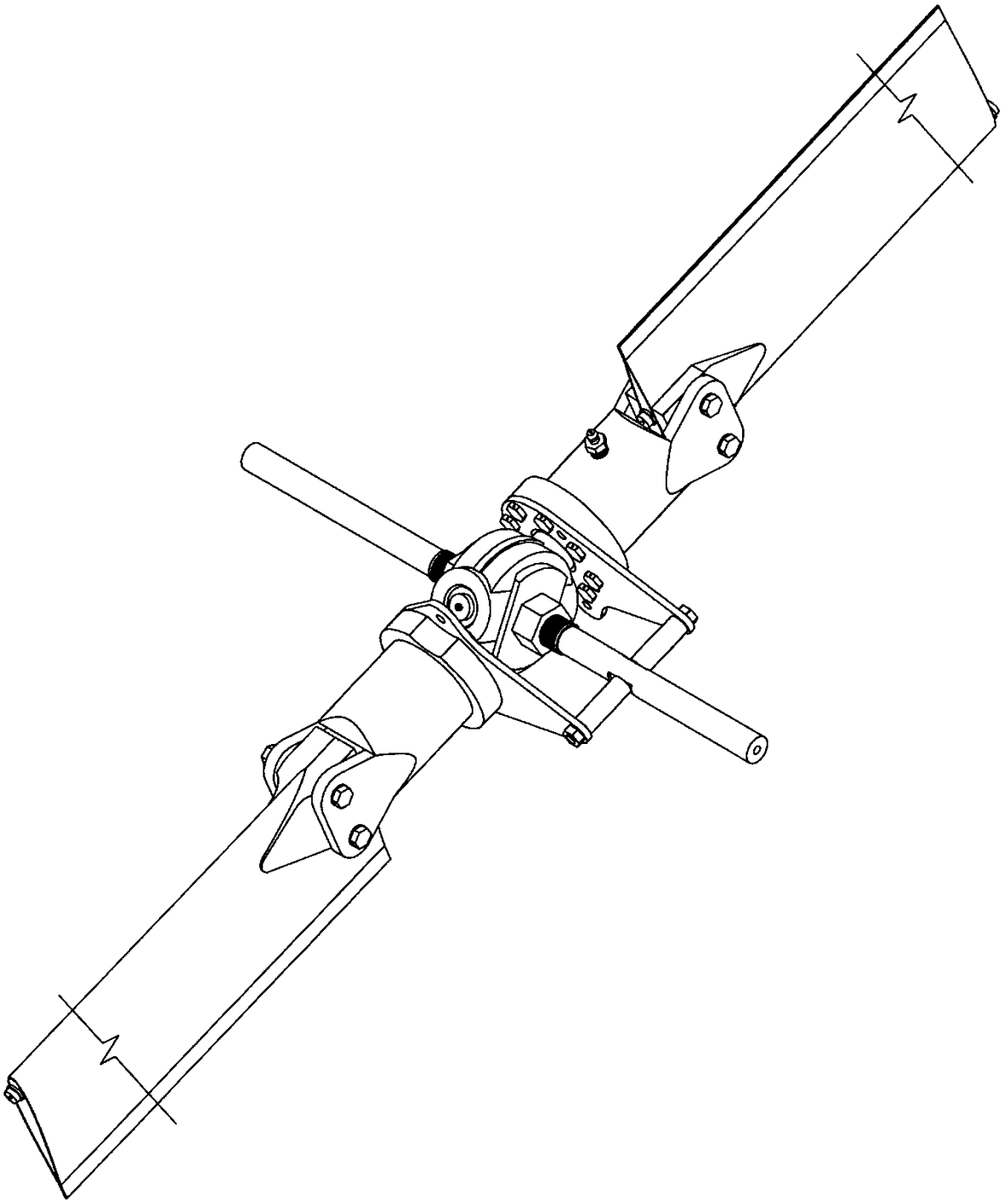


Figure 9-33. Tail Rotor Balance Mandrel Installation

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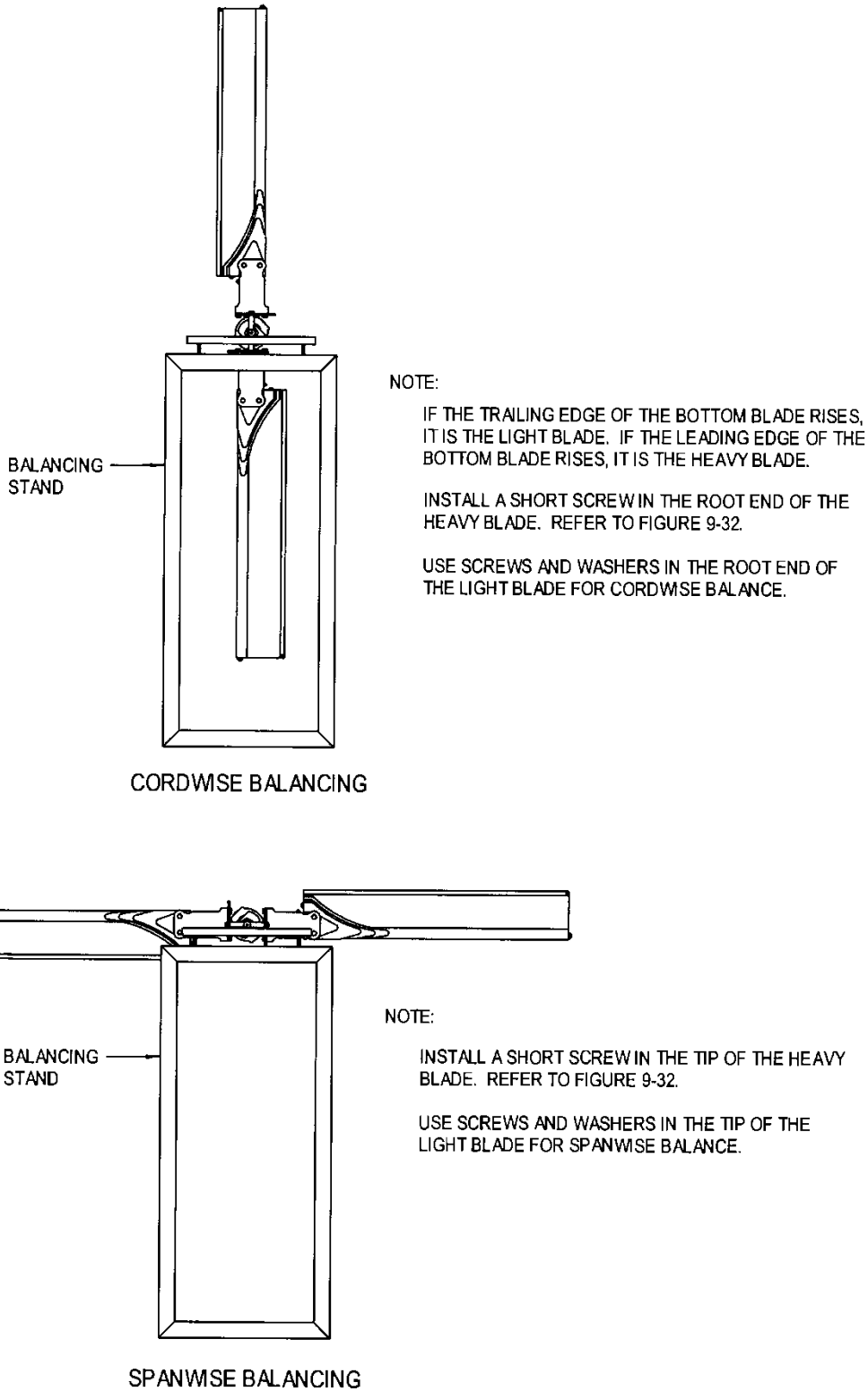


Figure 9-34. Tail Rotor Static Balancing

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M. Recheck the static balance at the vertical and 45° positions.

N. Remove the assembly from the balance fixture and remove the balancing mandrel. Install the bolts, washers, and nuts.

9-43. Tracking and Dynamic Balancing – Tail Rotor Assembly

NOTE

It is not necessary to track the tail rotor blades on Enstrom tail rotor assemblies. Earlier tail rotor assemblies with the 3 piece pitch links should be set to an overall length of 4.26”/10.82 cm in accordance with para. 12-125.

NOTE

The Honeywell-Chadwick 2000 system is described in the following instructions. Follow the operating instructions for the equipment being used if different than the following instructions.

NOTE

The procedure below should work for any of the digital balance systems but if the Velocimeter is installed in the vertical orientation, the polar chart will have to be rotated to compensate.

A. Install the tracking and balancing equipment as follows:

(1) Install the optical sensor into the tail rotor balance fixture T-0152.

(2) Install the velocimeter onto the right side of the tail rotor transmission under the tail rotor guard mounting nut. The velocimeter should be in a horizontal position with the connector pointing aft (Figure 9-34.1).

(3) Connect the velocimeter and optical sensor cables and wrap the cable around the stinger tube, around the right side horizontal stabilizer, the right rear oleo, and then into the right side cabin door. Secure the cables to the stinger tube, tailcone, and landing gear with tape.

(4) Install a 1.5” piece of reflective tape on one of the grips lengthwise. This will be the target blade (Figure 9-34.2).

(5) Connect the velocimeter and optical sensor cables to the Balancer box in accordance with the manufacturer’s instructions.

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Figure 9-34.1. Velocimeter and T-0152 Installation

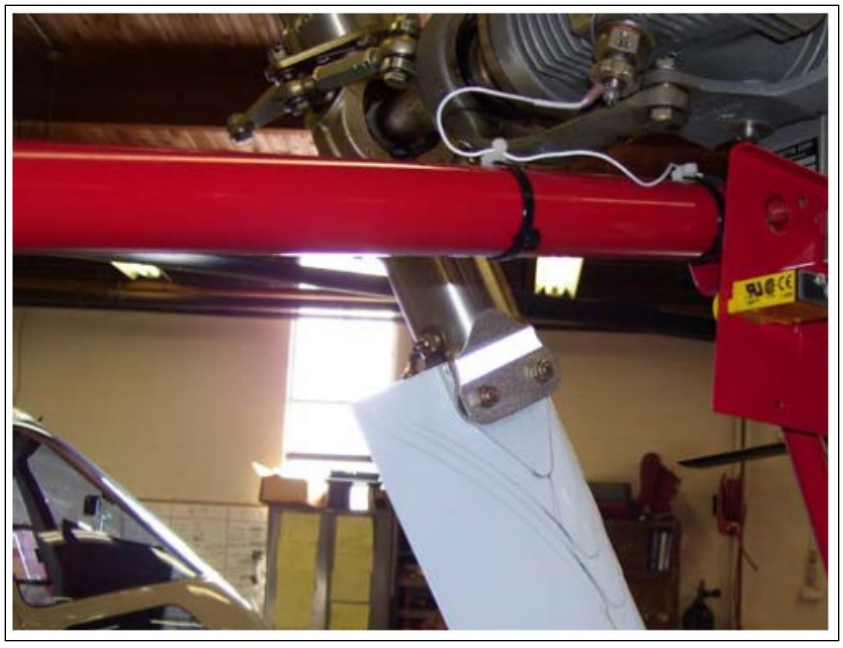


Figure 9-34.2. Reflective Tape Installed on the Target Blade

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B. Balance the tail rotor using the following procedure:

WARNING

The following steps are to be performed by authorized personnel.

(1) Position the helicopter so the tail rotor transmission output shaft is pointing into the wind (either upwind or downwind).

(2) Ground run the aircraft at 101% ± 1% N_2 with the tail rotor pedals neutral.

(3) Using the procedures provided by the operation instructions, obtain a clock angle and ips reading from the balance box.

(4) End the ground run to stop the blades from turning.

(5) Plot the ips reading and clock angle on the tail rotor balance chart (Figure 9-35).

NOTE

If more than five washers are required on the pitch change link bolts, the teeter hub can be shifted to move the balance fulcrum (para. 9-43, D). On early production tail rotors, with KP8A or KRP8A( ) bearings, the tail rotor must be removed to shift the teeter hub. On current production tail rotors, the teeter trunnion can be shifted without removing the tail rotor from the helicopter.

CAUTION

If adding or subtracting washers from the pitch change link bolts, ensure the correct grip length bolt is installed and account for the weight change of the bolt during the balancing procedure.

NOTE

If the tail rotor is difficult to balance, plot the move lines for both the tip weights and the pitch link weights. If the two move lines are parallel or don't intersect, then remove the tail rotor from the gearbox, turn it 180° and re-install it. It will also be necessary to rotate the trunnion 180° to maintain the 8° lag of rotation (ref. Figure 9-38).

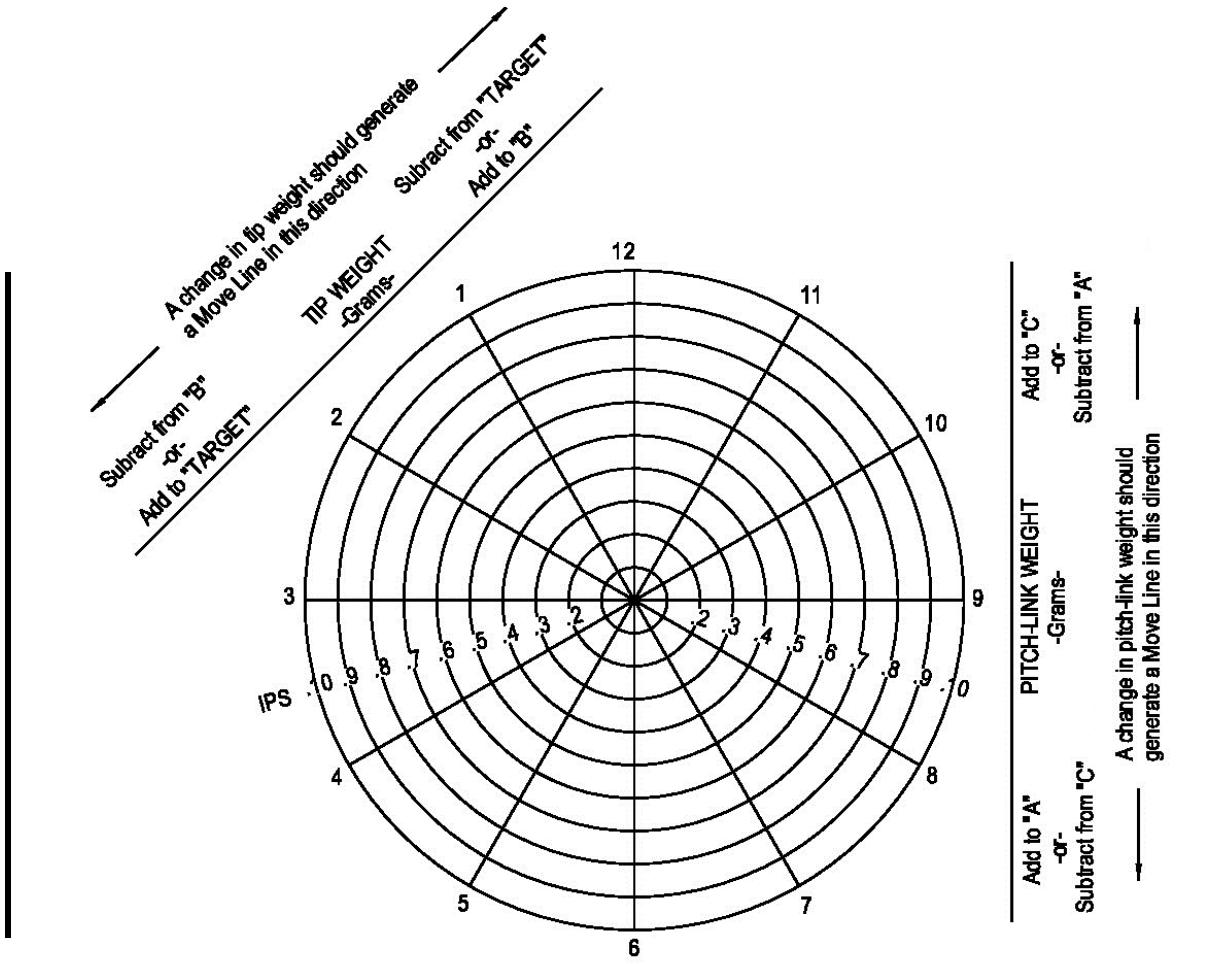
(6) Add weight in accordance with the chart (Figure 9-35) and check the clock angle and ips reading of the tail rotor. If the move line of the weight change does not coincide with the move lines on the chart, use the "Clock Angle Correction" procedure (para. 9-43, C).

(7) Continue the tail rotor balance procedure until the ips reading is 0.2 ips or less.

(8) Remove the tracking and balancing equipment from the aircraft.

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RUN	IPS/CLOCK	CORRECTIVE ACTION

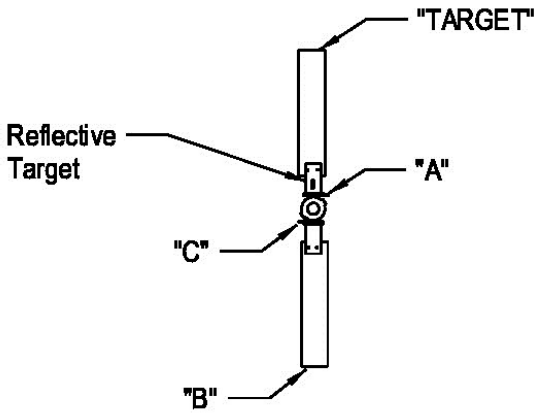


Figure 9-35. Tail Rotor Balancing Chart

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C. “Clock Angle Correction” Procedure

(1) Obtain the ips reading and clock angle using the procedure in paragraph B.

(2) As an example, the following results were obtained: Run 1, ips .55 @ 4:30 clock angle.

(3) Plot Run 1 on the tail rotor polar chart (Figure 9-35.1).

(4) Add a small washer (AN960-10L) to the tip at “B”.

(5) Run the helicopter again and record the ips reading and clock angle. In this example the following results were obtained: Run 2, 4.5 ips @ 6:30 clock angle.

(6) Plot Run 2 on the chart (Figure 9-35.2).

(7) Since the move line between Run 1 and Run 2 did not follow the chart in the expected direction, a correction must be made to the positions of the tip weight line and pitch link weight line relative to the clock orientation.

(8) Drawn a line between plot 1 and plot 2. Label the line “add B”.

(9) Rotate the tip weight line approximately 45° clockwise to reflect the actual results of the first weight change.

(10) The relationship between the tip weight line and the pitch link weight line should remain constant; therefore, the pitch link weight line can be rotated 45° clockwise (Figure 9-35.3).

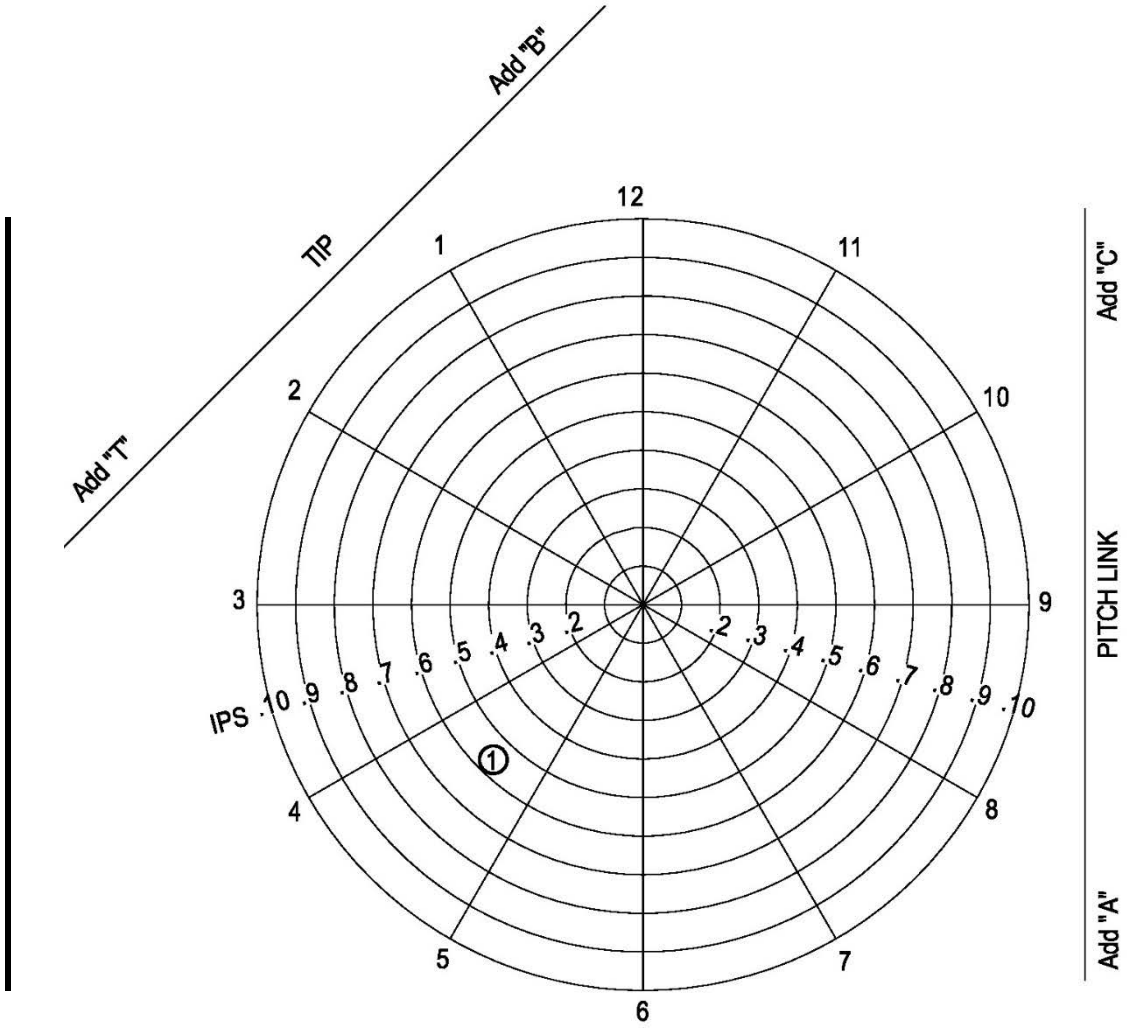
(11) Re-plot the original target reading (Figure 9-35.4).

(12) Remove the AN960-10L washer from tip B and add three 1/4 harper washers to the pitch link position C.

(13) Run the helicopter again and record the ips reading and clock angle. The following results were obtained: Run 3, .18 @ 6:00 clock angle (Figure 9-35.4).

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RUN	IPS/CLOCK	
#1	5.5 @ 4:30	add AN960-10L to B

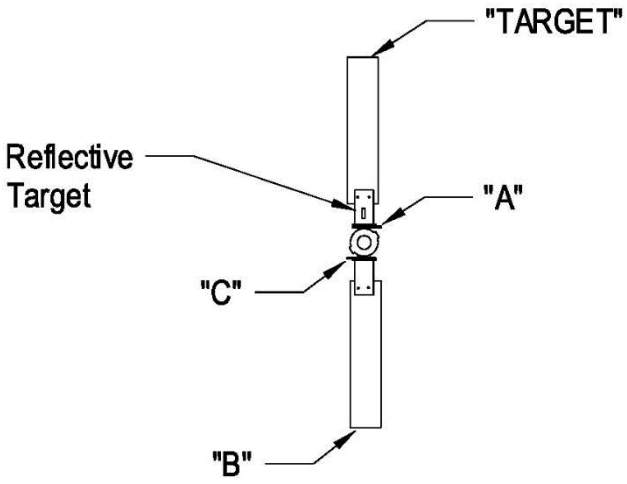
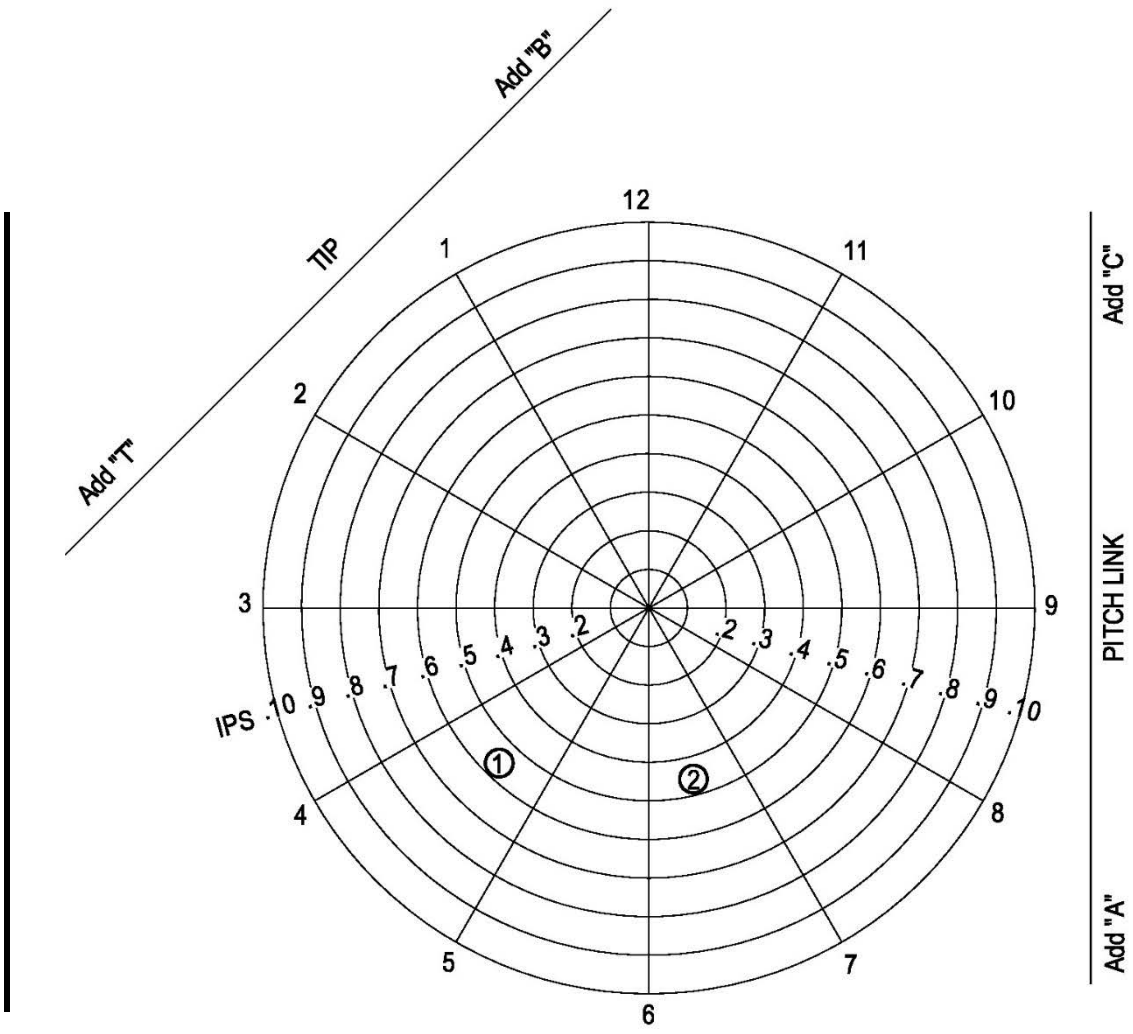


Figure 9-35.1. Tail Rotor Clock Angle Correction Example



RUN	IPS/CLOCK	CORRECTIVE ACTION
#1	5.5 @ 4:30	add AN960-10L to B
#2	4.5 @ 6:30	

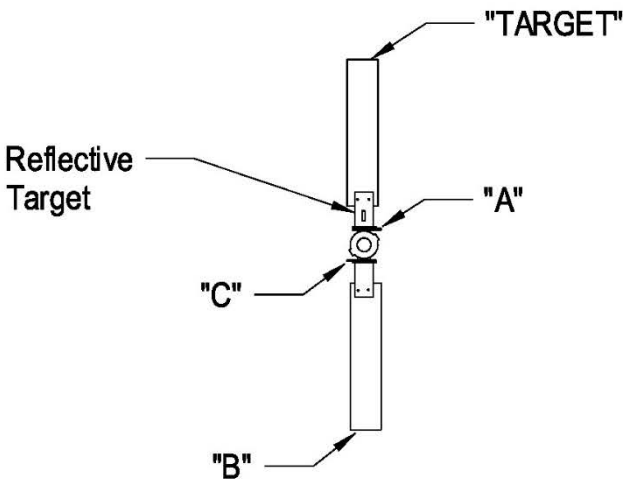
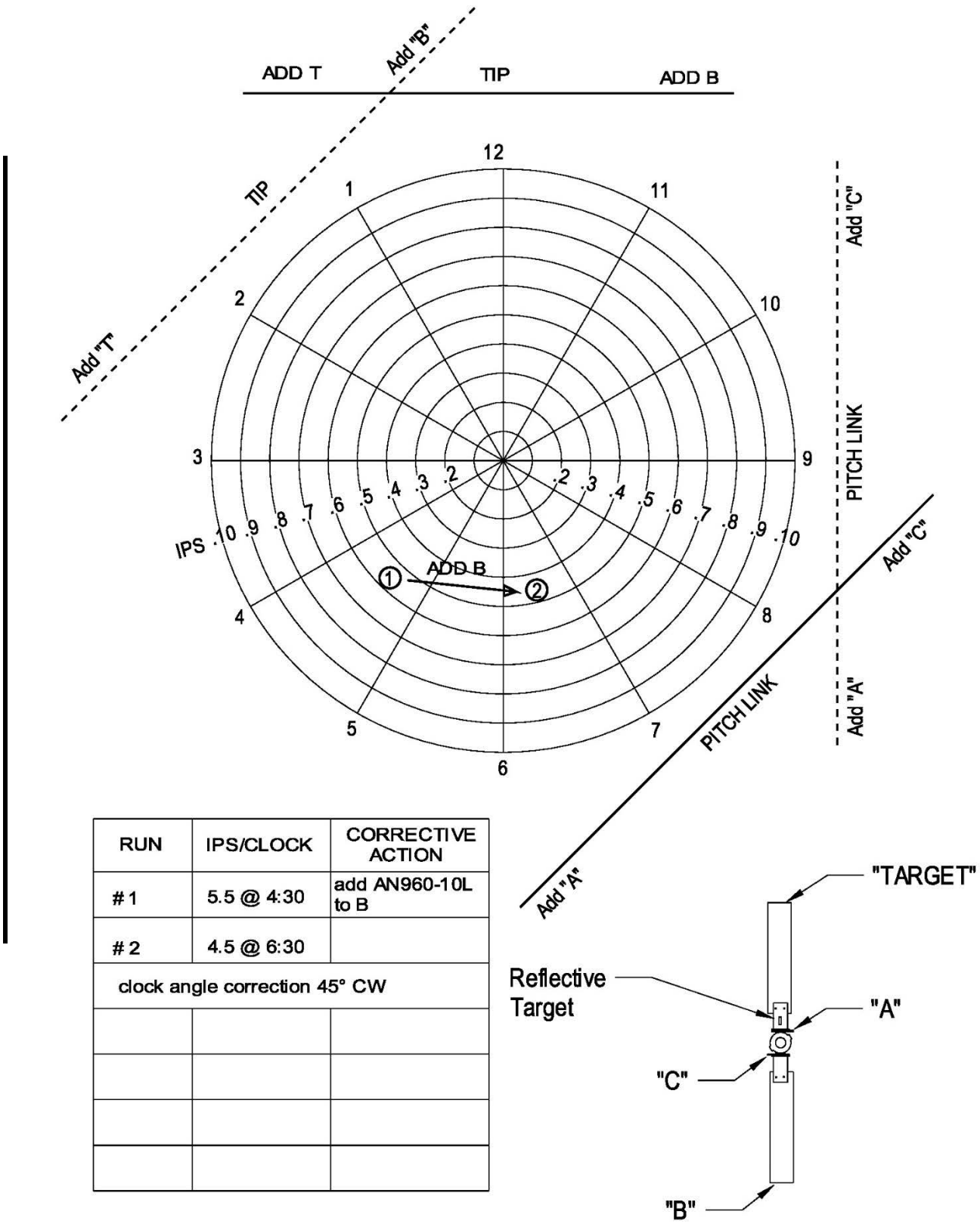
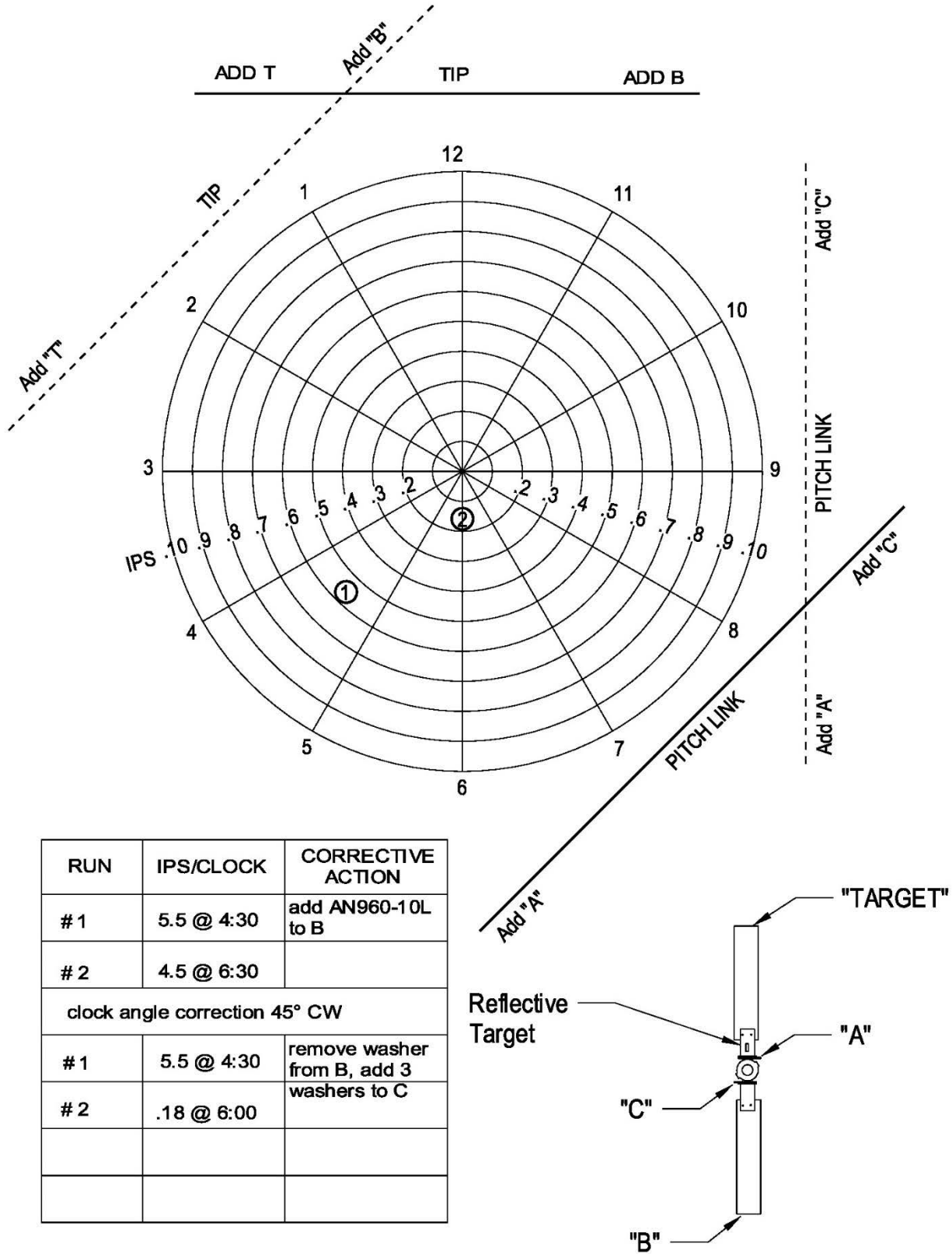


Figure 9-35.2. Tail Rotor Clock Angle Correction Example



RUN	IPS/CLOCK	CORRECTIVE ACTION
# 1	5.5 @ 4:30	add AN960-10L to B
# 2	4.5 @ 6:30	
clock angle correction 45° CW		

Figure 9-35.3. Tail Rotor Clock Angle Correction Example



RUN	IPS/CLOCK	CORRECTIVE ACTION
#1	5.5 @ 4:30	add AN960-10L to B
#2	4.5 @ 6:30	
clock angle correction 45° CW		
#1	5.5 @ 4:30	remove washer from B, add 3
#2	.18 @ 6:00	washers to C

Figure 9-35.4. Tail Rotor Clock Angle Correction Example

D. The following procedure is used to shim the teeter trunnion to correct chordwise out of balance (Figure 9-36).

NOTE

If more than five harper washers are required to balance the tail rotor in the chordwise axis, it may be necessary to shift the teeter hub to move the balance fulcrum.

NOTE

This procedure can be completed with the tail rotor installed on the helicopter and it is not necessary to disconnect the pitch change links from the tail rotor retention plate.

(1) From the previous example (para. 9-43, C, 12), the out-of-balance could be corrected by shifting the teeter hub (changing the balance fulcrum) rather than adding weight to the pitchlink.

(2) The chart calls for adding weight to the pitchlink at point A, which indicates that C is the heavy side of the blade in the vertical (chordwise) balance axis.

NOTE

This procedure can be completed with the tail rotor installed on the helicopter and it is not necessary to disconnect the pitch change links from the tail rotor retention plate.

(3) Remove the retaining ring (10) from the tail rotor spindle at the position closest to point C.

(4) Remove the end cap (9) and the seal (6). Use caution not to drop the thrust bumper (7) and the shims (8) as they may remain in the cap or stuck to the spindle.

(5) It may be necessary to insert a sharp hooked pick into the center hole of the thrust bumper (7) to withdraw it from inside the cap.

(6) Remove a 0.002” or 0.003” shim (8) from under the cap and carefully set it aside.

(7) Install the shims (8), gasket (6), cap (9), and the retaining ring (10) back into the spindle.

(8) Add the 0.002” or 0.003” shim previously removed from the C side to the shims (8) on the A side of the tail rotor spindle and reassemble the spindle.

(9) Ensure the retaining ring is securely seated in the grooves on both sides of the spindle.

(10) Continue with the balance procedure.

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9-44. Removal – Tail Rotor Assembly (Figure 9-36)

A. Index mark (color code) the pitch change links to the pitch change plates and disconnect the pitch change links from the pitch change plates.

B. Remove the safety wire from the tail rotor retention bolt. Remove the bolt (31), washer (30), and teeter stop (29).

NOTE

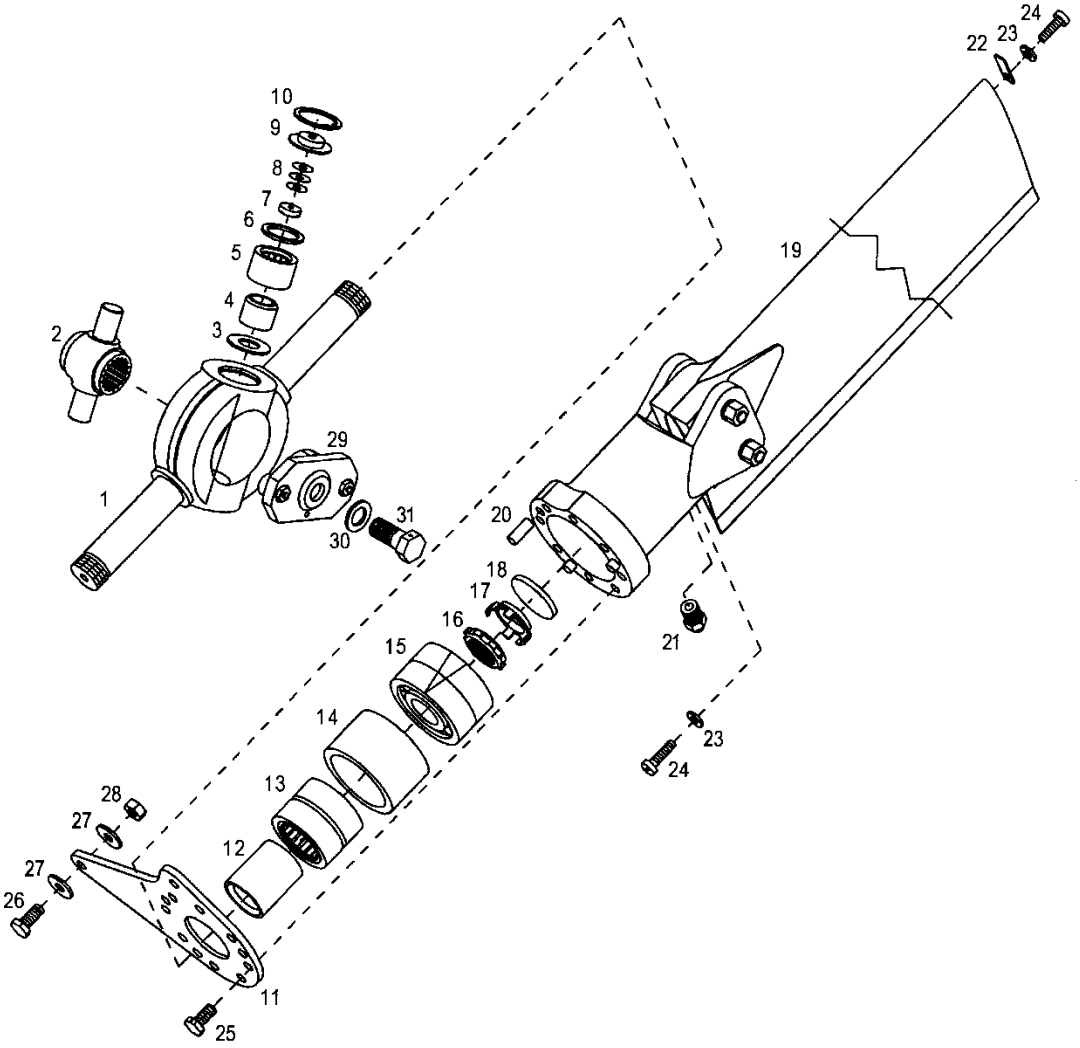
Index mark the hub and shaft splines for ease of installation.

C. Carefully slide the tail rotor assembly from the transmission output shaft.

D. Temporarily install the teeter stop, washer, and bolt or a PD-40 Caplug (-4 plug) into the transmission output shaft.

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1. Tail Rotor Spindle
2. Tail Rotor Hub
3. Washer
4. Bearing Journal
5. Teeter Bearing
6. Seal
7. Thrust Bumper
8. Shims
9. End Cap
10. Retaining Ring
11. Pitch Change Plate
12. Bearing Sleeve
13. Bearing
14. Bearing Retainer
15. Thrust Bearing Set
16. Nut
17. Lock Washer
18. Bumper
19. Blade and Grip Assembly
20. Dowel Pin
21. Lubrication Fitting
22. Strike Indicator
23. Washer
24. Screw
25. Bolt
26. Bolt
27. Harper Washer
28. Nut
29. Teeter Stop
30. Washer
31. Bolt

Figure 9-36. Tail Rotor Assembly (Exploded View)

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9-45. Disassembly – Tail Rotor Assembly (Figure 9-36)

A. Remove the retention bolt safety wire from around the center hub.

NOTE

The removal procedures are the same for both blade and grip assemblies.

CAUTION

Use brass protector plated in the vise jaws to prevent from damaging the tail rotor spindle.

B. Clamp the tail rotor assembly in a vise so that the blades can be rotated.

C. Remove the bolts (26), washers (27), and nuts (28) from the pitch change plates (11).

D. Remove the safety wire and bolts (25) from the pitch change plates.

NOTE

Remove the lubrication fitting from the blade grip to ease removal and installation of the blade and grip assembly.

CAUTION

Do not tap on the root of the blade during the removal process or remove the blade from the blade grip. They are match drilled when assembled.

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

E. Loosen the blade retention bolt nuts slightly and heat the blade grip to approximately 250°F/121°C.

F. Remove the blade and grip assembly (19) by pulling on the blade with one hand and tapping on the blade bolt nuts with a nylon hammer. If required, rotate the tail rotor assembly and remove the opposite blade and grip assembly.

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G. Remove the bumper (18) from the end of the spindle.

H. Remove the lock washer (17) by prying up on the tabs with a screw driver.

I. Remove the nut (16) from the spindle using tool T-0056.

NOTE

The thrust bearings are matched sets.

J. Remove the thrust bearings (15) from the spindle.

K. Remove the bearing retainer (14) and bearing (13).

L. Remove the bearing sleeve (12).

M. Remove the pitch change plate (11).

N. Remove the retaining rings (10), end caps (9), shims (8), thrust bumpers (7) and seals (6) from the spindle.

CAUTION

When pressing the bearings out of the spindle, do not allow the hub to bottom against the spindle.

O. Using tool kit T-2893 or other suitable device with a properly sized dowel, press the hub (2) toward one side of the spindle until the hub is about to contact the spindle. Turn the spindle over and press the hub and opposite needle bearing in the same manner.

P. Move the hub to the opposite side of the spindle as the bearing to be removed and insert the split pressing tools from the tool kit onto the journal (4). Press the needle bearing (5) from the spindle. Insert the split pressing tools onto the opposite side of the hub and press out the remaining needle bearing.

NOTE

The journals are installed with Loctite® 277 (red).

Q. Using the tool kit or other suitable device, remove one of the journals from the hub. Remove the hub from the spindle and remove the remaining journal and the washers (3).

9-46. Cleaning – Tail Rotor Assembly

A. Wash parts in cleaning solvent.

B. Wash bearings in clean solvent to prevent contamination of the bearings.

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9-47. Inspection – Tail Rotor Assembly

A. See Table 9-5 for the detailed inspection requirements for the tail rotor assembly.

B. Inspect the paint finish of the blades for blistering, erosion, cracking, chipping, peeling, and overall oxidation.

C. Inspect the trailing edge bond lines for voids or openings, dark deposits, and bubbly or scaly paint.

D. Inspect the spar bond lines for raised sections or voids, dark deposits, and bubbly or scaly paint.

E. Inspect the bond lines at the doubler edges for paint cracking or scaling, dark deposits, and void in the fairing compound.

F. Inspect the tail rotor blade skins, abrasion strip, retention plates, and root doublers for nicks, scratches, dents, and cracks. (Figure 9-32)

E. Inspect the blade tip rib for loose rivets.

9-48. Repair – Tail Rotor Assembly

CAUTION

The tail rotor assembly must be statically and dynamically rebalanced after any repair.

NOTE

Refinish the repaired area in accordance with paragraph 9-36, A, or paragraph 9-37 depending on the condition of the rest of paint finish.

A. Repair small areas of the paint finish in accordance with paragraph 9-36,A.

B. Reject tail rotor blades with the following bond line separations or voids:

(1) Trailing edge separations deeper than .050 inch/1.3 mm or more than 2.0inch/5.1 cm in length.

(2) Stainless steel abrasion strip separations more than 2.0 inch/5.1 cm from the tip of the blade or deeper than .062inch/1.6 mm.

(3) Root doubler separations closer than 2.0inch/5.1 cm from the tip of the doubler under which the separation appears, or greater than 1.0 inch/2.5 cm in length, or deeper than .062 inch/1.6 mm.

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Table 9-5. Tail Rotor Assembly

P/N	Figure 9-36 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-150074-11, -13	1	Spindle	Surface scratches, nicks, or corrosion	None Allowed	≤ .001 deep	Polish with Scotch Brite pad or equivalent
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Spindle
			Feathering bearing shaft O.D. .7864 to .7868	-.0002	Not Repairable	Replace Spindle
			Teeter bearing bore Dia. 1.0002 to 1.0007	-.0002	Not Repairable	Replace Spindle
			Cracks	None Allowed	Not Repairable	Replace Spindle
28-150067-15	2	Hub	Splines (pitted or wicked)	None Allowed	Not Repairable	Replace Hub
			Teeter bearing shaft Dia. .4989 to .4994	-.0002	Not Repairable	Replace Hub
			Nicks, scratches, or corrosion	None Allowed	≤ .005	Blend out smooth
			Cracks	None Allowed	Not Repairable	Replace Hub
			Threads (stripped or missing)	None Allowed	Not Repairable	Replace Hub

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Table 9-5. Tail Rotor Assembly

P/N	Figure 9-36 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-150076-15	4	Journal	Journal I.D. .4995 to .4998	+.0002	Not Repairable	Replace Journal
			Journal O.D. .7509 to .7511	-.0002	Not Repairable	Replace Journal
B-1210	5	Needle Bearing	Bearing O.D. 1.000	-.0002	Not Repairable	Replace Bearing
			Visible wear of the needles	None Allowed	Not Repairable	Replace Bearing
28-150076-13	7	Thrust Bumper	Thickness .123 to .125	-.002	Not Repairable	Replace Bumper
28-150060-11	11	Pitch Change Plate	Nicks in edge of plate	None Allowed	# .005 deep	Polish and blend locally not to exceed .008
			Pitch link bolt hole Dia. .250 to .251	+.0005	Not Repairable	Replace pitch change plate
			Corrosion	None Allowed		Return to the factory for inspection and replating, or replace pitch change plate
			Cracks	None Allowed	Not Repairable	Replace pitch change plate
28-150063-11, -13	12	Sleeve	Sleeve I.D. .7878 to .7882	+.0002	Not Repairable	Replace Sleeve
			Sleeve I.D. .7872 to .7876 (-13)	+.0002	Not Repairable	Replace Sleeve
			Sleeve O.D. 1.1245 to 1.1250	-.0002	Not Repairable	Replace Sleeve

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Table 9-5. Tail Rotor Assembly

Inspection Requirements*

P/N	Figure 9-36 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
ECD001-11	13	Bearing	Bearing O.D. 1.6250	+.0000 -.0005	Not Repairable	Replace Bearing
			Visible wear of the rollers	None Allowed	Not Repairable	Replace Bearing
28-150055-1, -13, -15	14	Retainer	Retainer I.D. 1.6250 to 1.6255	+.0005	Not Repairable	Replace Retainer
			Retainer I.D. 1.6240 to 1.6247 (-15)	+.0005	Not Repairable	Replace Retainer
			Retainer O.D. 2.043 to 2.044	-.001	Not Repairable	Replace Retainer
ECD002-11, -13, -15, -17	15	Bearing	Bearing O.D. 2.0467 to 2.0472	-.0002	Not Repairable	Replace Bearing
			Bearing Bore Dia. .7870 to.7874	+.0002	Not Repairable	Replace Bearing
			Preload to the thrust side and check for roughness or ratcheting	None Allowed	Not Repairable	Replace Bearing
SL61N-5P	16	Nut	Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut
			Nicks and burrs on O.D.	None Allowed	≤ .10 deep	Blend and polish out smooth
			Rounded or burred locking tabs	Max. 2 slightly rounded tabs	To allow use of the locknut wrench	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Nut

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Table 9-5. Tail Rotor Assembly

P/N	Figure 9-36 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
SL61W-5P	17	Lockwasher	Nicked locking tabs	None Allowed	≤ .005 deep	Blend and polish out smooth
			Bent locking tabs	> 10° from parallel to the bore	≤ 10° from parallel to the bore	Bend the tabs until parallel to the bore
			Serrated splines (smooth or rolled)	None Allowed	Not Repairable	Replace Lockwasher
28-15033-11, -17, -19	18	Bumper	Both sides for friction wear	Surfaces must be smooth	Not Repairable	Replace Bumper
			Cracks	None Allowed	Not Repairable	Replace Bumper
28-150001-9	19	Blade and Grip Assembly Note 1	<u>Blade Grip:</u> Bearing bore Dia. 2.0454 to 2.0466	+.0005	Not Repairable	Replace Blade and Grip Assembly
			Nicks, scratches, or corrosion in the bearing housing area of the grip	.020 deep	≤ .020 deep	Blend and polish out smooth, treat with chemical conversion coating
			Nicks, scratches, or corrosion in the blade retention area or the grip	.010 deep	≤ .010 deep	Blend and polish out smooth, brush with iridite finish
			Cracks	None Allowed	Not Repairable	Replace blade and grip assembly

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Table 9-5. Tail Rotor Assembly

P/N	Figure 9-36 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-150001-9	19	Blade and Grip Assembly (Cont'd) *-Note 1	<u>Blade:</u>			
			Doubler Separation	None Allowed	See paragraph 9-48	See paragraph 9-48
			Leading edge bond separations	None Allowed	See paragraph 9-48	See paragraph 9-48
			Trailing edge bond separations	None Allowed	See paragraph 9-48	See paragraph 9-48
			Sharp dents or scratches in the blade skin	None Allowed	See paragraph 9-48	See paragraph 9-48
			Smooth dents in the blade skin	.020 deep, not to exceed 1.0" in Dia.	See paragraph 9-48	See paragraph 9-48
			Bent, distorted or rippled blades	None Allowed	Not Repairable	Replace Blade
			Smooth dents in the leading edge	Not to exceed .020 deep	See paragraph 9-48	See paragraph 9-48
			Sharp dents or scratches in the leading edge	None Allowed	See paragraph 9-48	See paragraph 9-48
28-15030-1	29	Teeter Stop	Rubber bumpers for deterioration or cracks	Excessive cracking or deterioration	Not Repairable	Replace Bumper
			Nicks, scratches, or corrosion	.010 deep	≤ .010 deep	Replace Teeter Stop

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Table 9-5. Tail Rotor Assembly

P/N	Figure 9-36 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action

Note 1 - If the blade is attached to the grip using 1/4" bolts, a new grip or blade can be installed by Enstrom. The blade and grip assembly will have 5/16"bolts installed. Both of the blade and grip assemblies must have the same size retaining bolts. Do not intermix blade and grip assemblies that have different size retaining bolts.

* All dimensions are in inches.

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C. Repair voids and separations of the tail rotor blade bond lines that do not exceed the limits paragraph 9-48, B, in accordance with paragraph 9-36, D.

D. Reject tail rotor blades with the following blade skin damage:

(1) Scratches, nicks, or sharp dents deeper than .010 inch/.25 mm.

(2) Nicks in the trailing edge deeper than .100 inch/2.5 mm.

(3) Smooth dents exceeding .025 inch/0.6 MM.

(4) Cracks or punctures.

E. Repair damage to the blade skins not exceeding the limits in paragraph 9-48,D, as follows:

(1) Buff out all scratches not deep enough to penetrate the clad material.

(2) Blend scratches, nicks, or sharp dents out smooth over a 2.0 inch/5.1 cm diameter area.

(3) Blend out nicks in the trailing edge in accordance with Figure 9-37.

(4) No repair required for smooth dents.

F. Reject tail rotor blades with the following abrasion strip damage:

(1) Nicks and scratches deeper than .005 inch/0.13 mm.

(2) Dents deeper than .040 inch/0.1 mm.

(3) Cracks, punctures, or erosion penetration of the stainless steel.

G. Repair damage to the abrasion strip not exceeding the limits in paragraph 9-48,F, as follows:

(1) Blend nicks and scratches out smooth over an area 1inch/2.5 cm long (parallel to the leading edge) by .50inch/0.13 mm wide.

(2) No repair required for dents.

H. Reject tail rotor blades with the following root doubler damage:

(1) Nick, scratches, or sharp dents deeper than .010 inch/.25.

(2) Smooth dents deeper than .020 inch/5.1 mm.

(3) Cracks.

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I. Repair damage to the root doublers not exceeding the limits in paragraph 9-48,H, as follows:

(1) Blend nicks, scratches, or sharp dents out smooth to approximately .50 inch/13 mm on either side of the damaged area.

(2) No repair required for smooth dents.

J. Reject tail rotor blades with the following retention plate damage:

(1) Nick, scratches, or sharp dents deeper than .030 inch/0.8 mm.

(2) Cracks.

K. Repair damage to the retention plates not exceeding the limits in paragraph 9-48, J, as follows:

(1) Blend nicks, scratches, or sharp dents out smooth to approximately 1.0inch/2.5 cm in diameter.

L. Reject tail rotor blades with cracked tip ribs.

M. Replace loose rivets.

9-49. Refinishing – Tail Rotor Assembly

A. Remove the tail rotor assembly and disassemble.

B. Index mark the hardware in the blade and grip assembly.

C. Remove the hardware from the blade and grip assemblies and separate the blades from the grips.

D. Refinish the blades in accordance with paragraph 9-37.

NOTE

If the tail rotor blade and grip assembly in not installed on the tail rotor spindle, do not torque the blade retention bolt nuts at this time.

E. Reinstall the blades into the grips. Torque the blade retention bolt nuts to 75 in-lbs/8.5 Nm (140 in-lbs/15.9 Nm if the blade and grip assembly has been factory repaired and 5/16 inch bolts installed).

F. If required, reassemble the tail rotor assembly.

G. Statically balance the tail rotor assembly (para. 9-42).

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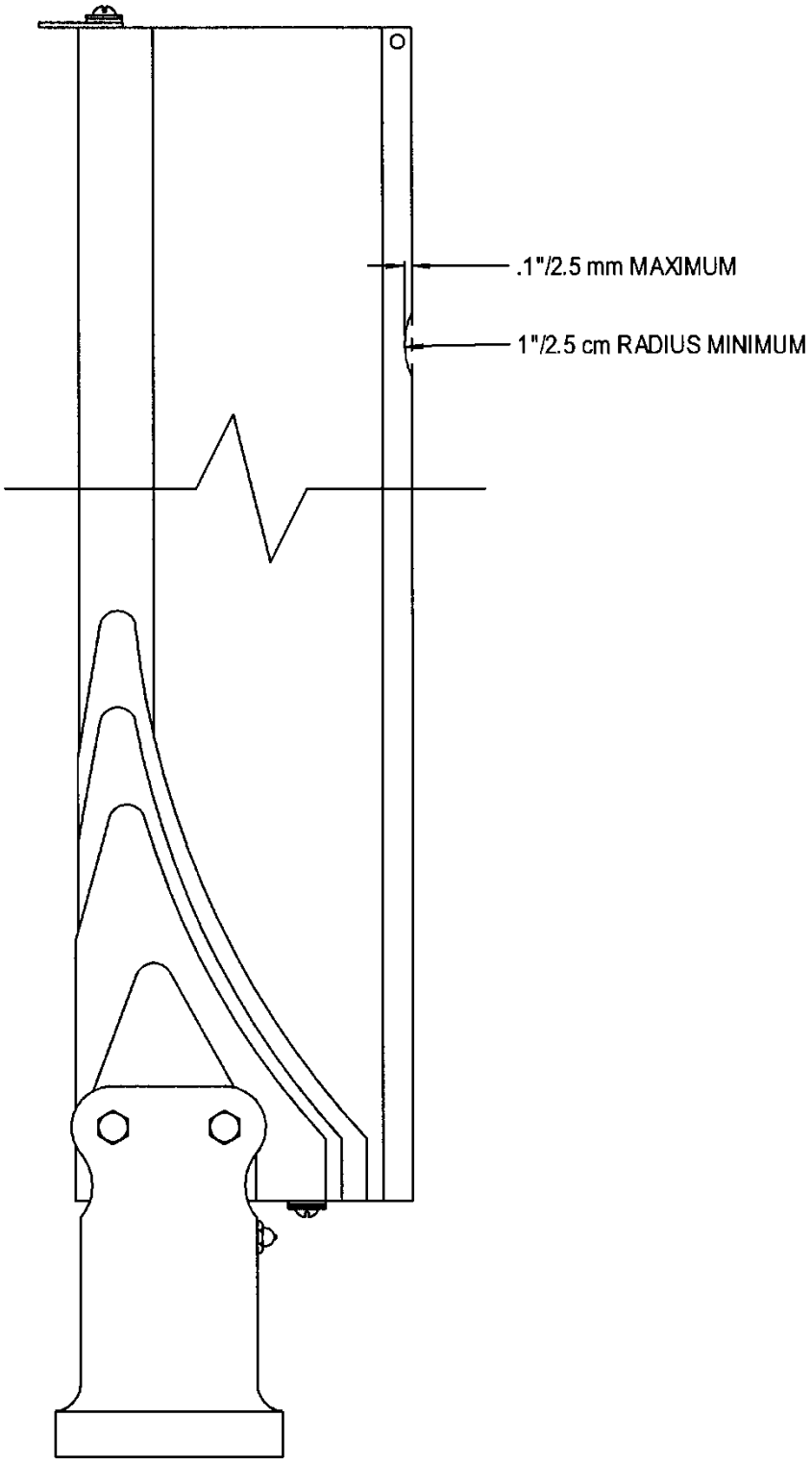


Figure 9-37. Tail Rotor Blade Trailing Edge Repair Limits

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9-50. Assembly – Tail Rotor Assembly (Figure 9-36)

A. Install the hub (2) into the spindle (1) using the following procedure:

(1) Install one of the washers (3) onto the hub with the chamfer toward the center of the hub.

(2) Apply a light coating of Loctite® 277 (red) to the inside diameter of one of the journals (4). Install the journal onto the hub with the large chamfer outboard. Remove any excess Loctite®.

NOTE

Use ultra fine crocus cloth to eliminate interference fit between the hub journal and the bearing journal.

(3) Install the hub into the spindle and install the other washer and journal in the same manner.

NOTE

Install the bearing into the spindle to a depth of .191/.193 inches if not using tool kit T-2893.

(4) Position one of the needle bearings (5) at the teeter bearing bore of the spindle and using the installation tool from the tool kit T-2893 press the bearing into the spindle.

CAUTION

Ensure the hub and journal are aligned with the remaining needle bearing during installation to prevent any damage.

(5) Turn the spindle over and insert the hub into the bearing that was just installed. Install the remaining bearing.

(6) Check that the hub rotates freely (smoothly and without resistance) in the bearings. Determine the cause if the hub does not rotate freely.

(7) Install the seal (6), thrust bumper (7) with the lubrication grooves toward the hub, end cap (9), and retaining ring (10) in both sides of the spindle.

(8) Determine the amount of shims (8) required to remove the end play from the hub. Add an additional .004 to .005 inch/0.10 to 0.13 mm of shims to each side for preload.

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(9) Remove the retaining rings and caps from the spindle. Divide the shims into two equal amounts. Install the shims between the thrust bumpers (7) and the end caps (9). Reinstall the end caps and retaining rings. If the caps or retaining rings do not seat properly in the spindle, use a pair of non-marring pliers to rotate the cap to seat it properly.

(10) Check 12-16 oz/0.34-45 kg preload applied at 6 in/15.2 cm from the teeter hub. The hub should still be able to be rotated.

(11) Purge lubricate the teeter bearings (ref. Table 4-2).

NOTE

The installation procedures are the same for both blade and grip assemblies.

CAUTION

Use brass protector plated in the vise jaws to prevent from damaging the tail rotor spindle.

B. Place the spindle into a vise so that the blade and grip assemblies can be rotated when installed.

C. Install the pitch change plate (11) on the spindle with the machined clearance surface of the pitch arm facing outboard.

D. Install the bearing sleeve (12) onto the spindle.

NOTE

The closed end of the retainer faces outboard toward the thrust bearings.

E. Press the bearings (13) into the bearing retainer (14) and install on the bearing sleeve.

F. Install the thrust bearings (15) in matched sets with the closed side of the bearing facing inboard toward the hub. This side of the bearing will also have the word "thrust" imprinted on the face of the outer race. Most of these bearing sets will be scribed with a "V" on the outer races pointing toward the center hub.

G. Install the retaining nuts (16) using tool T-0056 and torque to 80-90 ft-lbs/109.1-122.7 Nm.

H. Align and install the lock washer (17).

I. Clean the surface of the bumper (18) and the end of the spindle with acetone or equivalent. Apply a small amount of adhesive (Loctite® 4205 or equivalent) to the bumper and attach it to the end of the spindle. Ensure the bumper is centered and secure.

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J. Lubricate (MIL-PRF-81322) the O.D. of the bearings. Apply a small amount of Lubriplate 630-AA onto the end of the bumper.

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

K. Using a heat gun, heat the blade grip (19) to approximately 250°F/121°C.

L. Lubricate (MIL-PRF-81322) the bore of the blade grip. Quickly slide the blade and grip assembly onto the spindle. Align the pitch link hole in the pitch change plate to the leading edge of the blade. Align the dowel pins to the center holes in the pitch change plate (the holes are located in sets of three).

NOTE

Alternately tighten the bolts 1 to 2 turns to pull the pitch change plate and grip straight together.

M. Start three bolts (25) into the grip and tighten to pull the grip and the pitch change plate together.

N. Install the rest of the bolts (25). After the blade and grip assembly has cooled, torque the bolts to 50-70 in-lbs/5.7-8.0 Nm and safety wire (.032) in pairs.

O. Re-heat the blade grip and tap outboard to assure maximum CF (centrifugal force) position.

P. Torque the blade retention bolt nuts to 75 in-lbs/8.5 Nm (140 in-lbs/15.9 Nm if the blade and grip assembly has been factory repaired and 5/16 inch bolts installed) after the blade grip has cooled.

Q. Install the grease fitting into the grip and lubricate the grip (para. 4-39.4) until grease purges from the pitch change plate from around the spindle.

R. If required, install the opposite blade and grip assembly.

S. Statically balance the tail rotor (para. 9-42).

T. Install the bolts (26), washers (27), and nuts (28) onto the pitch arms if not installed.

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9-51. Installation – Tail Rotor Assembly

A. Start a .041 wrap of safety wire around one side of the tail rotor hub.

NOTE

The tail rotor assembly may be rotated 180° or the center hub may be pivoted 180° to obtain the proper installation position of the tail rotor assembly.

NOTE

See Figure 9-38. A line drawn through the grease fittings of either end of the teetering hub (Figure 9-36, 2) (tail rotor hub pivot center line) should align with the lagging ears of the pitch link retainer. If the tail rotor hub pivot centerline is centered between the ears of the pitch link retainer, rotate the teeter trunnion 180° to obtain the correct 8° alignment.

B. Install the tail rotor assembly onto the transmission output shaft. Ensure the center line of the tail rotor hub pivot axis aligns with the inboard side of the pitch change link retainer ear that lags in the direction of rotation (Figure 9-38).

C. Feed the safety wire through the hole in the teeter stop and install the teeter stop so that the rubber bumpers align with the flats of the spindle.

D. Install the washer and retaining bolt. Torque the retaining bolt to 300 in-lbs/34.1 Nm and complete the safety.

E. Connect the pitch change links to the pitch change plates (para. 12-126).

F. Dynamically balance the tail rotor (para. 9-43).

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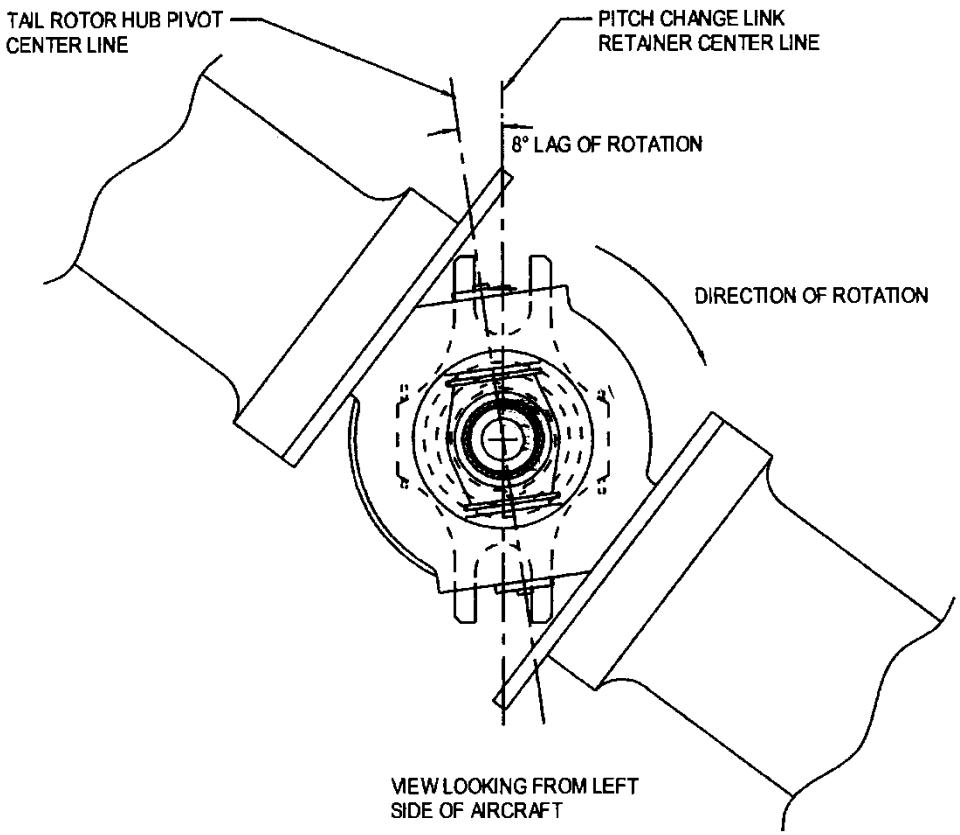


Figure 9-38. Tail Rotor Installation Orientation

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9-52. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Abrasive pad	Pad, 3M Brand (Scotch-Brite)	7447B
Acetone	Acetone solvent	
Adhesion promoter (primer)	Adhesion promoter, 3M Brand	86A
Adhesive	Epoxy adhesive, 3M Brand	DP190
Adhesive	Epoxy adhesive, 3M Brand	DP420
Adhesive	Adhesive, Loctite Brand (4205)	28028
Adhesive	Adhesive, Loctite Brand (635)	63531
Aluminum oxide paper or cloth	Aluminum oxide paper or cloth, medium and fine grit, 3M Brand or equivalent	
Chemical coating	Iridite solution, Allied-Kelite Brand	14-4A[1]
Corrosion inhibitor	ACF-50, Lear Chemical Research Brand	MIL-PRF-81309, Type II or III
Corrosion inhibitor	Corrosion X – Aviation, Corrosion Technologies Corporation	MIL-PRF-81309, Type II or III
Denatured alcohol	Denatured alcohol	
Epoxy sealant	Epoxy adhesive, Hysol Brand	EA 9309.2NA
Grease	Grease, Lubriplate Brand	630-AA[2] (06701)
Grease	Grease	MIL-PRF-81322
Grease	Aeroshell 22 (Shell)	
Isopropyl alcohol	Isopropyl alcohol	
Lockwire	Lockwire, .025”	MS20995C25
Lockwire	Lockwire, .032”	MS20995C32
Lockwire	Lockwire, .041”	MS20995C41
Lubricant	LPS 2 Heavy Duty Lubricant, LPS Laboratories	00216
MEK	MEK solvent	
Metal Etch	Aluminum etching compound, Semco Brand	Pasa-Jell 105[3]

[1] Complies with MIL-DTL-5541/MIL-DTL-81706 (formerly MIL-C-5541/MIL-C-81706).
[2] MIL-PRF-81322 is an acceptable alternate.
[3] Acceptable material where metal prep is required.

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ITEM	DESCRIPTION	PART NUMBER
Oil	Any grade internal combustion engine motor oil	
Oil	Silicon oil	L-45 or SF96-20
Paint	Acrylic aerosol touch up paint, flat black or flat light grey	
Paint	Any quality brand urethane paint	
Paint Stripper	Paint stripper, PPG Aerospace Brand	Eldorado PR-3500
Primer	Epoxy primer	MIL-PRF-23377[4]
Sandpaper	Sandpaper 80 grit, 3M Brand or equivalent	214U
Sandpaper	Sandpaper 150 grit, 3M Brand or equivalent	
Sandpaper	Sandpaper 400 grit, 3M Brand or equivalent	
Sealant	Silicone Sealant, Dow Corning Brand	732-RTV
Soap	Soap, Joy Brand	
Solvent	Extreme Simple Green, Sunshine Makers, Inc.	13440
Tape	Fine line tape, 3M Brand	218 or 471
Tape	Masking tape, 3M Brand	233+[5]
Tape	Polyurethane tape, 3M Brand	8681HS
Thread sealant	Loctite Brand (Threadlocker 222MS)	22221
Thread sealant	Loctite Brand (Threadlocker Red 271)[6]	27100
Thread sealant	Thread sealant, Loctite Brand (277)	27731
Thread sealant	Thread sealant, Loctite Brand Threadlocker Blue 242[7]	24200
Thread sealant	Thread sealant, Vibra-Tite Brand	VC-3
Wipes	Adhesion promoter wipes, 3M Brand	86A

[4] Example: PRC-DeSoto Brand 513x390/activated by 910x624, or equivalent.
[5] One half inch to two inch widths.
[6] Acceptable alternate for Loctite 222MS.
[7] Acceptable alternate for Vibra-Tite VC-3.

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ENSTROM TH-28/480 SERIES MAINTENANCE MANUAL

SECTION 10

FUEL SYSTEM

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FUEL SYSTEM

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10-1. Fuel System

10-2. Description – Fuel System (Figure 10-1)

The fuel system consists of two 45 gallon (US)/170 liter bladder type fuel cells mounted on both sides of the main rotor transmission. Each cell is housed in a composite fuel cell structure and is interconnected to the other fuel cell through a fuel crossover line in the lower one third (⅓) of the fuel cell and an overboard vent crossover line located at the top of each fuel cell. The main fuel supply lines, located at the lowest point in each fuel cell, interconnect at a tee to supply fuel to the engine equally from each fuel cell. The main fuel shutoff valve is incorporated onto the tee and is manually operated from the cockpit. Each fuel cell is equipped with sump drains, and the system is equipped with a low point drain at the fuel shutoff valve. A capacitance fuel quantity probe and a low fuel warning switch are mounted in the right-hand fuel cell. The refueling port is located in the top of the left-hand fuel cell. The right-hand fuel cell is filled by cross-feeding action during refueling. Fuel management is accomplished with the use of a fuel flow system (optional equipment - 480/480B) and a fuel quantity system. The fuel quantity system consists of a capacitance probe or transmitter, a signal conditioning unit (TH-28 Serial Number 3006 and 480 Serial Numbers 5001-5010) or a signal converter unit (480B Serial Numbers 5198 and Subsequent), and a quantity indicating gauge.

The crash resistant fuel system (CRFS) was introduced into production aircraft beginning with S/N 5256. Fuel capacity, fuel transfer, and fuel management aspects are similar to the legacy systems; however, components within the architecture are designed to retain fuel in a crash. The fuel bladders are fabricated from crash resistant material and extensible chimneys on the cross fill and vent connections allow stretch and angular misalignment that resist pull-out at these locations. A combination of lacing, hook and loop patches, and frangible studs and tabs secure the fuel bladder to the fuel shelf structure. A roll-over valve is located on the shared vent to prevent fuel leaks in inverted aircraft orientations. Breakaway couplings, consisting of paired, self-sealing breakaway valves, are installed on the vent, fuel cross fill, and fuel lines. The couplings are frangible and seal the fuel from both directions to prevent leaks in the event of an impact. In the case of an impact that causes a fuel bladder to move with respect to the surrounding structure, the frangible mechanism of the valve halves releases each ball valve to instantly close and prevent fuel flow. The position of the ball valve is indicated by the orientation of indicator dots visible on the surface of the valve. Indicator dots parallel with the valve coupling body indicate an open valve; indicator dots perpendicular to the valve coupling body indicate a closed valve. (See Figure 10-3.1.)

NOTES

Prior to S/N 5013, aircraft were manufactured with P/N 4122009 fuel bladders (Aerazur), which contain baffles. S/N 5013 through S/N 5254 were manufactured with P/N 4122054 fuel bladders, which are filled with open cell foam. (P/N 4122054 is commonly referred to as the standard fuel system.) Beginning with S/N 5256, aircraft are manufactured with the P/N 4122100-1 CRFS installation, which consists of open cavity fuel bladders.

Use of unauthorized fuels or additives may cause fuel cell rubber deterioration. Refer to Table 4-1 for the listing of approved, alternate, and emergency fuels as well as approved anti-icing additives.

Terms that are used interchangeably include: fuel cell/fuel bladder, fuel cell cover/fuel cell skin, fuel fitting/flange plate, and probe/transmitter.

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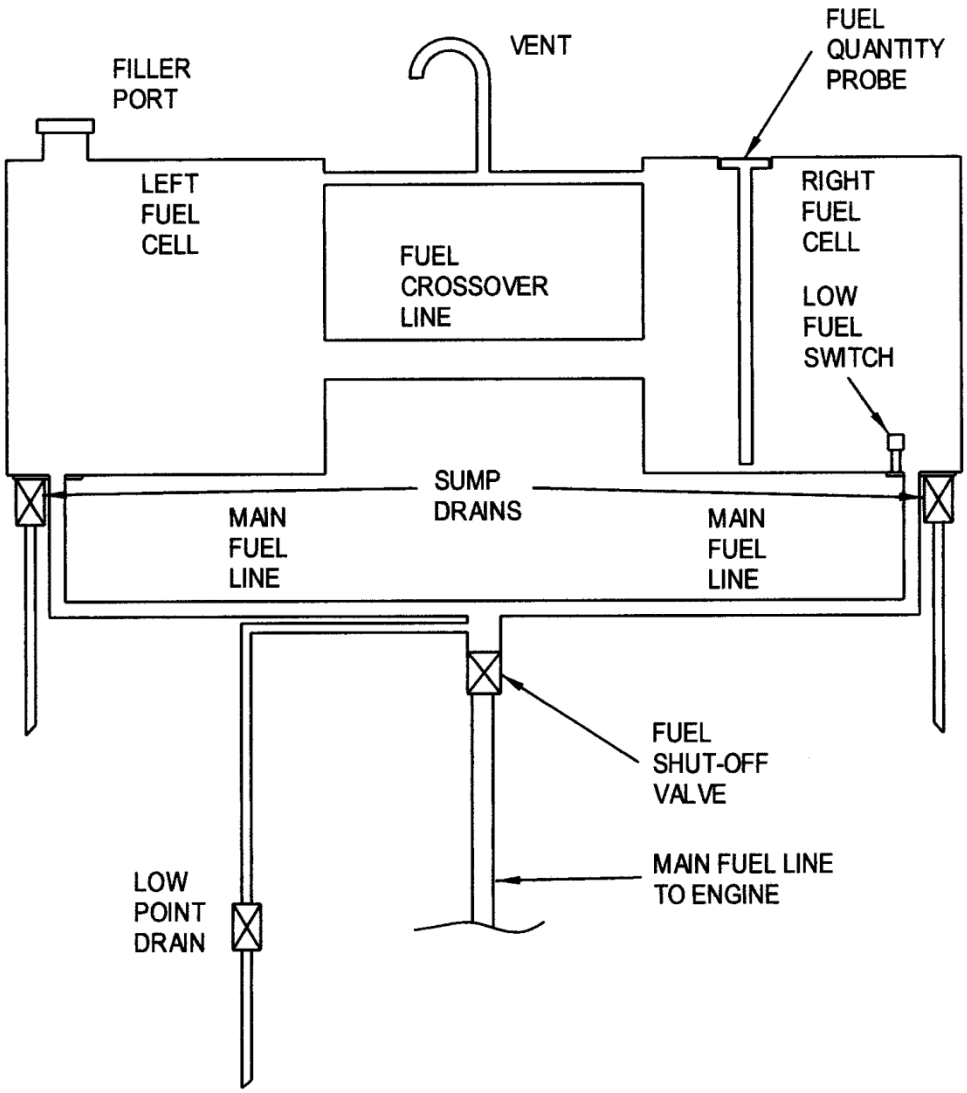


Figure 10-1. Simplified Fuel System Schematic Diagram (Standard and Aerazur)

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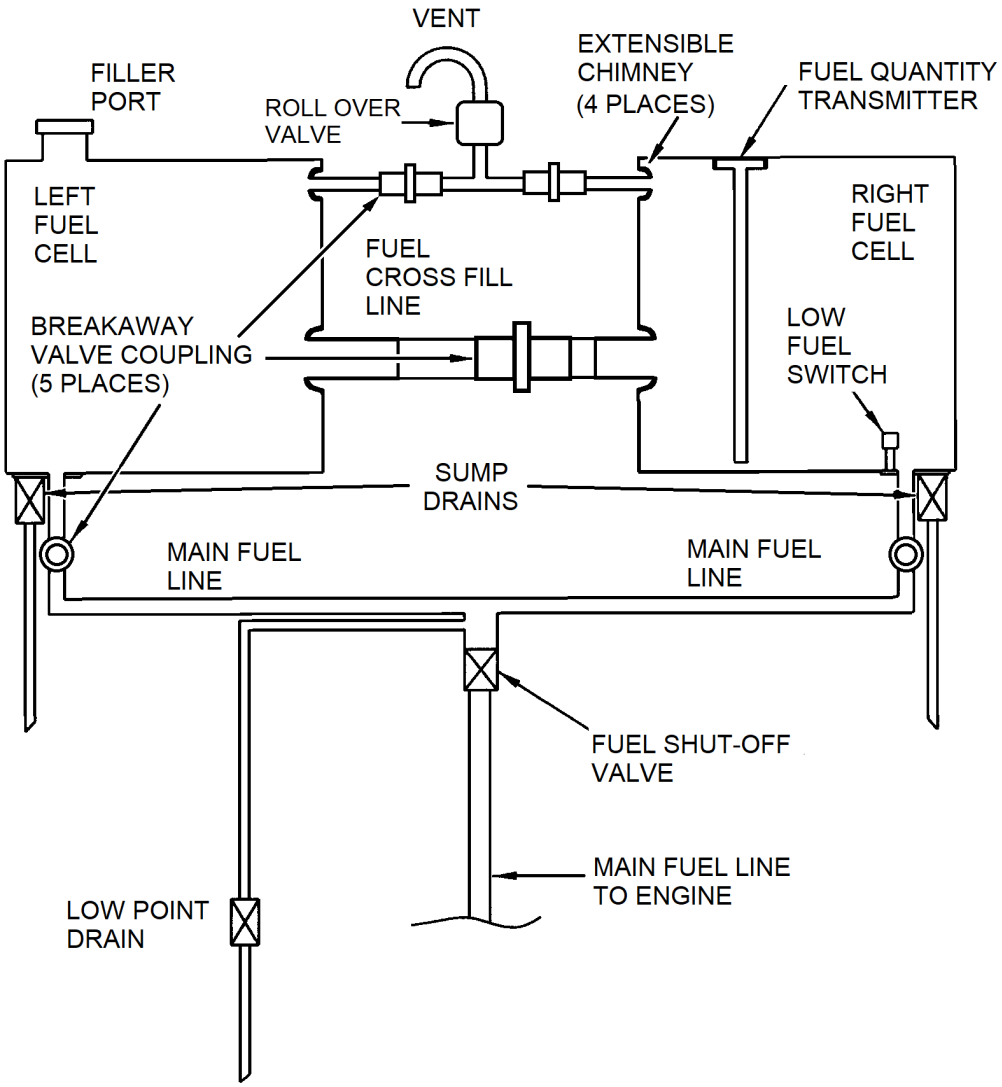
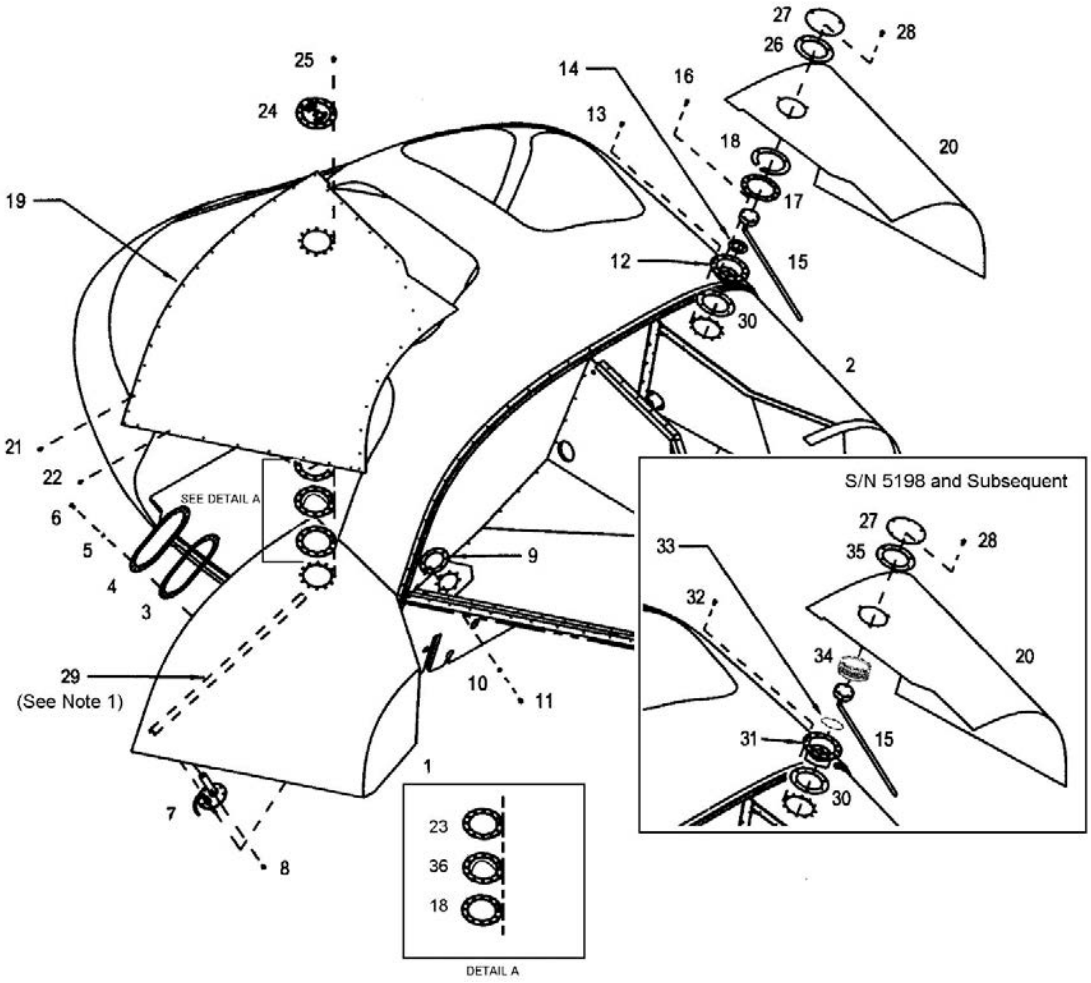


Figure 10-1.1. Simplified Fuel System Schematic Diagram (CRFS)

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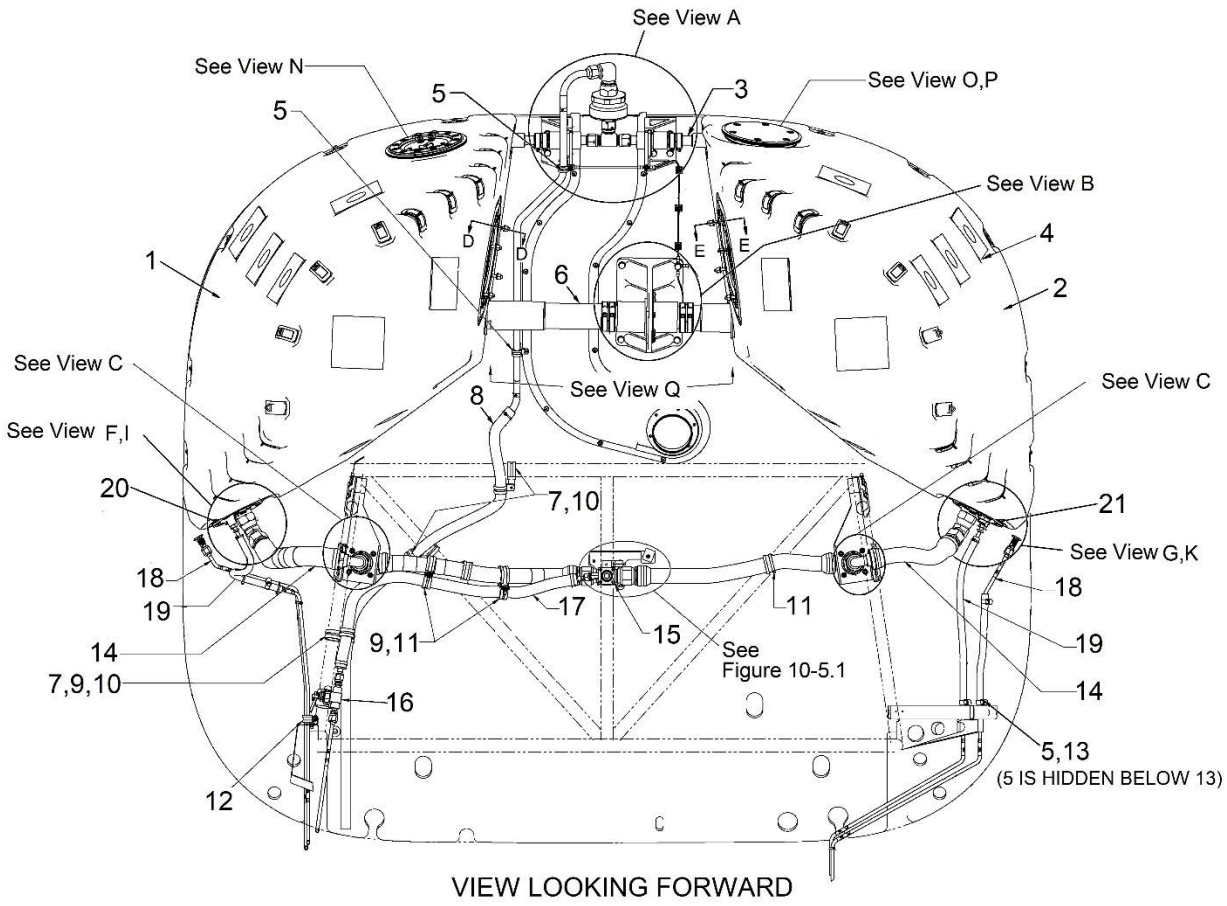


1.	Left Fuel Cell	19.	Left Fuel Cell Cover
2.	Right Fuel Cell	20.	Right Fuel Cell Cover
3.	Gasket	21.	Screw
4.	Oval Flange Plate	22.	Screw
5.	Washer	23.	Gasket
6.	Screw	24.	Fuel Cap Assembly
7.	Sump/Fuel/Flange Fitting Assembly	25.	Screw
8.	Screw	26.	Gasket
9.	Gasket	27.	Cover Plate
10.	Washer	28.	Screw
11.	Bolt	29.	Dip Stick Tube (See Note 1)
12.	Flanged Mount Plate	30.	Gasket
13.	Screw	31.	Flanged Cup Assembly
14.	Gasket	32.	Bolt
15.	Fuel Quantity Probe (Transmitter)	33.	O-Ring
16.	Screw	34.	Spanner Nut
17.	Gasket	35.	Gasket, Conductive
18.	Spacer	36.	Flange

Note 1: S/N 5231 and subsequent and helicopters that have incorporated SIL T-062 are not equipped with Item 29.

Figure 10-2. Standard Fuel Cell Installation

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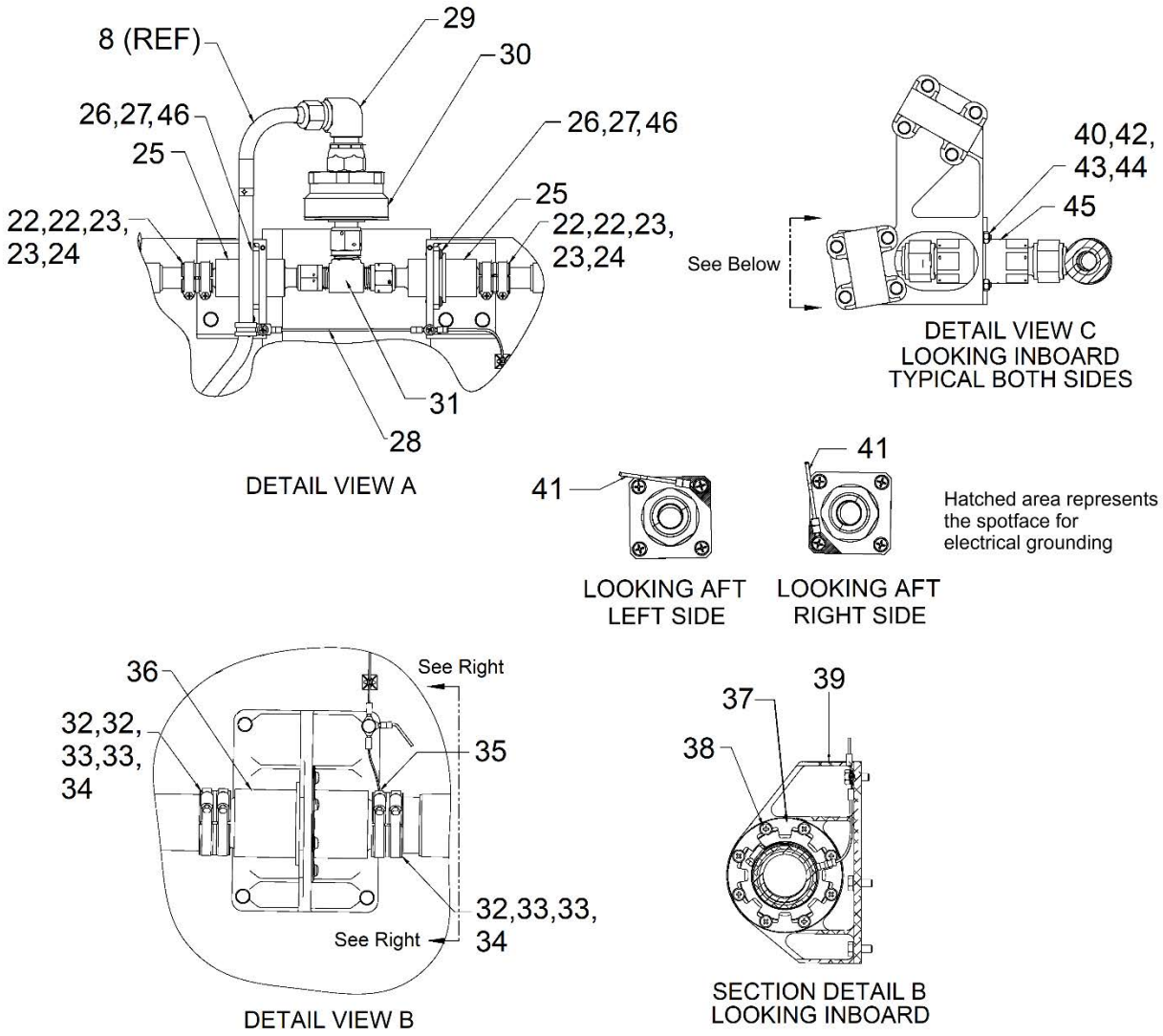


1. Left Fuel Bladder
2. Right Fuel Bladder
3. Overboard Crossover Vent
4. Velcro (hook)
5. Clamp (size 8)
6. Fuel Cross Fill
7. Clamp (size 12)
8. Vent Tube Assembly
9. Clamp (size 14)
10. Clamp (size 16)
11. Clamp (size 18)
12. Clamp
13. Clamp
14. Fuel Line
15. Shutoff Valve Assembly
16. Shutoff Drain Valve
17. Shutoff Valve Drain Line
18. Scupper Drain Line
19. Sump Drain Line
20. Left Flange Plate Assembly
21. Right Flange Plate Assembly

Sheet 1 of 5

Figure 10-2.1. CRFS Fuel Cell Assembly and Installation

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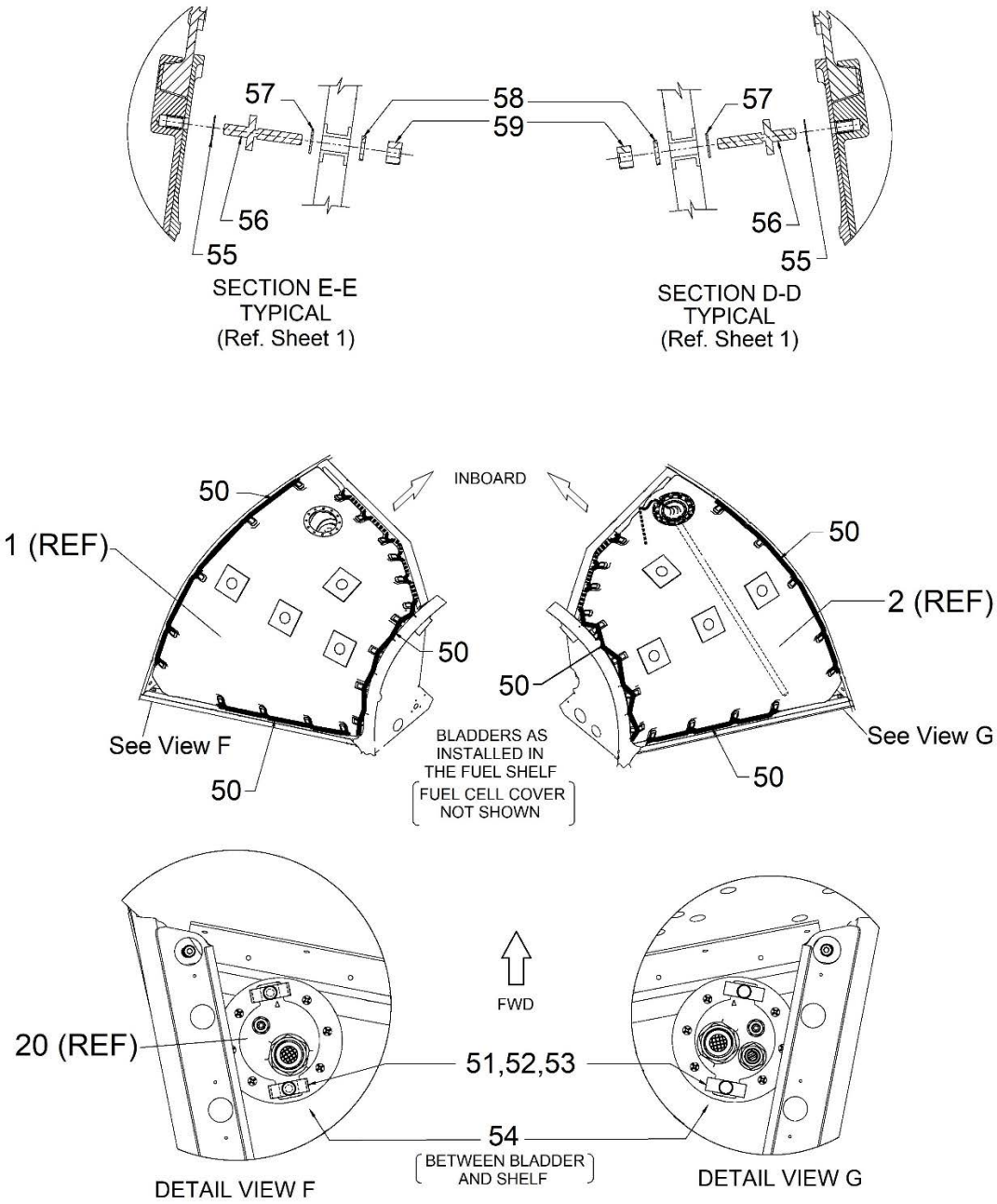


22.	Clamp	35.	Ground Clamp Assembly
23.	Half Clamp	36.	Cross Fill Breakaway Valve Coupling
24.	O-ring	37.	Frangible Ring
25.	Vent Breakaway Valve Coupling	38.	Screw
26.	Screw	39.	Coupling Bracket Assembly
27.	Washer	40.	Screw
28.	Ground Strap	41.	Ground Strap
29.	Fitting	42.	Washer
30.	Roll Over Valve Assembly	43.	Washer
31.	Tee Fitting	44.	Nut
32.	Clamp	45.	Fuel Line Breakaway Valve Coupling
33.	Half Clamp	46.	Lock Washer
34.	O-ring		

Figure 10-2.1. CRFS Fuel Cell Installation and Assembly

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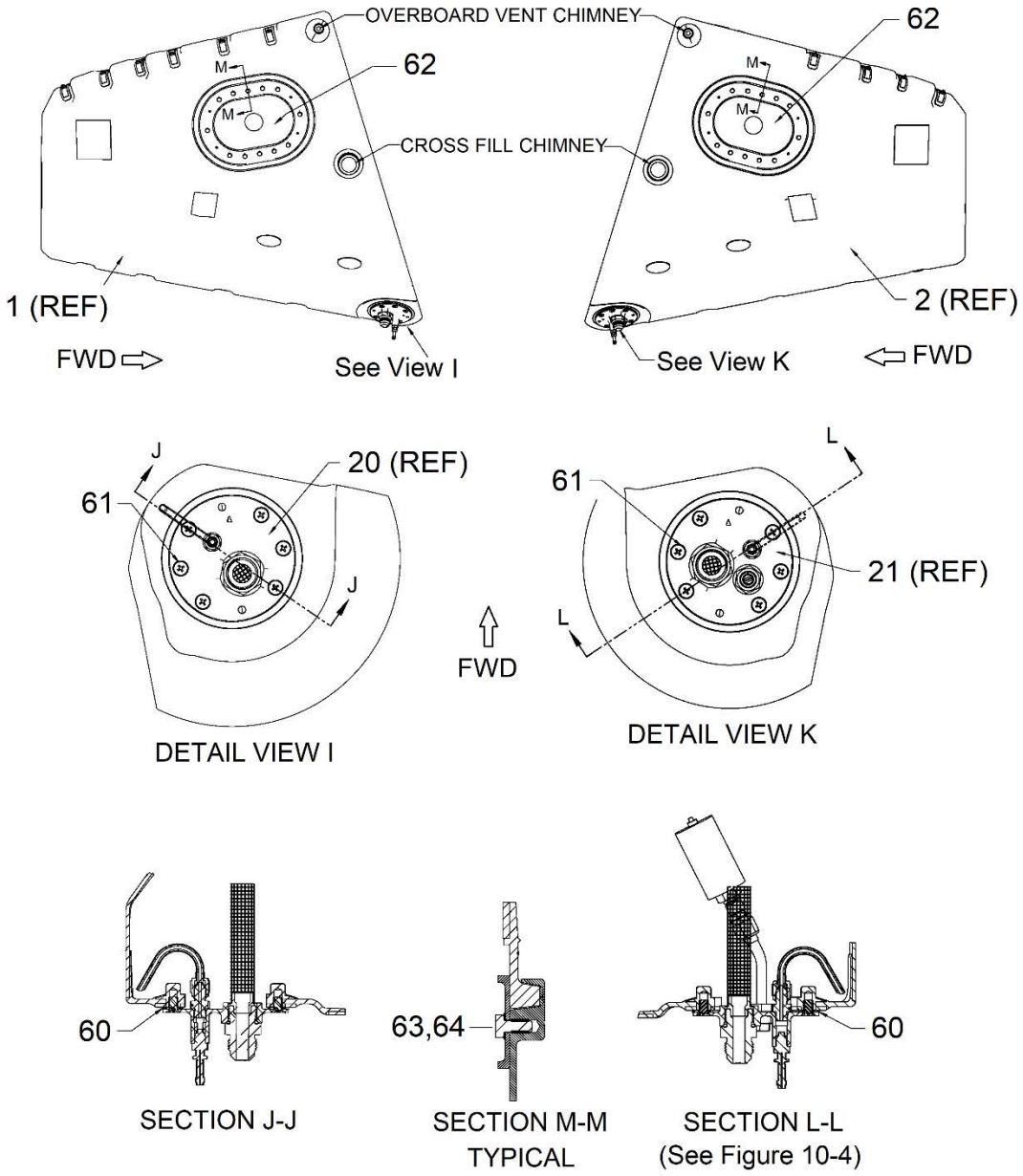


50.	Lacing (Paracord)	55.	Washer
51.	Frangible Tab	56.	Frangible Stud
52.	Bolt	57.	Nylon Washer
53.	Washer	58.	Washer
54.	Flow Diverter	59.	Nut

Figure 10-2.1. CRFS Fuel Cell Installation and Assembly

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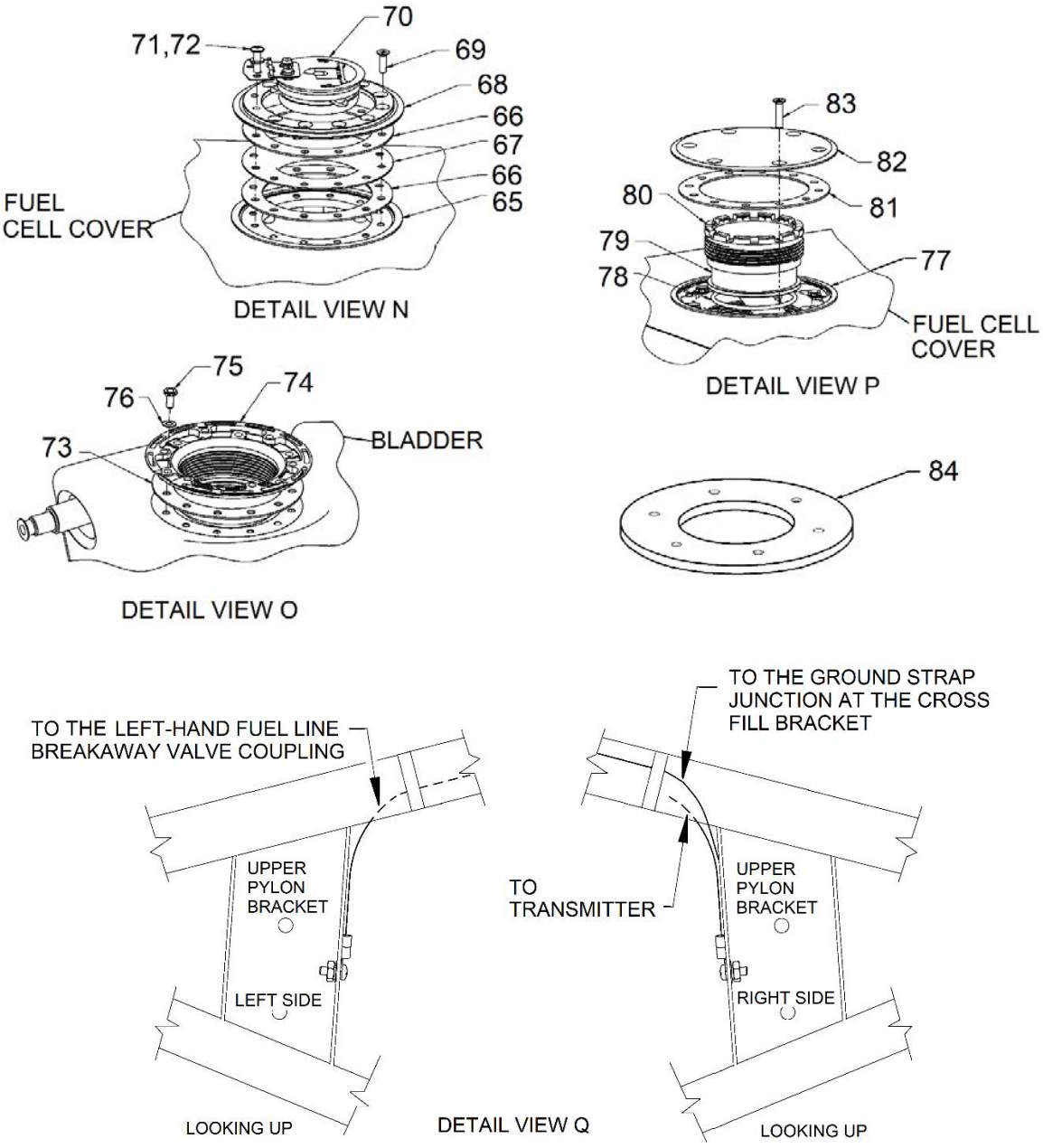


60. Gasket
61. Screw
62. Access Door (Inner and Outer)
63. Bolt
64. Washer

Figure 10-2.1. CRFS Fuel Cell Installation and Assembly

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65.	Gasket	75.	Bolt
66.	Gasket	76.	Washer
67.	Flange	77.	Gasket
68.	Frangible Ring	78.	O-ring
69.	Screw	79.	Fuel Quantity Transmitter
70.	Fuel Cap Assembly	80.	Spanner Nut
71.	Screw	81.	Gasket
72.	Washer	82.	Frangible Cover
73.	Gasket	83.	Screw
74.	Flanged Cup	84.	Tool T-4122100-1

Figure 10-2.1. CRFS Fuel Cell Installation and Assembly

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10-3. Fuel Cells

10-4. Removal – Fuel Cells

NOTE

For removing the standard fuel cell, proceed to paragraph 10-4.1. For removing the Aerazur fuel cell, proceed to paragraph 10-4.2. For removing the CRFS fuel cell, proceed to Para. 10-4.3.

10-4.1 Removal – Fuel Cell, Standard Fuel System (Figures 10-2 and 10-3)

NOTES

When possible, remove the fuel cells when the ambient temperature is at least 70°F/21°C.

Removal procedures are the same for both fuel cells unless noted otherwise.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28).

C. Remove the air deflector from the top of the cabin.

D. Remove the fuel cell cover (para. 8-14).

E. Disconnect the electrical connectors for the fuel quantity probe and the low fuel warning switch from the right-side fuel cell.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

F. Loosen the clamps on the lines and allow the rubber to relax.

NOTE

Fuel cell nipples may be softened by applying a hot, moist cloth to ease removal.

G. Disconnect the fuel crossover line (para. 10-15.1).

H. Disconnect the overboard vent crossover line (para. 10-15.1).

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CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

I. Disconnect the supply line from the fuel cell fitting.

J. Disconnect the sump drain line from the drain valve.

K. Remove the bolts and washers from the plate that secures the fitting assembly to the fuel cell structure.

L. Remove the fuel cell from the fuel cell structure.

M. Once the fuel cell is removed, wipe out any fuel residue and miscellaneous hardware from the cavity of the fuel cell structure.

N. Do not apply oil to the fuel bladder if moving the fuel cell to long term storage. Store removed fuel cells in a bag or box to protect the rubber from UV, ozone, heat, and/or humidity.

10-4.2 Removal – Fuel Cell, Aerazur Fuel Bladder System

NOTES

If practicable, removal of the fuel cells should occur when the ambient temperature is at least 70°F/21°C.

Removal procedures are the same for both fuel cells unless otherwise noted.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28).

C. Remove the air deflector from the top of the cabin.

D. Remove the fuel cell cover (para. 8-14).

E. Disconnect the electrical connectors for the fuel quantity probe and the low fuel warning switch from the right-side fuel cell.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

F. Disconnect the fuel crossover line (para. 10-15.2).

G. Disconnect the overboard vent crossover line (para. 10-15.2).

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CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

H. Disconnect the supply line from the fuel cell fitting.

I. Disconnect the sump drain line from the drain valve.

J. Unlace the fuel cell from the supports.

K. Remove the fuel cell from the fuel cell structure.

10-4.3 Removal – Fuel Cell, CRFS (Figure 10-2.1)

NOTES

If practicable, removal of the fuel cells should occur when the ambient temperature is at least 70°F/21°C.

Removal procedures are the same for both fuel cells unless noted otherwise.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28).

C. Remove the air deflector.

D. Remove the fuel cell cover (para. 8-14).

E. Disconnect the electrical connectors for the fuel quantity transmitter and the low fuel warning switch if removing the right-side fuel bladder (2).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use care when removing components connected to the breakaway valve couplings.

F. Disconnect the overboard crossover vent line (3).

1) Remove the hose clamps (22), half clamps (23), and O-ring (24) between the breakaway valve coupling (25) and the vent chimney of the bladder (1 or 2) to be removed.

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G. Disconnect the cross fill fuel line (6):

1) Remove the hose clamps (32), half clamps (33), and O-ring (34) between the breakaway valve coupling (36) and the cross fill chimney of the bladder (1 or 2) to be removed.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

H. Disconnect the fuel supply line (14) from the flange plate fitting (20 or 21).

I. Disconnect the sump drain line (19) from the sump drain valve (12, Figure 10-4).

J. Disconnect the fuel bladder from the fuel cell structure.

1) Remove the lacing cords (50) (3 cords) that attach the bladder to the structure.

CAUTION

Use caution when removing frangible hardware.

2) Remove the frangible tabs (51) from the flange plate assembly (20 or 21) (2 places) by removing the bolts (52) and washers (53).

CAUTION

Support the fuel cell when removing the frangible stud hardware.

3) Remove the nuts (59) and washers (58) that secure the frangible studs (56) (4 places).

K. Remove the fuel bladder (1 or 2) from the fuel cell structure.

L. Once the fuel bladder is removed, wipe out any fuel residue and miscellaneous hardware from the cavity of the fuel cell structure.

M. Refer to the manufacturer's publications for CRFS fuel bladder storage requirements. (Refer to Table 2-2.)

10-5. Inspection – Fuel Cells

A. Inspect the fuel cells for loose seams, cuts, abrasions, scuffed surfaces, tears, blisters, and for any area that appears to have become soaked with fuel.

1) Before removing a fuel cell, isolate areas of possible leaks by tracing the wetness or staining as far as visibly possible.

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B. Inspect fittings, flanges, access doors, and inserts for damage and security.

C. Check gaskets for tightness and ensure no gasket cement has been used.

D. Check all hose clamped connections for tightness, damage, and leaks.

E. CRFS: Inspect CRFS components I/A/W the manufacturer's instructions.

1) If fuel cell cover is removed, check lacing attachments and Velcro patches for damage and security.

10-6. Repair – Fuel Cells

A. Repair the fuel cells I/A/W the manufacturer's instructions.

B. Replace fittings that are damaged beyond repair.

C. Repair inserts I/A/W the manufacturer's instructions.

10-7. Replacement – Fuel Cells

NOTE

For replacing the standard fuel cell, proceed to paragraph 10-7.1. For replacing the Aerazur fuel cell, proceed to paragraph 10-7.2. For replacing the CRFS fuel cell, proceed to Para. 10-7.3.

10-7.1 Replacement – Fuel Cell, Standard Fuel System

NOTES

Refer to the *TH-28/480 Series Illustrated Parts Catalog* for authorized bladder part numbers for the standard fuel system.

Replacement procedures are the same for both fuel cells unless noted. Replace all used packings/O-rings.

Cover all open ports and lines to prevent contamination of the fuel system.

The foam assembly is installed in the replacement fuel cells.

A. Prepare the replacement fuel cell (1 or 2, Figure 10-2) as follows:

1) If installing a new foam assembly, refer to SIL T-054, latest revision. Prior to installing the foam, inspect the bladder cavity for debris.

2) Ensure that the captive nut plate threads are free of debris or sealant and ensure that the sealing surfaces are clean and dry.

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3) Install oval flange plate (4):

a) Install a new gasket (3). If needed, install 2 to 4 studs, hand tight, into the flange ring to hold the gasket in place on the fuel cell. (The studs are made by removing the heads from appropriate length AN4-XXA bolts and deburring the cut shank.)

b) Install the oval flange plate (4) (raised surface forward) with bolts (6) and washers (5). Torque (25-30 in-lb/2.8-3.4 Nm) in a crisscross torque pattern (for 24 bolts), making three full rounds to ensure proper gasket seating. Remove the studs as required when installing the bolts and washers.

c) Ensure that there is no movement of the washers. If there is movement, back out the bolt and recheck the threads for debris or sealant. Re-install and torque.

B. Remove the screws (8) that secure the fuel fitting assembly (7) to the fuel cell (1 or 2).

C. Partially separate the fuel fitting assembly from the fuel cell to access the syphon tube assembly nut coupling.

D. Loosen the nut coupling, then pivot the syphon tube toward the fuel strainer.

E. Remove the fuel fitting assembly from the fuel cell. The low fuel warning switch will be mounted on the fuel fitting assembly for the right fuel cell.

F. Position the fuel fitting assembly onto the replacement fuel cell such that the sump drain valve it is oriented toward the low corner of the fuel cell. Pivot the end of the syphon tube to the low corner. Torque the nut coupling (50-65 in-lb/5.6-7.3 Nm).

G. Install the screws to secure the fuel fitting assembly to the fuel cell and torque to 25-30 in-lb/2.8-3.4 Nm.

H. Remove the hardware securing the fuel quantity probe mounting flange (12 or 31) to the fuel cell and remove the fuel quantity probe mounting flange and probe. (The fuel quantity probe remains installed on the mounting flange.) Note the position of the fuel quantity probe.

I. Install new gasket (30) and install the mounting flange (12 or 31) on the replacement fuel cell. Torque the hardware to 25-30 in-lbs/2.8-3.4 Nm.

J. Allow several hours (preferably overnight) after installation of the oval flange plate (4), fuel fitting assembly and mounting flange components and retorque the hardware.

K. Safety wire as required.

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10-7.2 Replacement – Fuel Cell, Aerazur Fuel Bladder System

NOTES

Replacement procedures are the same for both fuel cells unless noted. Replace all used packings/O-rings.

Cover all open ports and lines to prevent contamination of the fuel system.

A. Remove the drain valve from the fuel cell. Clean the threads on the drain valve. Coat the threads with sealant (Permatex #1C) and install the valve into the replacement fuel cell.

B. Remove the supply line fitting from the fuel cell. Replace the packing and install the fitting into the replacement fuel cell.

C. Remove the access plates (zippers) from the fuel cell.

D. Remove the strainer assembly installed in the bottom of the fuel cell over the supply line outlet and install in the replacement fuel cell.

E. Remove the fuel quantity probe and the low fuel warning switch from the right fuel cell and install into the replacement fuel cell (para. 10-48.3 and 10-51.3).

NOTE

Ensure that the lacing cord used to secure the internal baffles in the bladder does not interfere with the access plates (zipper) during installation of the plates (zipper). The plates (zipper) will not seal if this occurs.

F. Reinstall the access plates (zippers) and torque the installation hardware to 40-50 in-lbs/4.5-5.7 Nm.

10-7.3 Replacement – Fuel Cell, CRFS

NOTES

Only replace a CRFS fuel bladder with another CRFS fuel bladder.

Refer to the manufacturer's instructions for preparing a fuel blader if it was removed from long term storage. (Refer to Table 2-2.)

The following procedures are the instructions for transferring the sump, fuel filler port, and fuel quantity transmitter assemblies between fuel bladders.

Replacement procedures are the same for both fuel cells unless noted. Replace all used packings/O-rings.

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NOTES

Cover all open ports and lines to prevent contamination of the fuel system.

Refer to Figure 10-2.1 for numbered items.

A. If applicable, remove the fuel quantity transmitter (79) and flanged cup (74) from the right-side bladder (2):

1) Remove the transmitter (79) I/A/W para. 10-48.4.

2) Remove bolts (75) and washers (76) (6 places) that secure the flanged cup (74) to the fuel bladder.

B. Remove the access door (62) from the bladder (1 or 2) being replaced:

1) Remove nylon washers (57), frangible studs (56), and washers (55) (4 places) from the access door (62).

2) Remove bolts (63) and washers (64) (12 places) that secure the access door to the bladder.

C. Remove the flange plate assembly (20 or 21) from bladder (1 or 2) being replaced:

1) Remove screws (61) (6 places) that secure the flange plate assembly (20 or 21) to the bladder.

NOTE

To facilitate access to the syphon B-nut, it may be helpful to remove the fuel strainer assembly. Refer to Figure 10-4 for numbered components in steps 2 and 3.

2) Access the syphon (5) through the bladder side opening and loosen the B-nut coupling, then pivot the syphon tube toward the fuel strainer assembly (15).

3) Remove the flange plate assembly (2) from the fuel cell. The low fuel switch (10) will be mounted on the flange plate assembly for the right fuel cell.

D. Prepare the replacement fuel bladder (1 or 2) as follows:

1) Ensure that any captive nut plate threads are free of debris and ensure that the sealing surfaces are clean and dry.

2) Ensure that the fuel bladder cavity is free of debris.

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E. Install the flange plate assembly (20 or 21) in the replacement fuel bladder (1 or 2):

1) Install gasket (60) between bladder and flange plate assembly (20 or 21).

NOTE

Refer to Figure 10-4 for numbered items in steps 2 through 4.

2) Insert flange plate assembly (2) into the bladder opening so that the sump drain valve (12) is turned toward the low corner of the fuel cell and the arrow points forward. The syphon tube (5) should be loose to allow it to pivot within the bladder cavity and ease insertion of the assembly into the bladder.

3) Align the syphon tube (5) to face the lower corner of the bladder and secure the syphon in position:

a) Verify torque on the syphon tube sump fitting (4) (40-65 in-lb/4.5-7.3 Nm).

b) Grip the flanged plate assembly (2) with a 1-3/8 inch wrench.

c) Access the syphon B-nut through the bladder opening and torque (50-65 in-lb/5.6-7.3 Nm).

4) Install new O-ring (14) and the fuel strainer assembly (15), if required (300-500 in-lb/33.9-56.5 Nm).

5) Install the screws (61) (6 places) to secure the flange plate assembly (20 or 21) to the fuel bladder. Torque to 25-30 in-lb/2.8-3.4 Nm.

F. If required, install the fuel quantity transmitter flanged cup (74) in the replacement fuel bladder (2).

1) Install new gasket (73) on bladder ring.

2) Install flanged cup (74) by aligning the bolt pattern and the “FWD” mark.

3) Install bolts (75) and washers (76) (6 places). Torque (25-30 in-lb/2.8-3.4 Nm).

G. Install access doors (62):

1) Install inner and outer doors with bolts (63) and washers (64) (12 places). Torque (25-30 in-lb/2.8-3.4 Nm).

2) Install washers (55) and frangible studs (56) (4 places). Torque (20-25 in-lb/2.3-2.8 Nm).

H. Cover all open ports to prevent contamination of the bladder.

I. Allow several hours (preferably overnight) after installation of access door, flange plate assembly, and fuel quantity transmitter cup (if applicable) and retorque the hardware.

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10-8. Installation – Fuel Cells

NOTES

Installation procedures are the same for both fuel cells unless otherwise noted.

Replace all used packings/O-rings.

For installing the standard fuel cell, proceed to paragraph 10-8.1. For installing the Aerazur fuel cell, proceed to paragraph 10-8.2. For installing the CRFS fuel cell, proceed to Para. 10-8.3.

10-8.1 Installation – Fuel Cell, Standard Fuel System

A. Ensure sealing surfaces are dry.

B. Apply a light coat of corn starch (or equivalent) to the inside surface of the fuel cell support structure to allow the fuel cell to be adjusted for final fit.

C. Install the fuel cell into the support structure.

D. Position the gasket between the fitting assembly the support structure. Install the bolts and washers that secure the fitting assembly to the support structure and torque to 25-30 in-lbs/2.8-3.4 Nm. Lockwire bolts with 0.020" lockwire.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

E. Connect the sump drain line to the drain valve.

F. Connect the supply line to the fuel cell fitting.

NOTE

Prior to connecting the overboard vent crossover line (3, Figure 10-3) and crossover line (9), inspect the nipples for restrictions and damage.

G. Connect the overboard vent crossover line (para. 10-18).

I. Connect the crossover line (para. 10-18).

J. Connect the electrical connectors for the fuel quantity probe and the low fuel warning switch in the right side fuel cell.

K. Allow several hours (preferably overnight) after the fuel cell has been completely installed and retorque the hardware.

L. Safety wire as required.

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M. Install the fuel cell covers (para. 8-17).

N. Install a filler port gasket between the fuel cell the fuel cell cover and one between the fuel cell cover and the filler port. Install the hardware and torque to 25-30 in-lbs/2.8-3.4 Nm.

O. Install the air deflector on the top of the cabin.

P. Install the upper plenum/air inlet (para. 13-31).

Q. Service the fuel cells (para. 4-4) and check for leaks.

R Check for proper operation of the fuel quantity system (para. 7-85) and the lower fuel warning system (para. 10-41). Install the cover for the fuel quantity probe after determining that the system is operating properly.

S Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-8.2 Installation – Fuel Cell, Aerazur Fuel Bladder System

NOTES

Installation procedures are the same for both fuel cells unless noted.

Replace all used packings/O-rings.

A. Apply a light coat of corn starch (or equivalent) to the inside surface of the fuel cell support structure to allow the fuel cell to be adjusted for final fit.

B. Install the fuel cell into the support structure.

C. Lace the top edge of the fuel cell to the support mounts.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

D. Connect the sump drain line to the drain valve.

E. Connect the supply line to the fuel cell fitting.

F. Connect the overboard vent crossover line (para. 10-18).

G. Connect the crossover line (para. 10-18).

H. Connect the electrical connectors for the fuel quantity probe and the low fuel warning switch in the right fuel cell.

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I. Install the fuel cell covers (para. 8-17).

J. Install a filler port gasket between the fuel cell the fuel cell cover and one between the fuel cell cover and the filler port. Install the hardware and torque to 40-50 in-lb/4.5-5.7 Nm.

K. Install the air deflector on the top of the cabin.

L. Install the upper plenum/air inlet (para. 13-31).

M. Service the fuel cells (para. 4-4) and check for leaks.

N. Check for proper operation of the fuel quantity system (para. 7-85) and the low fuel warning system (para. 10-41). If applicable, install the cover for the fuel quantity probe after determining that the fuel quantity system is operating properly.

O. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-8.3 Installation – CRFS Fuel Cell

NOTES

Installation procedures are the same for both fuel cells unless noted. Refer to Figure 10-2.1 for numbered items.

The bladders are previously assembled with the fuel transmitter flange cup and flange plate assemblies installed. If not assembled with those assemblies, refer to the applicable replacement step in Para. 10-7.3 to install the component.

Replace all used packings/O-rings.

A. Ensure sealing surfaces are dry.

B. Set the fuel bladder (1 or 2) into the support structure. Align the bladder with the access door frangible stud openings, cross fill opening, vent opening, hook and loop patches, and flanged plate assembly opening. Ensure an even gap around the vent and cross fill chimneys and the flange plate assembly fuel shelf opening.

C. If not present, install the flow diverter (54) for the interface between the flange plate assembly (20 or 21) and the surface of the fuel shelf compartment.

D. Attach the access door frangible studs (56) to the inboard fuel shelf wall:

1) Install nylon washer (57) over frangible stud (56) and insert studs through fuel shelf wall (4 places).

2) Install washers (58) and nuts (59) on the frangible studs (56). Do not fully tighten at this step.

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NOTE

Ensure a gap around all sides of the frangible tab and structure.

E. Install frangible tabs (51) with bolts (52), and washers (53) (2 places). Do not fully tighten at this step.

F. Right-side fuel bladder (2): Install fuel quantity transmitter (79) (para. 10-51.4, steps A through E.

G. Left-side fuel bladder (1): Cover the fuel filler port to help seal the bladder for the next step if a cover is not already installed.

H. Install lacing cords (50):

1) Install lacing cords (50). The cords may be installed in any order.

2) Pull lacing cord (50) tight to remove slack.

3) Tie off the ends.

I. Fully tighten hardware from steps D and E.

1) Access door frangible door stud nuts (59): Torque 7 in-lb/0.8 Nm.

2) Frangible tab bolts (52): Torque 25-30 in-lb/2.8-3.4 Nm.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

CAUTION

Use caution when installing components connected to the breakaway valve couplings.

J. Connect the sump drain line (19) to the sump drain valve (12, Figure 10-4).

NOTE

Hold the elbow by the flats to assist installation of the fitting to the flange plate assembly.

K. Connect the cross fill breakaway valve coupling (36) (para. 10-18.5, A).

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L. Connect the fuel supply line (14) to the flange plate assembly (20 or 21).

NOTE

Inspect the chimneys for restrictions and damage before connecting the overboard vent crossover and fuel cross fill.

M. Connect the vent breakaway valve couplings (25) (para. 10-18.5, B).

N. Connect the electrical connectors for the fuel quantity transmitter and the low fuel warning switch in the right-side fuel bladder (2).

O. Allow several hours (preferably overnight) after the fuel cell has been completely installed and retorque the hardware.

P. Install the fuel cell covers (para. 8-17).

Q. Install the fuel cap assembly (70):

1) Remove the temporary fuel port cover.

NOTE

Check that gasket (65) is present. It may be present either adhered to the fuel cell cover or to the underside of the frangible ring (68).

NOTE

To facilitate alignment and installation of the gaskets, flange, and frangible cover, a light coat of spray adhesive may be used as a temporary aid to maintain alignment during installation. Appy spray adhesive (Super 77 or equivalent) to one side of the gaskets (66) and (65, if required). Lightly tack on gasket (66) to the bottom of the flange (67) and to the bottom of the frangible ring (68), respectively. If required, lightly tack on gasket (65) to the bottom of the frangible ring (68).

2) Install gasket (65), if required.

3) Aligning the fastener openings, assemble gasket (66), flange (67), gasket (66), and the frangible ring (68) onto the bladder. Ensure the frangible ring (68) is orientated with the provisions for the fuel cap attachment on the forward side.

NOTE

To facilitate installation, use one or two longer fasteners to hold the assembly together during installation of the screws.

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4) Install screws (69) (10 places) and torque (25-30 in-lb/2.8-3.4 Nm).

5) Install the fuel cap assembly (70) with screws (71) and washers (72) (2 places) and torque (25-30 in-lb/2.8-3.4 Nm).

6) Remove the temporary fasteners as required when installing the screws.

R. Install the air deflector on the top of the cabin.

S. Install the upper plenum/air inlet (para. 13-31).

T. Service the fuel cells (para. 4-4) and check for leaks.

NOTE

Before performing either a fuel quantity system calibration or a low fuel warning test procedure, it is necessary to completely fill the tanks to fully expand the bladder within the fuel cell structure if the bladders are replacements and have not been previously filled with fuel.

U. Check for proper operation of the fuel quantity system (para. 7-85) and the low fuel warning system (para. 10-41).

NOTE

Check that gasket (77) is present. It may either be adhered to the fuel cell cover or to the underside of the frangible cover (82).

NOTE

Apply a light coat of spray adhesive (Super 77 or equivalent) to one side of gasket(s) (81) and (77, if required). Lightly tack on the sprayed side of the gasket(s) to the bottom of the frangible cover (82) to aid installation.

V. Install gasket (77), if required.

W. Install gasket (81) and the frangible cover (82) for the fuel quantity transmitter after determining that the system is operating properly. Torque screws (83) to 25-30 in-lb/2.8-3.4 Nm.

X. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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10-9. Lines and Hoses

NOTE

Refer to Figure 10-2.1 or Figure 10-3, as applicable.

NOTE

CRFS: Refer to para. 10-18.1 for breakaway valve coupling procedures. Refer to para. 10-18.6 for roll over valve assembly procedures.

10-10. Removal – Lines and Hoses

NOTE

The following procedures apply to the fuel supply, sump drain, scupper drain, and the vent lines. Ensure the lines are identified and the installation routing is understood before removal.

NOTE

CRFS: It is not necessary to remove the fuel line breakaway valve coupling when removing the fuel supply line.

NOTE

Defuel the aircraft only if removing the fuel supply lines or the sump drain line from the shutoff valve.

A. Defuel the aircraft (para. 4-5).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

CAUTION

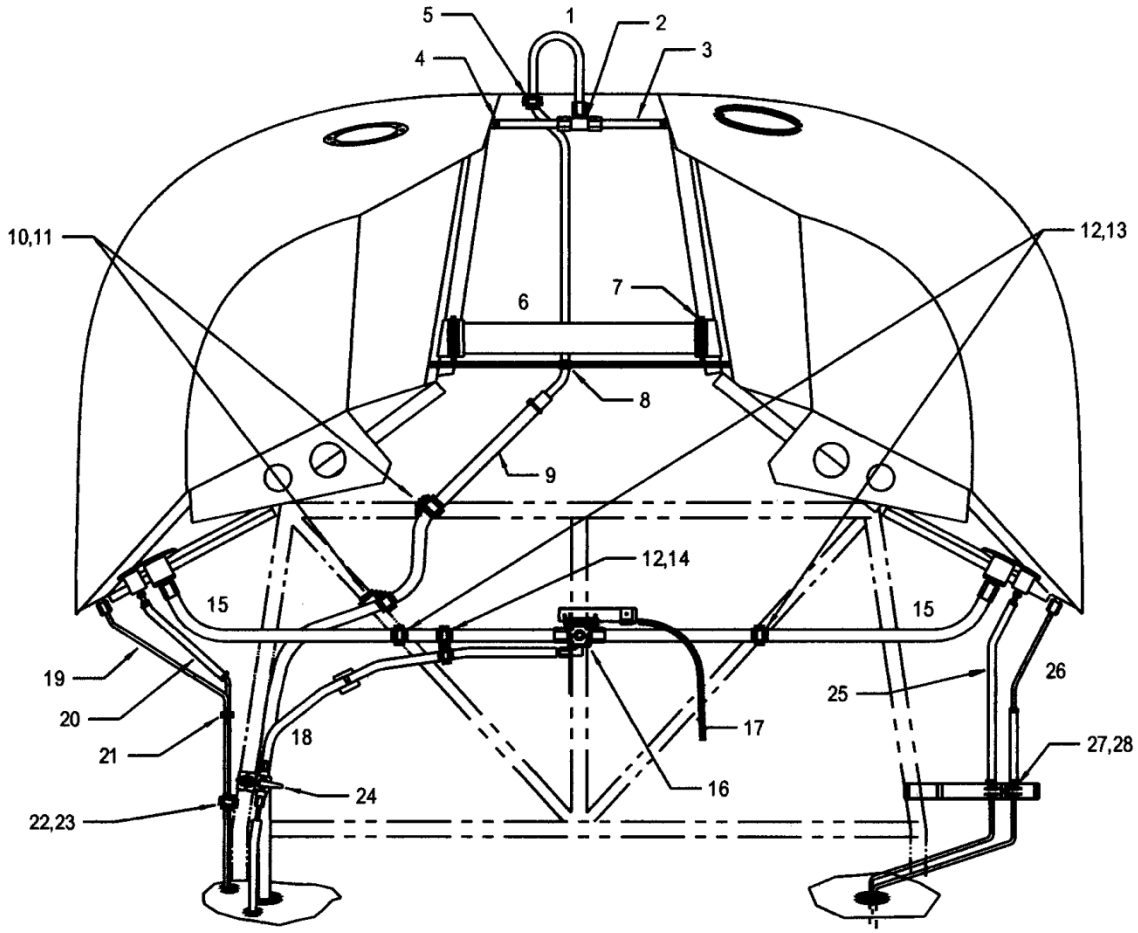
CRFS: When disconnecting fuel lines from the breakaway valve coupling, hold the valve half by the flats to prevent separation of the coupling.

B. Disconnect the line or hose from the fittings.

C. If installed, remove the support clamps and remove the line or hose.

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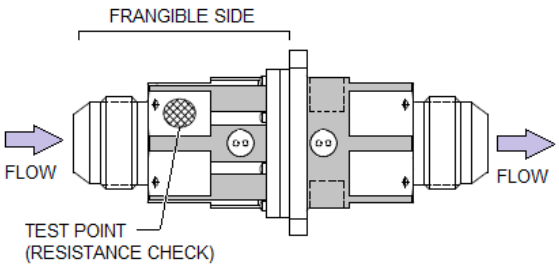
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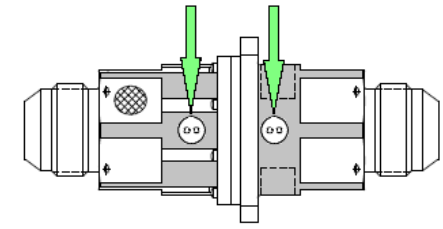


1.	Vent Line	15.	Fuel Line
2.	Tee Fitting	16.	Shutoff Valve Assembly
3.	Crossover Vent Line	17.	Fuel Shutoff Cable
4.	Clamp	18.	Shutoff Valve Drain Line
5.	Clamp	19.	Scupper Drain Line
6.	Fuel Crossover Line	20.	Sump Drain Line
7.	Clamp	21.	Clamp
8.	Grommet	22.	Clamp
9.	Vent Line	23.	Clamp
10.	Clamp	24.	Shutoff Drain Valve
11.	Clamp	25.	Sump Drain Line
12.	Clamp	26.	Scupper Drain Line
13.	Clamp	27.	Clamp
14.	Clamp	28.	Clamp

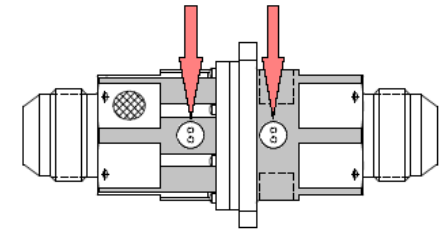
Figure 10-3. Fuel Lines and Crossovers - Standard System

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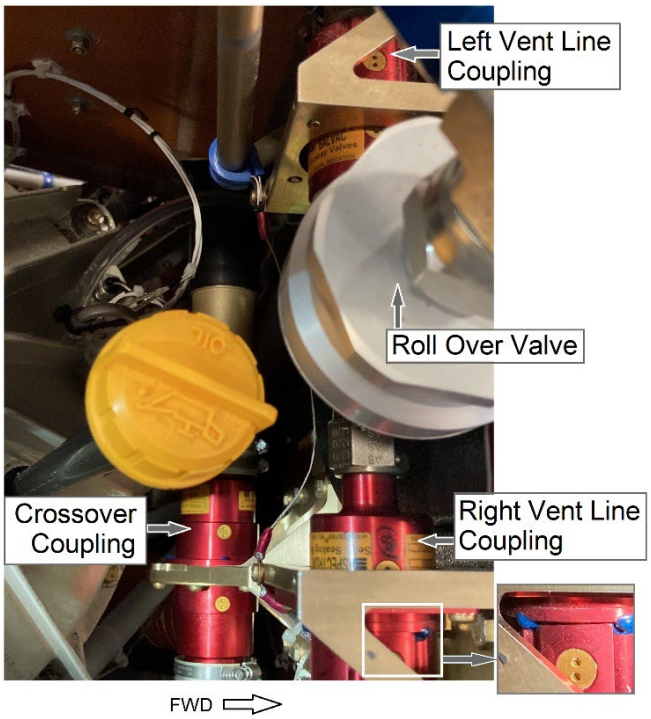


DOTS PARALLEL - VALVES ARE OPEN



DOTS PERPENDICULAR - VALVES ARE CLOSED

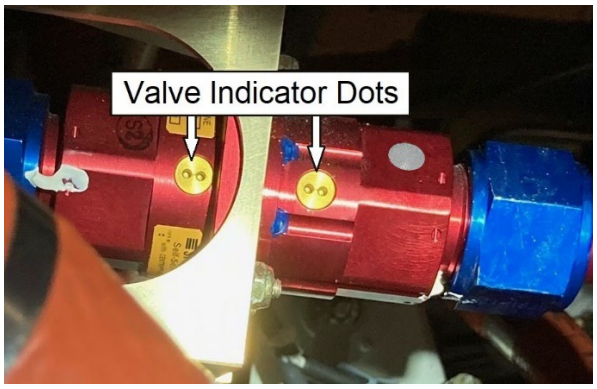
The fuel line breakaway coupling is depicted in the illustrations above.



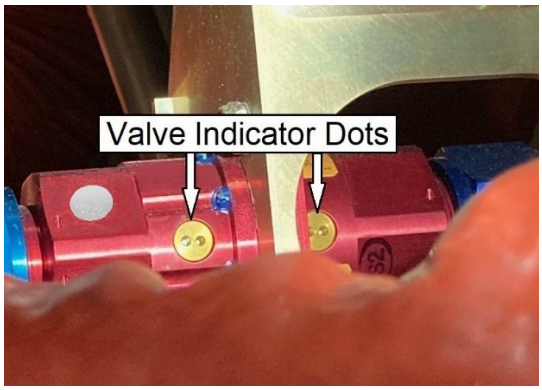
Left and right vent line couplings, crossover coupling, and roll over valve as viewed from the top of the fuselage.

Inset photo in the lower right is a close-up view of the valve indicator dots hidden from view by a bracket.

(The forward scoop and upper plenum are removed for clarity.



Left-side fuel line breakaway coupling as viewed from the left-side engine access panel.



Right-side fuel line breakaway coupling as viewed from the right-side engine access panel.

Figure 10-3.1. CRFS Breakaway Valve Couplings and Roll Over Valve

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10-11. Inspection – Lines and Hoses

A. Inspect the hoses for damage and evidence of leakage.

B. Inspect the lines for bends, cracks, corrosion, nicks, and scratches.

10-12. Repair – Lines and Hoses

A. Replace hoses that leak from the coupling or have the fire shield covering worn through.

B. Replace lines that are kinked, cracked, or have bends that cannot be repaired I/A/W AC 43.13-1B.

10-13. Installation – Lines and Hoses

NOTES

The sump drain, scupper drain, and vent lines may be slightly hand formed to aid installation. Do not kink the lines.

The fuel cell vent line on TH-28 Serial Number 3007 and subsequent and 480 Serial Number 5013 and subsequent are manufactured from 0.5 inch/12.7 mm line. Do not attempt to hand form the vent line.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

CAUTION

CRFS: When installing the fuel lines to the breakaway valve couplings, hold the valve half by the flats to prevent separation of the coupling.

A. Install the line or hose and torque the B-nuts.

1) CRFS: Fuel line (to breakaway valve coupling (45)) torque: 650 in-lb/73.4 Nm.

2) CRFS: Vent tube assembly (to 90° fitting (29)) torque: 230-260 in-lb/26.0-29.4 Nm.

B. Install the support clamps.

C. If the aircraft was defueled, service the aircraft (para. 4-4) and check for leaks.

D. If the aircraft was defueled, bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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10-14. Crossovers

NOTE

The CRFS fuel cell crossovers (cross fill and vent chimneys) are integrated into the bladder design and are not removeable. Proceed to para. 10-18.1 for removal, inspection, repair, and installation procedures for the fuel, cross fill, and vent breakaway valve couplings.

10-15. Removal – Crossovers

NOTE

The crossovers include both the fuel crossover and the overboard vent crossover.

10-15.1 Removal – Crossovers, Standard Fuel System (Figure 10-3)

NOTE

Complete defueling is not required for removal of the overboard vent crossover.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

C. If removing the overboard vent crossover, disconnect the vent line from the tee in the crossover.

D. Remove the retaining clamps securing the crossover into the fuel cells.

E. Slightly twist the crossover and remove both ends from the fuel cells.

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10-15.2 Removal – Crossovers, Aerazur Fuel Bladder System

NOTE

Complete defueling is not required for removal of the overboard vent crossover.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

C. If removing the overboard vent crossover, disconnect the vent line from the tee in the crossover.

D. Remove the retaining clamps securing the split clamps at both ends of the crossover.

E. Remove the split clamps from the fittings.

F. Remove the clamp securing the crossover to the transmission standoff bracket or the cable tie securing the crossover to the bracket mounted on the backwall.

G. Remove the crossover from the fittings and the packing on each end of the crossover.

10-16. Inspection – Crossovers

A. Inspect the crossovers for damage and evidence of leakage.

B. Inspect the fittings for damage and security.

10-17. Repair – Crossovers

A. Repair the standard fuel system crossovers I/A/W AC 43.13-1B. Replace crossover if damaged beyond repair.

B. Repair the Aerazur fuel bladder system crossovers I/A/W the manufacturer's instructions.

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10-18. Installation – Crossovers

A. Standard Fuel System

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

NOTE

Use a lubricant (ACF-50, or equivalent) to aid installation of the crossover if required.

CAUTION

When installing clamps (4 and 7, Figure 10-3), do not over torque. Allow the rubber about an hour to relax, then retorque (18 in-lb/2 Nm). Over torquing will result in damage and leaks.

NOTE

Prior to connecting the overboard vent crossover line and crossover line, inspect the fuel cell nipples for restrictions and damage.

(1) Insert the crossover into the fuel cell fittings approximately 1.5 inch/38 mm. If installing the overboard vent, orientate the tee up.

(2) Install the retaining clamps onto the fuel cell fittings (inboard of the crossover bead) and tighten (torque 18 in-lb/2 Nm).

(3) Connect the vent line if installing the overboard vent crossover.

(4) Service the aircraft (para. 4-4) and check for leaks.

(5) Install the upper plenum/air inlet (para. 13-31).

(6) If the aircraft was defueled, bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

B. Aerazur Fuel Bladder System

(1) Install the packing on one end of the crossover and install the crossover on one of the fittings (orientate the tee in the vent crossover up).

(2) Install the split clamps onto the flange of the fittings and secure with the retaining clamp.

(3) Install the opposite end using the same procedures.

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(4) Install the clamp that secures the crossover to the transmission standoff bracket or a cable tie to secure the crossover to the bracket on the backwall.

(5) Connect the vent line if installing the overboard vent crossover.

(6) Service the aircraft (para. 4-4) and check for leaks.

(7) Install the upper plenum/air inlet (para. 13-31).

(8) If the aircraft was defueled, bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-18.1 CRFS Breakaway Valve Coupling

NOTE

There are five breakaway valve couplings in the CRFS installation. Of the five couplings, there are three configurations – two overboard vent couplings, one cross fill coupling, and two fuel line couplings. Refer to para. 10-18.2, C, for the vent couplings. Refer to para. 10-18.2, D, for the cross fill coupling. Refer to para. 10-18.2, E, for the fuel line couplings.

NOTE

Refer to Figure 10-2.1 for numbered items.

10-18.2 Removal – CRFS Breakaway Valve Coupling

NOTE

Complete defueling is not required for removal of the vent breakaway valve coupling.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28) and air deflector if removing the fuel cross fill or a vent breakaway valve coupling.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

CAUTION

Use care when handling the breakaway valve couplings.

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C. Overboard vent breakaway valve coupling (25) removal:

NOTE

Removal procedures are the same for both breakaway couplings unless noted.

1) If removing the left-side coupling, disconnect the vent tube (8) from the 90° fitting (29) connected to the roll over valve assembly (30).

2) Remove the hose clamps (22), half clamps (23), and O-ring (24) between the coupling (25) and the bladder chimney.

3) Disconnect the coupling (25) from the tee fitting (31).

4) Remove screws (26), lock washer (46) (1 place), and washers (27) (4 places) that secure the coupling (25) to the bracket.

5) Slide the coupling (25) outboard to clear it from the bracket. Pivot the vent chimney down or to the side to facilitate removal of the coupling.

D. Cross fill breakaway valve coupling (36) removal:

1) Disconnect the ground clamp assembly (35) from the coupling bracket assembly (39).

2) Remove the hose clamps (32), half clamps (33), and O-ring (34) between the coupling (36) and the cross fill chimneys.

3) Remove the frangible ring (37) by removing screws (38) (8 places).

4) Slide the coupling (36) outboard to clear it from the bracket (39). Pivot the chimney down or to the side to facilitate removal of the coupling (36).

E. Fuel line breakaway valve coupling (45) removal:

NOTE

Removal procedures are the same for both breakaway couplings unless noted.

CAUTION

When disconnecting fuel lines from the breakaway valve coupling, hold the valve half by the flats to prevent separation of the coupling.

1) Disconnect the fuel lines (14) from the forward and aft coupling (45) ends.

2) Remove the screws (40), washers (42 and 43), and nuts (44) (4 places) that secure the coupling (45) to the bracket.

3) Slide the coupling (45) forward to remove it from the bracket.

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10-18.3 Inspection – CRFS Breakaway Valve Coupling

A. Inspect the connections for leaks.

B. Inspect the breakaway valve couplings for security, damage, and indicator dot status.

1) Indicator dots parallel with the valve body indicate the valve is open. Indicator dots perpendicular to the valve body indicate the valve is closed. Refer to Figure 10-3.1.

C. Inspect the frangible ring (37) for security and damage.

D. Inspect the ground straps (28 and 41) and ground clamp assembly (35) for security and damage.

1) Check resistance between each breakaway valve coupling test point and airframe grounding point (100 milliohms or less). (Refer to Figure 10-3.1 for pictorials of the test point. Refer to Figure 10-2.1, Detail View Q, for the left- and right-side airframe grounding locations.)

10-18.4 Repair – CRFS Breakaway Valve Coupling

A. If a CRFS crossover breakaway valve indicates the closed position, send the coupling to the manufacturer for repair. (Refer to Table 2-2.)

10-18.5 Installation – CRFS Breakaway Valve Coupling

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

Use care when handling the breakaway valve couplings.

NOTES

Prior to connecting the overboard vent line and cross fill line, inspect the fuel cell chimneys for restrictions and damage.

Replace all used packing/O-rings.

A. Cross fill breakaway valve coupling (36) installation:

1) From the right side, install the coupling (36) into the bracket opening. Ensure that the orientation of the coupling is such that the valve indicators are facing up and the test point is facing down. Pivot the right-side chimney down or to the side to facilitate installation of the coupling.

2) Install the frangible ring (37) with screws (38) (8 places). Torque 20 in-lb/2.3 Nm.

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3) Slide a pair of hose clamps (32) over the left- and right-side bladder cross fill chimneys.

4) Install a new O-ring (34) onto each end of the coupling (36).

5) Install the coupling (36) to the ends of the cross fill chimneys with a pair of half clamps (33) and secure with the pair of hose clamps (32) (torque 18 in-lb/2.0 Nm). Ensure that the half clamps are evenly seated around the connection and that there is full contact between the inboard half clamp and the coupling for electrical grounding.

6) Connect the ground clamp assembly (35) to the coupling bracket assembly (39).

B. Vent breakaway valve coupling (25) installation:

1) Insert the coupling (25) from outboard to inboard into the bracket. Ensure that the final orientation of the coupling is such that the valve indicators and test point are facing up. Pivot the vent chimney down or to the side to facilitate insertion of the coupling into the bracket.

2) Install the coupling (25) to the bracket with screws (26), lock washer (46) (1 place), and washers (27) (4 places). Torque 12 in-lb/1.4 Nm.

NOTE

The lock washer is installed at the single spotface location. (When the coupling is properly installed per step 1), the spotface is at the top, aft location for the left coupling or at the top, forward position for the right coupling.

3) Connect the coupling (25) to the tee fitting (31). Torque 230-260 in-lb/26.0-29.4 Nm.

4) Slide a pair of hose clamps (23) over the vent chimney.

5) Install a new O-ring (24).

6) Install the coupling (25) to the end of the vent chimney with a pair of half clamps (22) and secure with the pair of hose clamps (23) (torque 18 in-lb/2.0 Nm). Ensure that the half clamps are evenly seated around the connection and that there is full contact between the inboard half clamp and the coupling for electrical grounding.

7) If the left-side coupling was installed, connect the vent tube (8) to the 90° fitting (29) connected to the roll over valve assembly (30). Torque 230-260 in-lb/26.0-29.4 Nm.

C. Fuel line breakaway valve coupling (45) installation:

NOTE

Installation procedures are the same for both fuel line breakaway couplings unless noted otherwise.

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1) Insert the fuel line breakaway valve coupling (45) from the forward side into the bracket. Ensure that the installation of the coupling is such that the valve indicators and test point are facing outboard.

2) Install the coupling (45) to the bracket with screws (40), washers (42 and 43), and nuts (44) (4 places). Torque 7 in-lb/0.8 Nm. Ensure ground strap (41) is installed at the proper attachment point (bare and clean surface).

CAUTION

When installing fuel lines to the breakaway valve coupling, hold the valve half by the flats to prevent separation of the coupling.

3) Connect the fuel lines (14) to the forward and aft coupling (45) ends. Torque 650 in-lb/73.4 Nm.

D. Service the aircraft (para. 4-4) and check for leaks.

E. Install the air deflector and upper plenum/air inlet (para. 13-31), if required.

F. If the aircraft was defueled, bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-18.6 Roll Over Valve Assembly

10-18.7 Removal – Roll Over Valve Assembly

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fittings to prevent damage.

A. Remove the upper plenum/air inlet (para. 13-28) and air deflector.

B. Disconnect the vent tube (8) from the 90° fitting (29) connected to the roll over valve assembly (30).

C. Disconnect the 90° fitting (29) connected to the roll over valve assembly (30).

D. Disconnect the roll over valve assembly (30) from the tee fitting (31).

10-18.8 Inspection – Roll Over Valve Assembly

A. Inspect the roll over valve assembly for security and damage.

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10-18.9 Repair – Roll Over Valve Assembly

A. If any of the conditions described in paragraph 4-48.1, 2, A, have occurred, remove the roll over valve assembly and inspect for open or closed valve status.

1) With the roll over valve assembly positioned upright, blow clean air down through the top opening (maximum 1 psi). If exiting air can be felt at the base of the assembly, the status is open. If exiting air cannot be felt at the base of the assembly, the status is closed.

2) If the status is closed, return the roll over valve assembly to the manufacturer for repair or overhaul. (Refer to Table 2-2.)

10-18.10 Installation – Roll Over Valve Assembly

A. Install the roll over valve assembly (30) to the tee fitting (31). Torque 330-360 in-lb/37.3-40.7 Nm.

B. Install the 90° fitting (29) to the roll over valve assembly (30). Torque 460-500 in-lb/52.0-56.5 Nm.

C. Connect the vent tube (8) to the elbow fitting (29). Torque 230-260 in-lb/26.0-29.4 Nm.

D. Install the air deflector and upper plenum/air inlet (para. 13-31).

10-19. Sump Drain Valves

10-20. Removal – Sump Drain Valves

A. Defuel the aircraft (para. 4-5).

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

B. Disconnect the drain lines from the valves.

C. Remove the valves.

10-21. Inspection – Sump Drain Valves

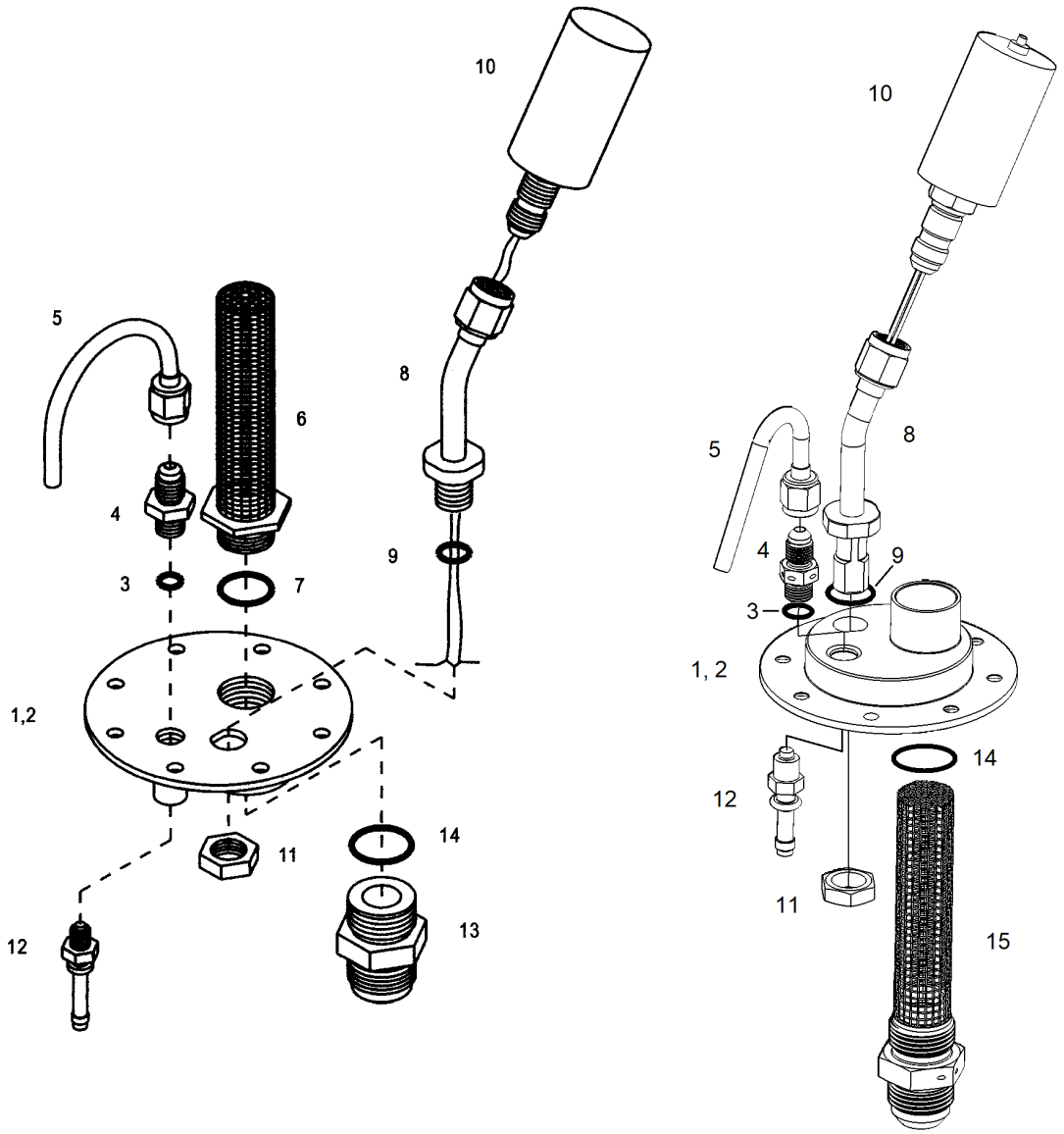
A. Inspect the valves for damage, leaks, and proper operation.

10-22. Repair – Sump Drain Valves

A. Replace valves that leak or fail to operate properly after resealing the threads for leaks around the threads or flushing the valve to attempt to remove possible debris from a sticky or leaking valve.

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Standard System CRFS

(Right-side sump assembly shown)

1. Flange Plate (Left Side)
2. Flange Plate (Right Side)
3. O-Ring
4. Sump Fitting
5. Syphon Tube Assembly
6. Fuel Strainer Assembly
7. O-Ring
8. Support Tube Assembly (R/S Only)
9. O-Ring (R/S Only)
10. Low Fuel Switch (R/S Only)
11. Nut
12. Sump Drain Valve
13. Fitting
14. O-Ring
15. Fuel Strainer Assembly

Figure 10-4. Sump Assembly

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10-23. Installation – Sump Drain Valves

A. Apply sealant (Permatex #1C, Loctite 569) to the valve threads and install the valves (40-44 in-lb/4.5-5.0 Nm).

B. Connect the drain lines to the valves.

C. Service the aircraft (para. 4-4) and check for leaks.

D. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-24. Fuel Shutoff Valve Assembly (Figure 10-5 or Figure 10-5.1)

10-25. Removal – Fuel Shutoff Valve Assembly

A. Defuel the aircraft (para. 4-5).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

B. Disconnect the fuel supply and the drain lines from the shutoff valve assembly.

C. Disconnect the shutoff cable from the valve.

D. Remove the hardware (5) (4) securing the shutoff valve assembly mount (1) to the pylon.

E. Remove the shutoff valve assembly.

10-25.1 Disassembly – Fuel Shutoff Valve Assembly

CAUTION

Perform disassembly in a clean area to prevent contamination.

NOTE

If leakage is detected, the plug valve O-rings (12) may be faulty. The following procedure disassembles the fuel shutoff valve assembly to access the plug valve O-rings.

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NOTE

The following procedure is applicable to the fuel shutoff valve assembly configuration depicted in Figure 10-5.1.

A. Remove screws (6) and washers (7) to remove the tee (8).

B. Remove screws (21) and washers (22) to remove the valve body fitting (20).

C. Remove retaining ring (23).

D. Grasp the valve body arm (24). With a slight rotation motion, carefully pull up the valve plug arm to remove the plug valve (13).

10-26. Inspection – Fuel Shutoff Valve Assembly

A. Inspect the valve assembly for damage, leaks, and proper operation.

B. Remove minor nicks, scratches, or corrosion.

10-27. Repair – Fuel Shutoff Valve Assembly

A. Replace the valve assembly if not operating properly.

10-27.1 Assembly – Fuel Shutoff Valve Assembly (Figure 10-5.1)

NOTE

Perform assembly in a clean area to prevent contamination.

NOTE

The following procedure is applicable to the fuel shutoff valve assembly configuration depicted in Figure 10-5.1.

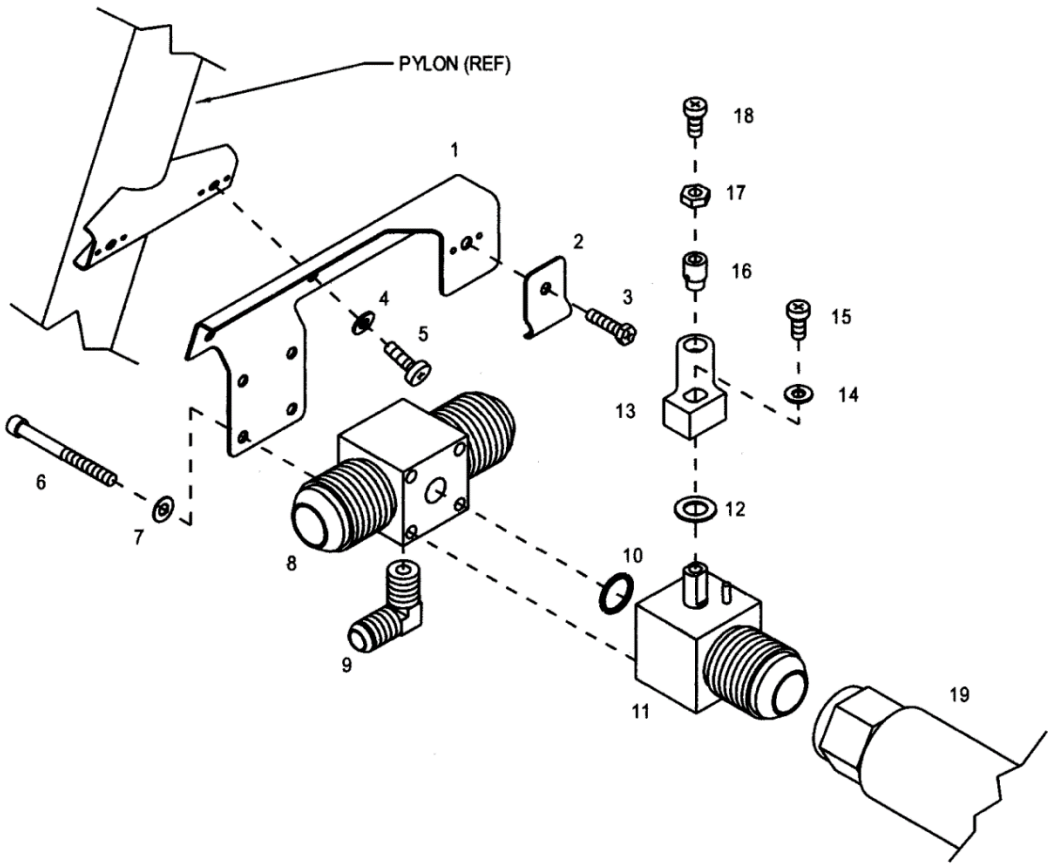
A. Install the plug valve (13):

1) Lubricate (Jet A) new O-rings (12) and mating surfaces of the valve body (11).

CAUTION

Use care to prevent the O-rings (12) from being pinched or torn during assembly.

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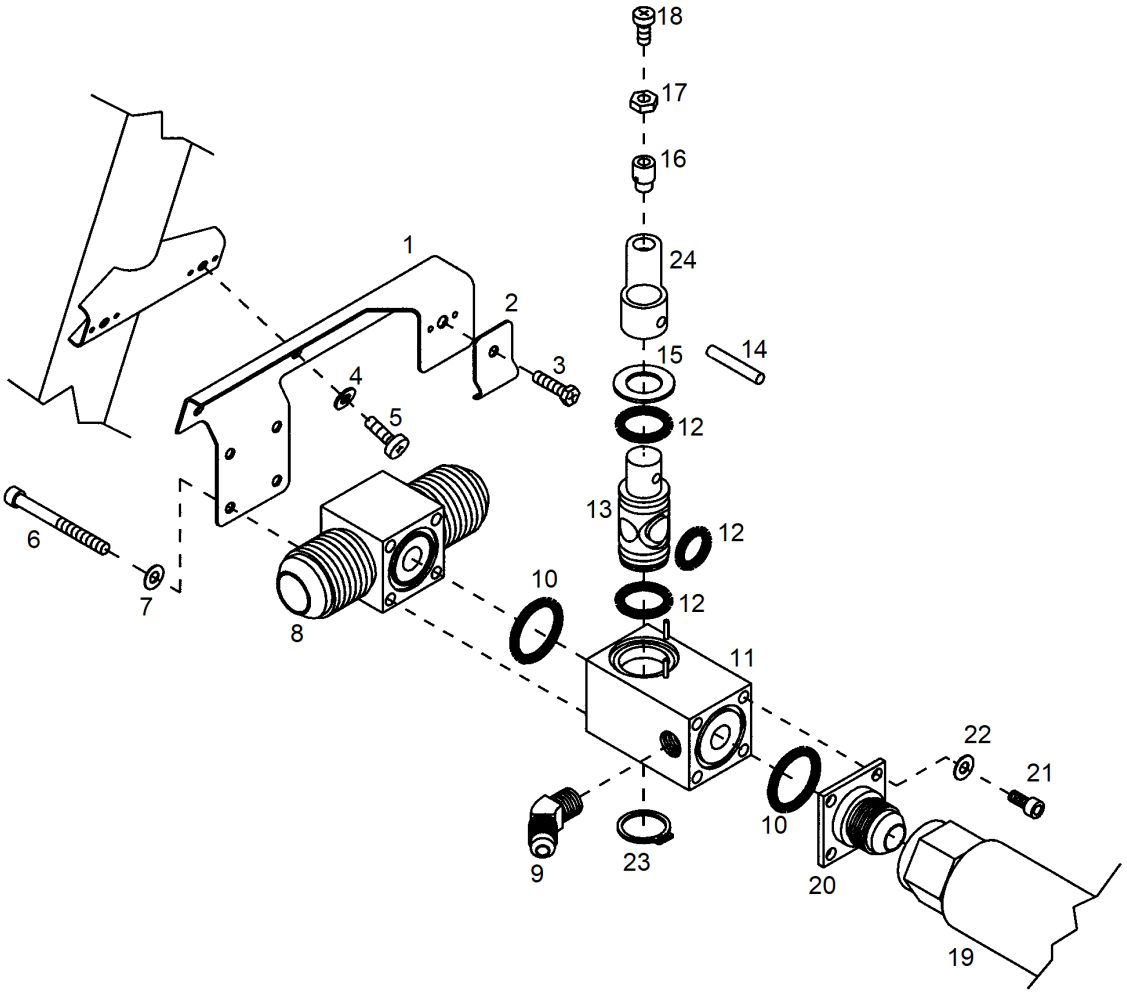
480: S/N 5001-5032

1.	Bracket Assembly	11.	Valve Body
2.	Clip	12.	Washer
3.	Screw	13.	Arm
4.	Washer	14.	Washer
5.	Screw	15.	Screw
6.	Screw	16.	Swivel
7.	Washer	17.	Washer
8.	Tee	18.	Screw
9.	Elbow	19.	Fuel Line
10.	O-ring		

Figure 10-5. Fuel Shutoff Valve

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480/480B: S/N 5039 and subsequent

1.	Bracket Assembly	13.	Plug Valve
2.	Clip	14.	Pin
3.	Screw	15.	Washer
4.	Washer	16.	Swivel
5.	Screw	17.	Washer
6.	Screw	18.	Screw
7.	Washer	19.	Fuel Line
8.	Tee	20.	Valve Body Fitting
9.	Elbow	21.	Screw
10.	O-ring	22.	Washer
11.	Valve Body	23.	Retaining Ring
12.	O-ring	24.	Valve Body Arm

Figure 10-5.1 Fuel Shutoff Valve

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2) Install plug valve (13) with O-rings (12) into the valve body (11). Carefully twist and push the plug valve into the valve body. Press the middle O-ring securely against the plug valve to prevent the O-ring from deforming during installation.

3) Install the retaining ring (23).

B. Lubricate (Jet A) new O-ring (10) and install valve body fitting (20) with screws (21) and washers (22). Torque 12-15 in-lb/1.4-1.7 Nm and lockwire (0.025 inch).

C. Lubricate (Jet A) new O-ring (10) and install tee (8) with screws (6) and washers (7). Torque 12-15 in-lb/1.4-1.7 Nm and lockwire (0.025 inch).

10-28. Replacement – Fuel Shutoff Valve Assembly (Figure 10-5 or Figure 10-5.1)

A. Remove the hardware securing the valve (11) to the tee (8) and to the mounting bracket (1) in accordance (refer to para. 10-25.1). Separate the valve from the tee. Discard the O-ring (10).

B. S/N 5001-5032 only: If replacing the tee (8), remove the drain line elbow (9). Clean the threads and using sealant (Permatex #1C or Loctite 569), install the replacement tee.

C. Install a new O-ring (10) between the valve body (11) and the tee (8).

D. Install the hardware (6) (7) securing the mounting bracket (1) to the valve body (11) and tee (8). Torque 12-15 in-lb/1.4-1.7 Nm and lockwire (0.025 inch).

10-29. Installation – Fuel Shutoff Valve Assembly

A. Install the shutoff valve assembly into position and install the hardware (4) (5) securing it to the pylon.

CAUTION

Use a backing wrench when installing or removing fluid lines and fittings to prevent damage.

B. Connect the supply and drain lines to the valve assembly.

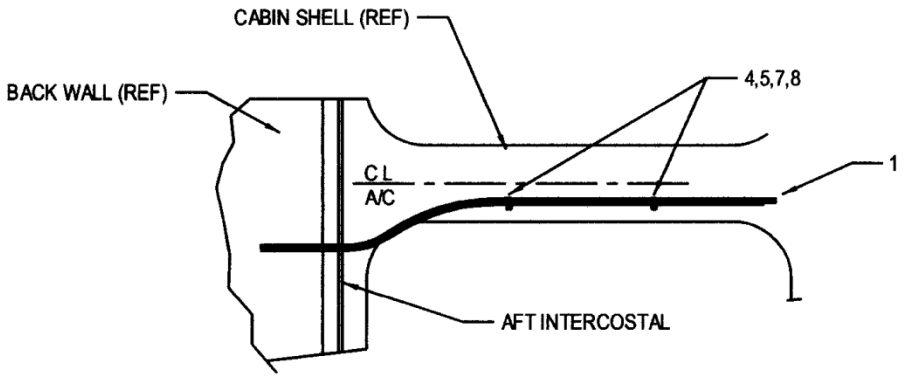
C. Ensure the position of the valve body arm (24) corresponds with the position of the control cable. Connect the cable to the valve body and rig so when the valve is full on there is a small amount of cushion at the control cable knob.

D. Service the aircraft (para. 4-4) and check for leaks. If leaks are present, disassemble (para. 10-25.1) the plug valve (13) from the valve body (11) and check condition of O-rings (12).

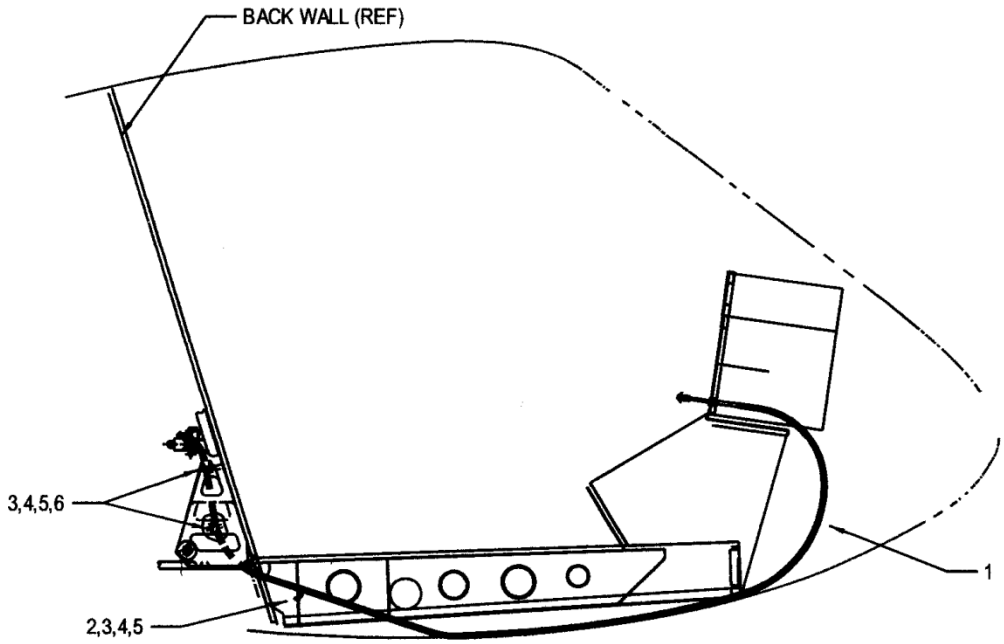
E. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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VIEW LOOKING DOWN AT CABIN BOTTOM



VIEW LOOKING FROM RIGHT SIDE

1.	Shutoff Cable	5.	Nut
2.	Clamp	6.	Clamp
3.	Screw	7.	Clip
4.	Washer	8.	Screw

Figure 10-6. Fuel Shutoff Valve Cable Installation

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10-30. Fuel Shutoff Valve Control Cable (Figure 10-6)

10-31. Removal – Fuel Shutoff Control Cable

NOTE

Before removing the cable, be thoroughly familiar with the cable routing (Refer to Figure 10-6).

A. Remove the right-side keel access panel.

B. Gain access to the back of the instrument panel (para. 7-3).

C. Remove the right-side engine access panel.

D. Disconnect the cable from the shutoff valve.

E. Remove the cable from the support clamps.

F. Remove the retaining nut from the cable behind the instrument panel and remove the cable.

10-32. Inspection – Fuel Shutoff Valve Control Cable

A. Inspect the cable for damage, kinks, and proper operation.

10-33. Repair – Fuel Shutoff Valve Control Cable

A. Replace the cable if kinked or binding.

10-34. Installation – Fuel Shutoff Valve Control Cable

A. Install the cable in reverse order of removal.

B. Ensure the position of the valve arm corresponds with the position of the control cable. Connect the cable to the valve and rig so that when the valve is full ON there is a small amount of cushion at the control cable knob.

10-35. Refueling Port Cap

10-36. Removal – Refueling Port Cap

A. Lift the locking handle and rotate the handle counterclockwise.

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NOTE

Only early production TH-28/480's use a retainer attached to the refueling port cap. Later production aircraft have the cap attached to the refueling port mount by a safety clip or a hinged refueling port cap may be installed.

B. Remove the cap from the refueling port. Rotate the cap retainer to allow removal from the fuel cell, or disconnect the retention chain from the refueling port and remove the cap from the aircraft, or remove the screws securing the hinge half to the refueling port cap and remove the cap.

10-37. Inspection – Refueling Port Cap

A. Inspect the cap for proper locking and sealing.

B. Inspect the chain and retainer for security, if applicable.

C. Inspect the hinge installation for condition and security, if applicable.

10-38. Repair – Refueling Port Cap

A. Replace the O-ring seal if worn or deteriorated.

B. Repair or replace the retaining chain, if required.

C. Repair or replace the hinge, if required.

D. Adjust the tension of the cap by removing the cotter pin from the nut on the bottom of the cap, adjusting the nut and installing a cotter pin.

10-39. Installation – Refueling Port Cap

A. Replace the packing on the cap.

B. Install the cap retainer into the fuel cell, or attach the retention chain to the refueling port with the safety clip, or install the hinge screws and lockwire, as applicable.

C. Install the cap, rotate the locking handle clockwise and push the handle down into the recess in the cap.

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10-40. Low Fuel Warning Switch

NOTE

For CRFS, if the bladders are replacements and have not been previously filled with fuel, it is necessary to completely fill the tanks to fully expand the bladder within the fuel cell structure before proceeding with the functional test.

10-41. Functional Test – Low Fuel Warning Switch

A. Defuel the aircraft (para. 4-5).

B. Verify the electrical circuit is operating properly (para. 6-140).

C. Level the aircraft (para. 4-45).

NOTES

Unusable fuel for the standard fuel system is 1.7 gallons/6.43 liters; however, only use 0.7 gallons/2.65 liters while preparing to check the low fuel warning switch in a standard fuel system equipped aircraft.

Unusable fuel for the CRFS is 0.75 gallons/2.84 liters.

D. Add the volume of fuel that represents unusable fuel:

1) Standard fuel system: Add 0.7 gallons/2.65 liters

2) Aerazur fuel system: Add 0.3 gallons/1.14 liters

3) CRFS: Add 0.75 gallons/2.84 liters

E. Verify the fuel quantity gauge indicates “0” and the LOW FUEL segment of the caution panel is illuminated.

F. Add 6-8 gallons/22.7-30.3 liters of fuel. The LOW FUEL segment should extinguish.

G. Allow the fuel to levels to equalize in the fuel cells.

NOTE

Drain the fuel from the fuel cells using either the low point drain on the shutoff valve or the engine supply hose.

H. Drain fuel from the fuel cells until the LOW FUEL segment illuminates. Measure the amount of fuel drained.

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I. The LOW FUEL segment should illuminate according to the following measurements (the measurement represents the volume of useable fuel in the fuel cells):

1) Standard fuel system: 7.0 gallons (US)/26.5 liters, ± 1.0 gallon (US)/3.79 liters

2) Aerazur fuel system: 5.0 gallons (US)/18.93 liters, ± 1.0 gallon (US)/3.79 liters

3) CRFS: 4.0 gallons (US)/14.8 liters, + 1.5 gallons (US)/5.7 liters/ - 0.5 gallons (US)/1.9 liters

NOTE

The low fuel warning switch is not adjustable in the Standard Fuel System or CRFS.

J. Aerazur Fuel Bladder System: If the LOW FUEL segment fails to illuminate or extinguish within the parameters of the test, adjust the position of the switch (para. 10-42).

10-42. Adjustment – Low Fuel Warning Switch, Aerazur Bladder System

NOTE

The low fuel warning switch is not adjustable in the Standard Fuel System or CRFS.

A. Defuel the aircraft (para. 4-5).

B. Remove the right-side fuel cell cover (para. 8-14).

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

C. Disconnect the overboard vent crossover line from the right-side fuel cell (para. 10-15).

D. Disconnect the electrical connectors for the fuel quantity and low fuel warning systems.

E. Unlace the upper portion of the fuel cell.

F. Remove the access plates (zipper) from the fuel cell.

G. Remove the upper portion of the fuel quantity probe from the fuel cell (para. 10-48).

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H. Collapse the fuel cell to gain access to the low fuel warning switch mounting bracket.

NOTE

The switch must be orientated toward the front of the aircraft.

I. If the warning segment comes on early, lower the mounting bracket on the probe. If the warning segment comes on late, raise the mounting bracket on the probe.

J. Reinstall the fuel quantity probe.

K. Install the fuel cell access plates (zipper).

L. Reassemble the rest of the right-side fuel cell.

M. Perform a functional test of the low fuel warning system (para. 10-41).

N. If the aircraft was completely defueled, bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-43. Removal – Low Fuel Warning Switch

NOTE

Refer to Figure 10-4.

10-43.1 Removal – Low Fuel Warning Switch, Standard Fuel System and CRFS

A. Defuel the aircraft (para. 4-5).

B. Remove the right fuel cell:

1) Standard: Remove the right fuel cell in accordance with para. 10-4.1.

2) CRFS: Remove the right fuel cell in accordance with para. 10-4.3.

C. Remove the fuel fitting assembly from the fuel cell.

1) Standard: Remove the fuel fitting assembly in accordance with para. 10-7.1, steps B through E.

2) CRFS: Remove the flange plate assembly in accordance with para. 10-7.3, C.

D. Remove the pins from the connector housing if the special tool is available.

NOTE

Cut the wiring to ensure enough wire is available to splice when the low fuel warning switch is installed.

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E. If the tool is not available, cut the wiring. Retain the electrical connector for installation of the replacement switch.

F. Remove the low fuel warning switch from the support tube assembly:

1) To facilitate removal, disassemble the support tube assembly and low fuel switch by removing the base nut.

2) Loosen the fitting of the tube assembly to release the switch.

3) Remove sealant residue from the fittings and threads on the ends of the support tube assembly.

4) To facilitate installation of the replacement low fuel switch, attach a length of safety wire (8 in/20 cm) to the end of the wiring of the switch that is to be removed.

5) Remove the switch and wiring from the tube assembly. Pull the safety wire through the tube assembly leaving adequate length to reattach to the replacement switch wiring and adequate tail length to pull the wire harness through the base of the tube assembly.

6) Detach the safety wire from the wiring.

10-43.2 Removal – Low Fuel Warning Switch, Aerazur Fuel Bladder System

A. Defuel the aircraft (para. 4-5).

B. Remove the right-side fuel cell cover (para. 8-14).

C. Remove the fuel quantity probe (para. 10-48.1).

NOTE

If not required, do not remove the switch mounting bracket from the fuel quantity probe.

D. Mark the position of the switch mounting bracket and remove the low fuel switch mounting bracket from the fuel quantity probe.

E. Remove the switch from the mounting bracket.

10-44. Inspection – Low Fuel Warning Switch

A. Inspect the switch for cracks, damage, and security.

10-45. Repair – Low Fuel Warning Switch

A. Replace the switch if it is inoperative or fails the inspection requirements.

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10-46. Installation – Low Fuel Warning Switch

10-46.1 Installation – Low Fuel Warning Switch, Standard Fuel System and CRFS

A. If the tooling and parts are available, install the pins onto the wiring for the low fuel warning switch.

B. Insert the low fuel switch wiring and the switch into the support tube assembly.

1) If applicable, attach the safety wire to the wiring of the replacement switch and install switch into the mounting tube pulling the safety wire to guide the wires through the tube. Detach the safety wire.

C. If the wiring for the switch has the pins for the connector installed, install the pins into the electrical connector.

D. Splice the wiring I/A/W AC 43.13-1B if the wiring was cut for removal of the low fuel warning switch.

E. Apply PR 1440 B2 fuel sealant to the support tube threads, the base of the support tube, and the wiring exit on the bottom side of the flange plate.

F. Install the fuel fitting assembly onto the fuel cell:

1) Standard: Install the fuel fitting assembly into the fuel cell in accordance with para. 10-7.1, steps F and G.

2) CRFS: Install the flange plate assembly into the fuel cell in accordance with para. 10-7.3, E).

G. Install the right fuel cell:

1) Standard: Install the right fuel cell in accordance with para. 10-8.1.

2) CRFS: Install the right fuel cell in accordance with para. 10-8.3.

H. Perform a functional test of the low fuel warning switch (para. 10-41).

I. Bleed the fuel system I/A/W the Roll-Royce 250-C20 Series Operation and Maintenance Manual.

10-46.2 Installation – Low Fuel Warning Switch, Aerazur Fuel Bladder System

A. Install the switch onto the mounting bracket and lockwire (0.025").

NOTE

Later production aircraft require the low fuel warning switch and mounting bracket to be installed on the fuel quantity probe after the probe is inserted into the fuel cell. Refer to paragraph 10-51 for the applicable aircraft serial numbers.

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B. If removed, install the mounting bracket onto the fuel quantity probe so that the top of the switch mounting bracket is 5.85 inches/14.86 cm from the bottom of the fuel quantity probe.

NOTE

The switch must be orientated toward the front of the aircraft.

C. Install the fuel quantity probe into the fuel cell (para. 10-51.3).

D. Install the right-side fuel cell access cover (para. 8-17).

E. Perform a functional test of the low fuel warning system (para. 10-41).

F. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-47. Fuel Quantity Probe (Transmitter)

10-48. Removal – Fuel Quantity Probe

NOTE

Aircraft S/N 5198 through 5255 are configured with P/N ECD4092-1 fuel quantity transmitter at the time of manufacture.

10-48.1 Removal – Fuel Quantity Probe, Standard Fuel System

NOTE

The fuel quantity transmitter is P/N ECD4092-1. See also Figure 10-1.

A. Defuel the aircraft (para. 4-5).

B. Remove the fuel quantity probe cover and gasket from the right fuel cell cover.

C. Disconnect the fuel quantity transmitter wiring.

D. Remove the safety wire.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

NOTE

The spanner nut may be used as a tool to remove the transmitter. Flip the nut over, install the slotted side over the notches of the transmitter and engage the slots in the groove around the perimeter of the transmitter. Pull up the nut to remove the transmitter.

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E. Remove the spanner nut and carefully remove the transmitter.

10-48.2 Removal – Fuel Quantity Probe, Standard Fuel System

NOTE

The following procedure is applicable to 480/B S/N 5197 and Previous. See also Figure 10-1.

A. Defuel the aircraft (para. 4-5).

B. Remove the fuel quantity probe cover from the right fuel cell cover.

C. Disconnect the fuel quantity probe electrical connector.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

D. Remove the screws securing the fuel quantity probe to the mounting flange. Remove the probe and the gasket.

10-48.3 Removal – Fuel Quantity Probe, Aerazur Fuel Bladder System

NOTE

The following procedure is applicable to TH-28 S/N 3006 and previous, and 480 S/N 5012 and previous. See also Figure 10-1.

A. Defuel the aircraft (para. 4-5).

B. Remove the upper plenum/air inlet (para. 13-28) and the air deflector from the top of the cabin.

C. Remove the fuel cell cover from the right side of the aircraft.

D. Disconnect the electrical connectors for the fuel quantity probe and the low fuel warning switch from the right side fuel cell.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

E. Disconnect the overboard vent crossover line from the fuel cell (para. 10-15).

F. Unlace the upper portion of the cell from the supports.

G. Remove the access plates (zipper) from the fuel cell.

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H. Loosen the clamp securing the top end of the fuel quantity probe in the mounting cup. Remove the top end of the probe from the cup.

I. Collapse the cell and loosen the clamp securing the lower end of the probe.

J. Remove the fuel quantity probe and low fuel warning switch electrical connectors from the mounting plate on the fuel cell.

K. Remove the fuel quantity probe and low fuel warning switch assembly from the fuel cell.

NOTE

If not required, do not remove the switch mounting bracket from the fuel quantity probe.

L. Remove the low fuel warning switch and bracket from the fuel quantity probe.

10-48.4 Removal – Fuel Quantity Transmitter, CRFS

NOTE

Aircraft S/N 5256 and subsequent are configured with P/N ECD4092-3 fuel quantity transmitter at the time of manufacture. See also Figure 10-2.1.

A. Defuel the aircraft (para. 4-5).

B. Remove screws (83) to remove the fuel quantity transmitter frangible cover (82) from the right fuel cell cover.

C. Disconnect the fuel quantity transmitter wiring.

D. Remove the safety wire.

NOTE

Cover all open ports and lines to prevent contamination of the fuel system.

NOTE

The spanner nut (80) may be used as a tool to remove the transmitter. Flip the nut over, install the slotted side over the notches of the transmitter and engage the slots in the groove around the perimeter of the transmitter. Pull up the nut to remove the transmitter.

E. Remove the spanner nut (80) and carefully remove the transmitter.

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10-49. Inspection – Fuel Quantity Probe

A. Inspect the probe for security of installation, damage, and proper operation.

B. Inspect the electrical leads for damage and corrosion.

NOTE

Step C and D below apply to aircraft S/N 5134, 5136 through 5197.

C. Inspect the ferrite beads on the probe and probe wires for condition and security. Inspect for missing, cracked, or chipped beads. Five ferrite bead cores are installed on the fuel probe and three ferrite bead cores are installed on each of the three wire leads.

D. Transmit for 10 seconds on 136.0 MHz and observe the fuel gauge for movement. If movement is detected and the ferrite bead installation is satisfactory, remove the fuel bladder and inspect the shielding coating (para. 8-73, 8-74).

10-50. Repair – Fuel Quantity Probe

A. Replace the probe if the probe is damaged, the electrical wiring or connector is damaged, the ferrite beads are damaged or missing (S/N 5134, 5136 through 5197), or after determining the fuel quantity system is not functioning properly and the cause is the fuel quantity probe.

10-51. Installation – Fuel Quantity Probe

NOTE

Aircraft S/N 5198 through 5254 are configured with ECD4092-1 fuel quantity transmitter at the time of manufacture. See also Figure 10-1.

10-51.1 Installation – Fuel Quantity Probe, Standard Fuel System

A. Install a new O-ring in the base of the flanged cup assembly.

B. Install the fuel quantity probe into the fuel cell. Orientate the end of the probe towards the lower corner of the fuel cell. Ensure the alignment of the three locating holes on the base of the transmitter flange plate with the three alignment pins in the flanged cup assembly.

NOTE

The spanner nut may be used as a tool to install the transmitter. Install the slotted side over the notches of the transmitter and engage the slots in the groove around the perimeter of the transmitter. Push the nut to seat the transmitter in the base of the flanged cup assembly to ensure even compression with the O-ring prior to torquing. Remove the nut and flip over for installation.

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C. Install the spanner nut. Torque 120 in-lbs/13.6 Nm

D. Connect the electrical wiring for the fuel quantity probe. Apply a corrosion inhibitor (para. 10-59) to the ground wire and the probe wire connections.

E. Safety (0.032") the spanner nut to one flanged cup assembly attachment bolt.

F. Check the calibration of the fuel quantity system (para. 7-85) if the fuel quantity probe was replaced or the system is suspected of being out of calibration.

G. Perform a leak check while servicing the aircraft.

H. Install conductive gasket and install fuel quantity transmitter cover.

I. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-51.2 Installation – Fuel Quantity Probe, Standard Fuel System

NOTE

The following procedure applies to 480/B aircraft prior to and including S/N 5197. See also Figure 10-1.

A. Install a new gasket on the fuel quantity probe mounting flange.

B. Install the fuel quantity probe into the fuel cell. Orientate the end of the probe towards the lower corner of the fuel cell.

C. Install the screws and torque to 25-30 in-lbs/2.8-3.4 Nm.

D. Connect the electrical connector for the fuel quantity probe.

E. Check the calibration of the fuel quantity system (para. 7-85) if the fuel quantity probe was replaced or the system is suspected of being out of calibration.

F. Perform a leak check while servicing the aircraft.

G. Apply a bead of silicon sealant (RTV type) to the fuel quantity probe cover and install the fuel quantity probe cover.

H. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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10-51.3 Installation – Fuel Quantity Probe, Aerazur Fuel Bladder System

NOTE

The following procedure is applicable to TH-28 S/N 3006 and previous, and 480 S/N 5012 and previous. See also Figure 10-1.

A. If removed, install the low fuel warning switch and bracket on the fuel quantity probe (para. 10-46).

NOTE

The low fuel warning switch must be orientated toward the front of the aircraft.

B. Install the fuel quantity probe into the fuel cell, place the bottom adapter into the cup on the bottom of the fuel cell, and secure in position with the retaining clamp.

C. Install the electrical connectors for the fuel quantity probe and low fuel warning switch onto the mounting plate in the fuel cell. Ensure they are properly installed or they will leak.

D. Install the upper portion of the fuel quantity probe in the upper cup of the fuel cell and secure with the retaining clamp.

E. Install the fuel cell access plates (zipper) and torque the hardware to 40-50 in-lbs/4.5-5.7 Nm.

F. Reinstall the lacing cord and secure the upper portion of the fuel cell to the support structure.

G. Connect the electrical leads for the fuel quantity probe and low fuel warning switch.

H. Connect the overboard vent crossover (para. 10-18).

I. Install the fuel cell cover (para. 8-17).

J. Install the air deflector and the upper plenum/air inlet (para. 13-31).

K. Check the calibration of the fuel quantity system (para. 7-85) if the fuel quantity probe was replaced or the system is suspected of being out of calibration.

L. Perform a functional test of the low fuel warning system (para. 10-41), adjust as required.

M. Perform a leak check while servicing the aircraft.

N. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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10-51.4 Installation – Fuel Quantity Transmitter, CRFS

NOTE

Aircraft S/N 5256 and subsequent are configured with P/N ECD4092-3 fuel quantity transmitter at the time of manufacture. See also Figure 10-2.1.

A. Install a new O-ring (78) in the base of the flanged cup assembly (74).

B. Install the fuel quantity transmitter (79) into the fuel bladder:

1) Ensure the alignment of the three locating holes on the base of the transmitter with the three alignment pins in the flanged cup assembly (74).

2) Orientate the end of the transmitter toward the lower corner of the fuel cell and into the rubber cup.

NOTE

The spanner nut (80) may be used as a tool to install the transmitter. Install the slotted side over the notches of the transmitter and engage the slots in the groove around the perimeter of the transmitter. Push the nut to seat the transmitter in the base of the flanged cup assembly to ensure even compression with the O-ring prior to torquing. Remove the nut and flip over for installation.

C. Install the spanner nut (80). Torque 120 in-lbs/13.6 Nm.

D. Connect the electrical wiring for the fuel quantity transmitter. Apply a corrosion inhibitor (para. 10-59) to the ground wire and the transmitter wire connections.

E. Safety (0.032”) the spanner nut (80) to one flanged cup assembly attachment bolt.

F. Service the fuel cells (para. 4-4) and check for leaks.

G. Check the calibration of the fuel quantity system (para. 7-85) if the fuel quantity transmitter was replaced or the system is suspected of being out of calibration.

NOTE

Check that gasket (77) is present. It may either be adhered to the fuel cell cover or to the underside of the frangible cover (82).

NOTE

Apply a light coat of spray adhesive (Super 77 or equivalent) to one side of gasket(s) (81) and (77, if required). Lightly tack on the sprayed side of the gasket(s) to the bottom of the frangible cover (82) to aid installation.

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H. Install gasket (77), if required.

I. Install gasket (81) and install fuel quantity transmitter frangible cover (82) with screws (83) (6 places). Torque 25-30 in-lb/2.8-3.4 Nm.

J. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

10-52. External Fuel Filter (Optional Equipment)

NOTE

The external fuel filter is an equipment option for the legacy fuel systems only.

10-53. Description – External Fuel Filter

An optional external fuel filter can be installed on the TH-28 (S/N 3007 and subsequent) and the 480/B (S/N 5003 and subsequent). The filter assembly, located on the left side of the pylon near the lateral trim motor assembly, is installed between the fuel shutoff valve and the engine fuel inlet. The filter assembly incorporates a drain in the bottom of the bowl assembly, a bypass valve, an impending bypass indicator which is an electrical switch that is connected to the caution panel, and a test button for checking the operation of the electrical switch. The filter element is replaced every 300 hours or when the impending bypass indicator activates.

10-54. Filter Element Replacement – External Fuel Filter

A. Pull the fuel shutoff valve to OFF.

B. Disconnect the battery.

C. Place a suitable container beneath the filter assembly drain and drain the fuel from the filter assembly and the fuel lines.

D. Remove the lockwire securing the bowl assembly and remove the bowl assembly from the filter assembly.

E. Discard the filter element, the bowl assembly O-ring, and the filter element seals.

F. Install new filter element seals, a new bowl assembly O-ring, and a new filter element.

G. Install the bowl assembly onto the filter assembly and torque to 100-150 in-lbs/11.7-17.0 Nm. Lockwire the bowl assembly to the filter assembly.

H. Open the fuel shutoff valve.

I. Connect the battery.

J. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

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10-55. Removal – External Filter Assembly

A. Pull the fuel shutoff valve to OFF.

B. Disconnect the battery.

C. Place a suitable container beneath the filter assembly drain and drain the fuel from the filter assembly and the fuel lines.

D. Disconnect the electrical connector from the filter assembly.

E. Disconnect the fuel lines from the inlet and outlet ports of the filter assembly.

F. Remove the hardware securing the filter assembly mounting bracket to the pylon and remove the filter assembly from the aircraft.

G. Remove the hardware securing the filter assembly to the mounting bracket and remove the filter assembly from the mounting bracket.

10-56. Inspection – External Filter Assembly

A. Inspect the filter assembly for damage, leaks, and security of installation.

B. Inspect the mounting bracket for cracks, bends, corrosion, and security of installation.

C. Inspect the electrical connector and wiring for general condition.

D. Operate the test button and check for proper operation of the impending bypass switch.

10-57. Repair – External Filter Assembly

A. Replace the filter assembly if damage causes the assembly to be unserviceable.

B. Repair the mounting bracket I/A/W AC 43.13-1B. Replace damaged or missing hardware.

C. Repair or replace the electrical connector or wiring if damaged.

D. Replace the filter assembly if the impending bypass switch does not function properly.

10-58. Installation – External Filter Assembly

A. Install the filter assembly onto the mounting bracket.

B. Position the filter assembly onto the pylon and install the securing hardware.

C. Connect the fuel lines to the inlet and outlet ports.

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D. Connect the electrical connector to the filter assembly.

E. Open the fuel shutoff valve.

F. Connect the battery.

G. Bleed the fuel system I/A/W the Rolls-Royce 250-C20 Operation and Maintenance Manual.

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10-59. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Adhesive	Multipurpose Spray Adhesive, 3M brand	Super 77
Corrosion Inhibitor, Lubricant	ACF-50, Lear Chemical Research Corp.	10013 10032
Lacing, Cord	750 LB Paracord, Black	MIL-C-5040 (Type IV)
Lockwire	Lockwire (0.032”)	MS20995C32
Sealant	Fuel Tank Sealant, Class B	PR 1440 B2
Sealant	Thread Sealant, Loctite Brand	569
Thread Sealant	Thread sealant, Permatex Brand	1C
Silicone Sealant	Sealant, Dow Corning	732-RTV

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ENSTROM TH-28/480 SERIES MAINTENANCE MANUAL

SECTION 11

POWER TRAIN

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SECTION 11

SERVICING, RECOMMENDED OVERHAULS, INSPECTIONS,
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SECTION 11

POWER TRAIN

11-1. Power Train

11-2. Description – Power Train

The power train includes the main rotor transmission, upper pulley, "H"- strut, lower pulley, lower pulley drive shaft, drive belt, overrunning clutch, power output drive shaft, tail rotor drive shafts, and the tail rotor transmission.

11-3. Overrunning Clutch

11-4. Description - Overrunning Clutch

The overrunning clutch (ORC) is installed on the front side of the engine accessory gearbox. The outer housing of the ORC forms the driving portion of the clutch and is driven by the engine power output shaft. In the driving direction, the sprags engage and connect the outer housing to an inner drive housing which transmits the engine torque to a splined drive shaft that passes through the center of the clutch assembly to the rear of the engine accessory gearbox where it is coupled to the lower pulley drive shaft. In the overrunning direction, the inner drive shaft, being driven by the rotor system, will rotate faster than the outer housing of the ORC and the sprags disengage thus disconnecting the engine from the rotor drive system. The ORC is a sealed unit and contains its own lubrication separate from the engine.

Some aircraft may have been retrofitted with a vented clutch oil reservoir. The oil reservoir consists of a vented container with a sight glass and service port, and a top air/oil vent line and a bottom oil return line, each running to a modified bearing housing that supports the clutch. The system allows excess oil to flow from the ORC to the reservoir and vent the pressure increase that occurs during normal operation of the aircraft. Excess oil flows back into the ORC when the aircraft is shut down. The reservoir allows for availability of more lubricating oil for the ORC. Refer to para. 11-8.1 for maintenance instructions.

11-5. Removal - Overrunning Clutch (Figure 11-1.1)

CAUTION

Prior to removing the ORC, review the maintenance records for entries indicating that an offset bearing housing is installed on the ORC for the specific engine/accessory gearbox installation. If maintenance entries indicate that an offset bearing housing is installed, visually verify that the notches in the bearing housing are orientated in accordance with the maintenance entry.

NOTE

The engine access panels do not need to be removed if the optional panel openers are installed.

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A. Remove the left and right side engine access panels.

B. Disconnect the battery. Remove the starter/generator (para. 13-119).

CAUTION

Cap or plug all open fluid/air lines and fittings to prevent contamination of the engine.

C. Pull the fuel shutoff valve "OFF".

D. Disconnect the fuel line from the fuel pump inlet. Disconnect the fuel filter differential pressure switch lines and the fuel pump seal drain line from the fuel pump.

E. Remove the fuel pump assembly from the engine. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

NOTE

Step F is applicable to aircraft equipped with the vented clutch oil reservoir.

F. Disconnect the vented clutch oil reservoir lines at the top and lower side of the ORC bearing housing.

G. Remove the Py - Pg pneumatic line from between the fuel control and the power turbine governor located under the ORC. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

H. Remove the safety from the service plugs (18) in the clutch cover (16). Place a suitable container under the clutch cover, remove one of the service plugs and drain the oil from the clutch by rotating the open port to the 6 o'clock position. Remove a second plug to help vent the system as the oil drains.

I. Remove the clutch cover retaining ring (21) and the clutch cover.

J. Remove the retaining ring (14), spacer/shim (12), and/or shims (13) from the end of the power output shaft.

K. Remove the nuts (10) and washers (11) securing the ORC bearing housing (3) to the accessory gearbox.

NOTE

If no bearing maintenance is required, it is not necessary to perform step L.

L. Remove the power output shaft assembly from the engine (para. 11-11).

M. Using a suitable plastic or brass drift/punch, remove the ORC (1) from the accessory gearbox by tapping the end of the ORC in the engine output shaft from the compressor side. When the gasket and o-ring release, remove the ORC from the accessory gearbox.

N. Remove the gasket (9) and o-ring (8) from the bearing housing assembly.

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11-6. Inspection - Overrunning Clutch

A. Inspect the ORC for metal flakes, contamination, scratches, nicks, damage, seal leakage, and proper oil level.

B. Inspect the bearings (5) for roughness and excessive wear.

C. Rotate the clutch in the overrunning direction and inspect for roughness or noise.

11-7. Repair - Overrunning Clutch

A. See Table 11-1 for damage limit and repair criteria for the splined outer shaft (1) and the bearing housing (3).

B. The ORC requires overhaul if roughness is felt or noise is heard when the clutch is rotated in the overrunning direction.

NOTE

If replacing a bearing housing seal, the bearings must also be replaced. Pressing the bearings housings from the clutch and power output shaft while removing a seal will damage the bearings. Do not reuse the bearings.

C. Replace a leaking bearing housing seal (2) and bearing (5) as follows:

(1) Remove the ORC from the engine (para. 11-5).

(2) Remove the retaining ring (7) from the splined outer shaft.

(3) Place the clutch assembly in the T-0186-11 tool (Figure 11-1a). Use the T-0186-9 segments to support the bearing housing (3).

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel. Use protective gloves when handling heated parts.

(4) Push the clutch assembly (shaft) from the bearing housing (3) using a press (hydraulic or arbor) (Figure 11-1b) and remove the shaft. If the shaft will not press out of the bearing housing assembly using moderate pressure, heat the bearing assembly to approximately 250°F/121°C and remove the shaft.

(5) Remove the retaining ring (6).

(6) Place the bearing housing assembly in the T-0186-11 and T-0186-9 tool (Figure 11-1b). Use the T-0186-13 tool to press the bearing set (5) from the bearing housing (3) and remove the bearing.

(7) Retain any shims (4) that are installed under the bearing (5).

(8) Turn the bearing housing (3) over and place in the T-0186-11 and T-0186-9 tool. Use the T-0186-13 tool and press the seal (2) out of the bearing housing (3).

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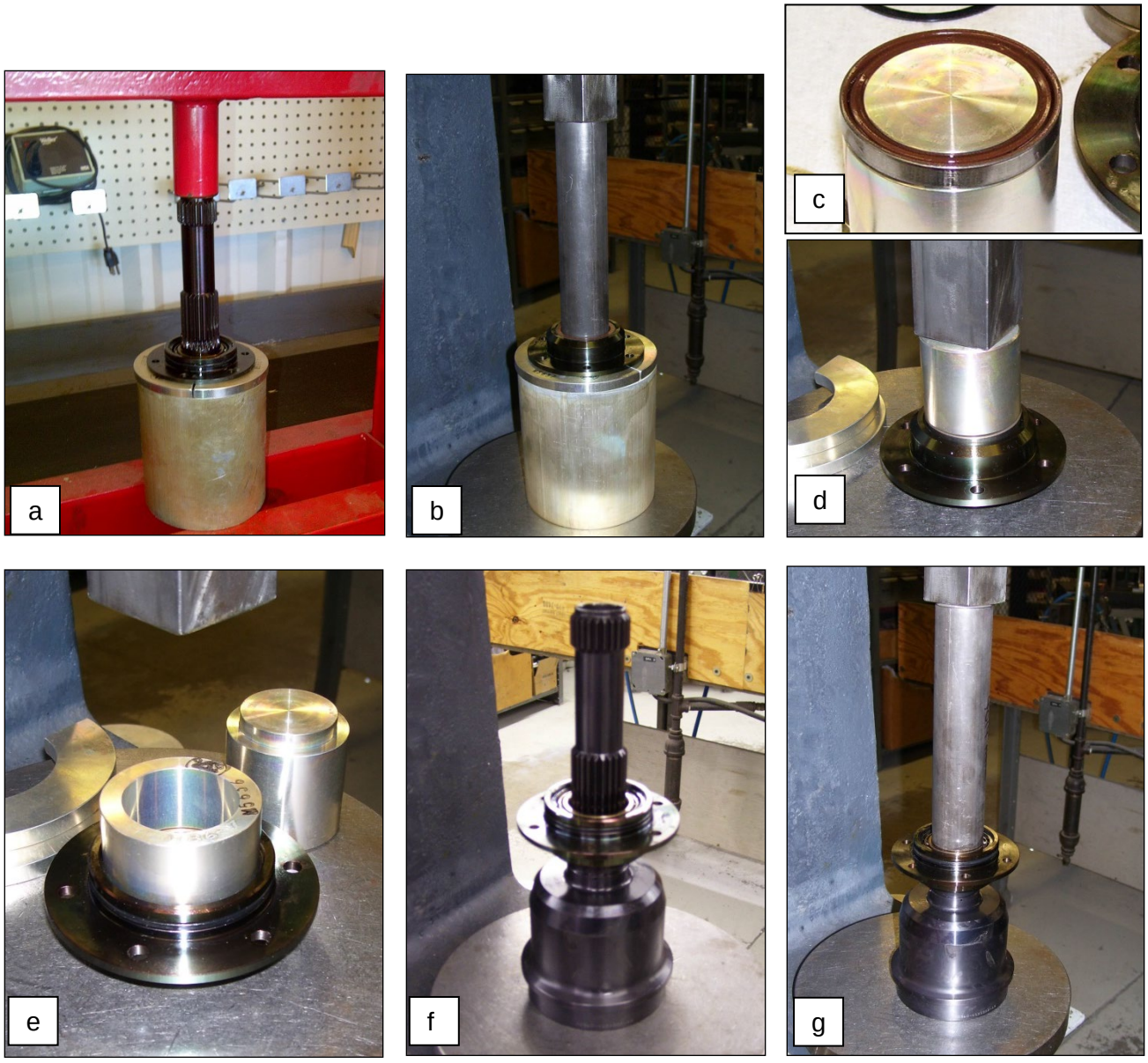


Figure 11-1. Examples of using tool T-0186 for the ORC assembly and ECD4014 bearing: (a) removing the power output shaft from the bearing housing, (b) removing the bearing from the bearing housing, (c,d) installing the seal into the bearing housing, (e) installing the bearing into the bearing housing, and (f,g) installing the bearing housing assembly onto the clutch shaft.

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D. Assemble the new seal and bearing into the bearing housing.

(1) Place a new seal (2) on the stepped end of T-0186-5. Press the seal into the bearing housing (3) (Figure 11-1c, d).

(2) Determine the amount of shims required for assembly.

a. Measure the distance from the seating surface in the bearing housing to the bottom of the retaining ring groove in the bearing housing (dimension is etched on newer bearing housings). Measure the height of the new bearing stack-up. Determine the amount of shims required to allow .000/.003 inch (.000/.076 mm) pinch fit between the bearing and the retaining ring.

(3) Install the shim stack-up from step (2) into the bearing housing (3).

CAUTION

When installing the bearing set into the bearing housing, pressure may be applied to only the outer race. Damage to the bearing will occur if pressure is applied to the inner race.

NOTE

The bearing set consists of a pair of bearings. The word THRUST on the face of the outer ring indicates the thrust side of the bearing. Also, on the thrust side will be an * mark on the face of the outer ring and an * mark on the face of the inner ring. When installing the bearing set into the bearing housing, best results will be obtained if the bearing set is positioned thrust sides facing together and with the * marks aligned axially (outer * to outer * and inner * to inner *).

(4) Place the bearing housing with the shims installed in the press. Use T-0186-7 to push the bearing set (5) into the bearing housing (Figure 11-1e).

(5) Install the retaining ring (6).

CAUTION

When installing the clutch assembly, pressure may be applied to only the inner race. Damage to the bearing will occur if pressure is applied to the outer race.

(6) Place the clutch assembly (1) in the press. Carefully place the bearing housing (3) onto the clutch shaft and press the bearing housing onto the clutch shaft (Figure 11-1f, g).

(7) Install the retaining ring (7).

E. If a different engine and/or accessory gearbox has been installed in the aircraft, determine if an offset bearing housing is required in accordance with paragraph 13-117, I and install the correct offset bearing housing on the ORC (para. 11-7. D)

11-8. Installation - Overrunning Clutch

NOTE

Replace all used O-rings/packings and gaskets.

CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

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CAUTION

If an offset bearing housing is installed on the ORC, ensure that the notches in the bearing housing are orientated in accordance with the previous maintenance entry or in accordance with the new orientation for the new engine/accessory gearbox combination from paragraph 13-117, I.

A. Lubricate (MIL-PRF-23699) the O-ring (8) on the ORC bearing housing (3). Install a new gasket (9) on the bearing housing. Install the ORC into the accessory gearbox.

B. Install and torque the mounting nuts (10) and washers (11).

C. Install the power output shaft (para. 11-14), if required.

NOTE

The power output shaft must be installed to perform steps C through E.

D. Install the spacer/shim (12) and/or required amount of shims (13) to have .004" to .006" distance/clearance between the spacer/shims and the retaining ring. Install the retaining ring (14).

NOTE

Install the spacer/shim and/or shims so that the thickest item is against the retaining ring.

E. Install the clutch cover (16), O-ring (15), and retaining ring (21). Replace the service plug O-rings (17) and the sight glass O-ring (19). Torque two of the service plugs (18) and sight glass (20) to 20 in-lb/2.3 Nm and lockwire (.025") to the cover.

NOTE

Step F is applicable to aircraft equipped with the vented clutch oil reservoir.

F. Connect the vented clutch oil reservoir oil lines.

G. Service the clutch (para. 4-10). Torque the remaining service plug to 20 in-lbs/2.3 Nm and lockwire (.025") to the cover.

H. Check for leaks.

I. Install the Py-Pg pneumatic line between the fuel control and the power turbine governor. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

J. Install the engine fuel pump assembly. Refer to the Roll-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

K. Connect the fuel filter differential pressure lines, fuel pump seal drain line and the fuel supply line to the fuel pump.

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L. Install the starter/generator (para. 13-122).

M. Perform a pneumatic leak check. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

N. Purge the air from the engine fuel system. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

O. Install the left and right side engine access panels.

WARNING

The following step is to be performed by authorized personnel only.

P. Perform a limited maintenance test flight (para. 4-61).

11-8.1. Vented Clutch Oil Reservoir (Figure 11-1.2)

11-8.2. Removal – Vented Clutch Oil Reservoir

NOTE

Some aircraft may be retrofitted with a vented clutch oil reservoir.

A. Open the left side engine access panel.

B. Disconnect the oil lines at the top and lower side of the ORC bearing housing.

C. Remove clip securing the vent line. Reinstall nut on the engine housing stud.

D. Loosen the hose clamp that secures the reservoir assembly to the mounting bracket. Remove the reservoir assembly and oil lines.

11-8.3. Inspection – Vented Clutch Oil Reservoir

A. Inspect the vented clutch oil reservoir for security, chaffing or cracks around clamping points, cracks in reservoir welds, leakage, proper vent operation, and proper oil level.

11-8.4. Installation – Vented Clutch Oil Reservoir

A. Install reservoir into hose clamp and secure.

B. Install clip.

C. Connect the oil lines to the bearing housing. Torque 95-105 in-lb / 10.7-11.9 Nm.

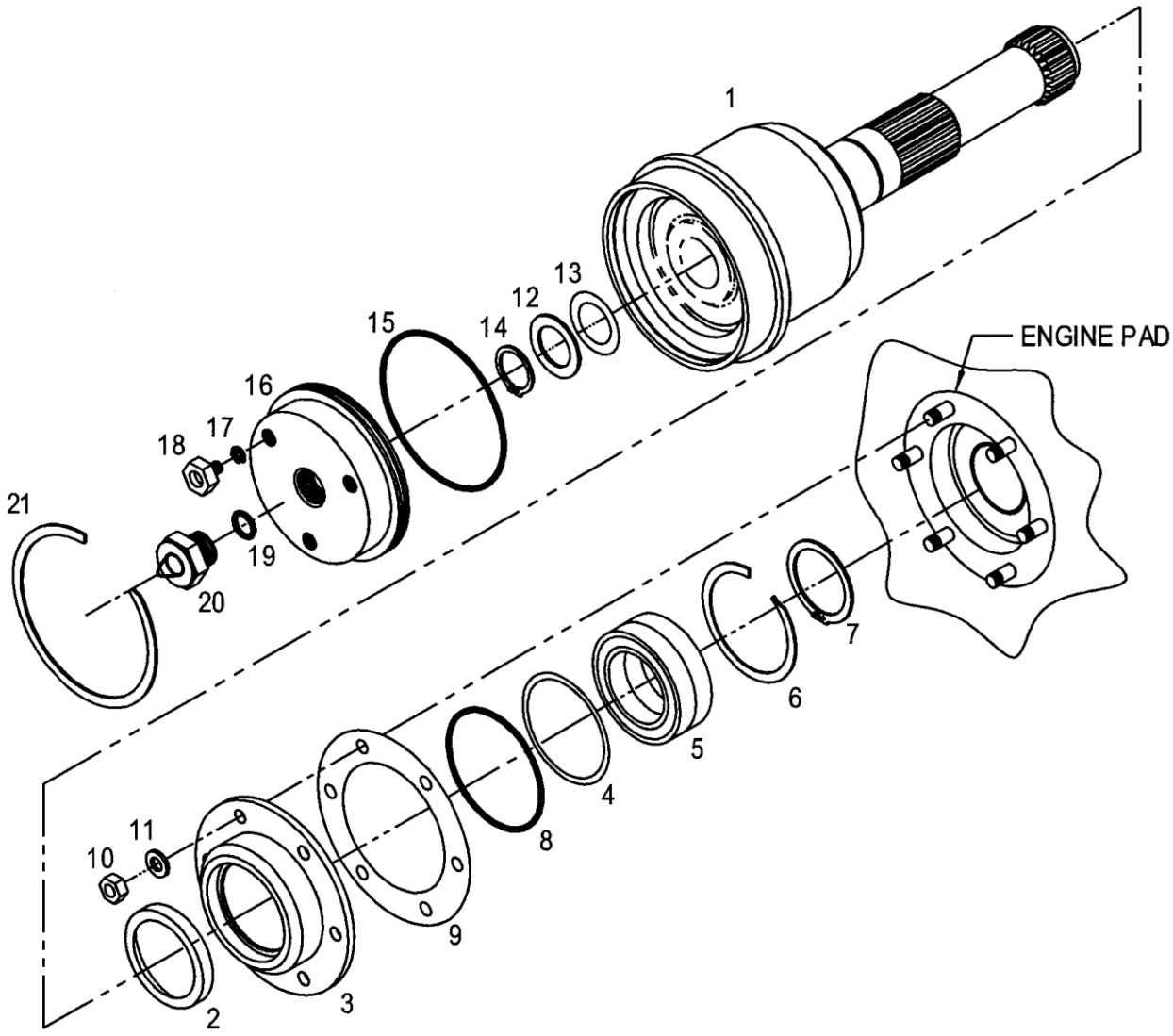
D. Service the clutch (para. 4-10).

E. Check for leaks.

F. Perform a maintenance ground run and check for leaks.

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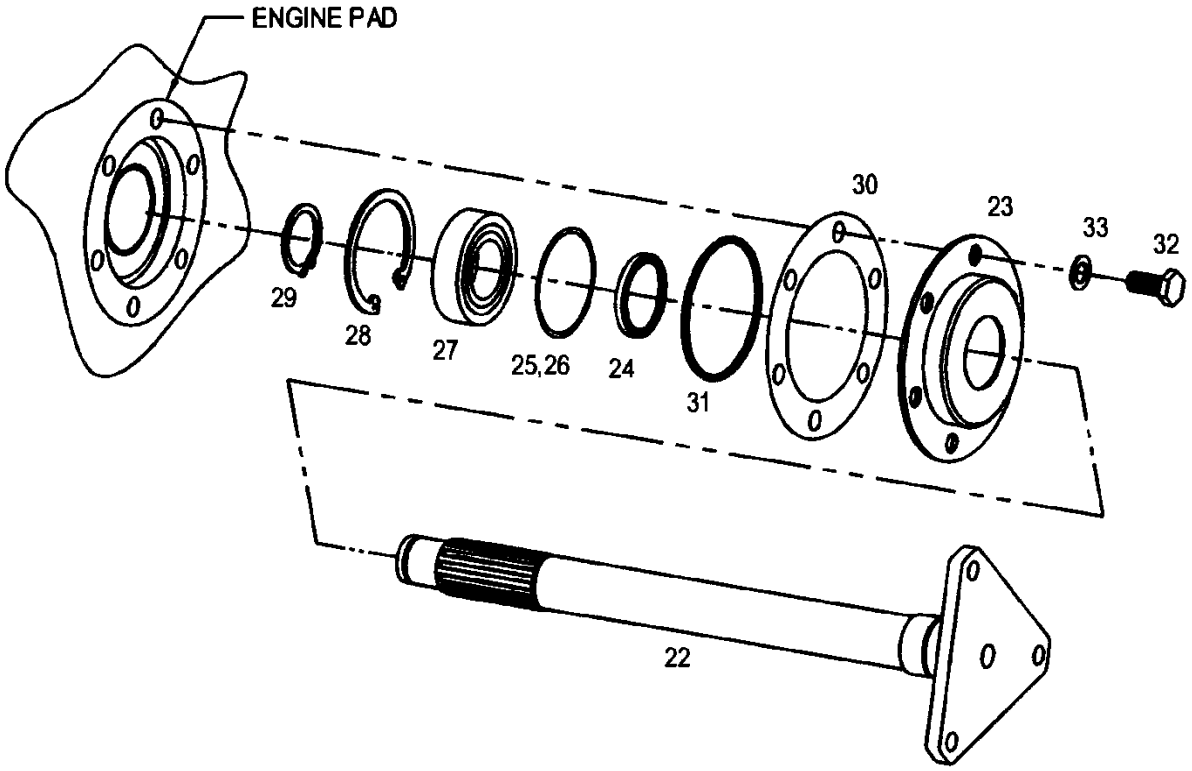


1. Overrunning Clutch
2. Seal
3. Bearing Housing
4. Shim
5. Bearing Set
6. Retaining Ring
7. Retaining Ring
8. O-ring
9. Gasket
10. Nut
11. Washer
12. Spacer/Shim
13. Shim
14. Retaining Ring
15. O-ring
16. Cover
17. O-ring
18. Plug
19. O-ring
20. Sight Glass
21. Retaining Ring

Sheet 1 of 2

Figure 11-1.1. Overrunning Clutch and Power Output Shaft

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22.	Power Output Shaft	28.	Retaining Ring
23.	Bearing Housing	29.	Retaining Ring
24.	Seal	30.	Gasket
25.	Shim	31.	O-ring
26.	Shim	32.	Bolt
27.	Bearing	33.	Washer

Figure 11-1.1. Overrunning Clutch and Power Output Shaft

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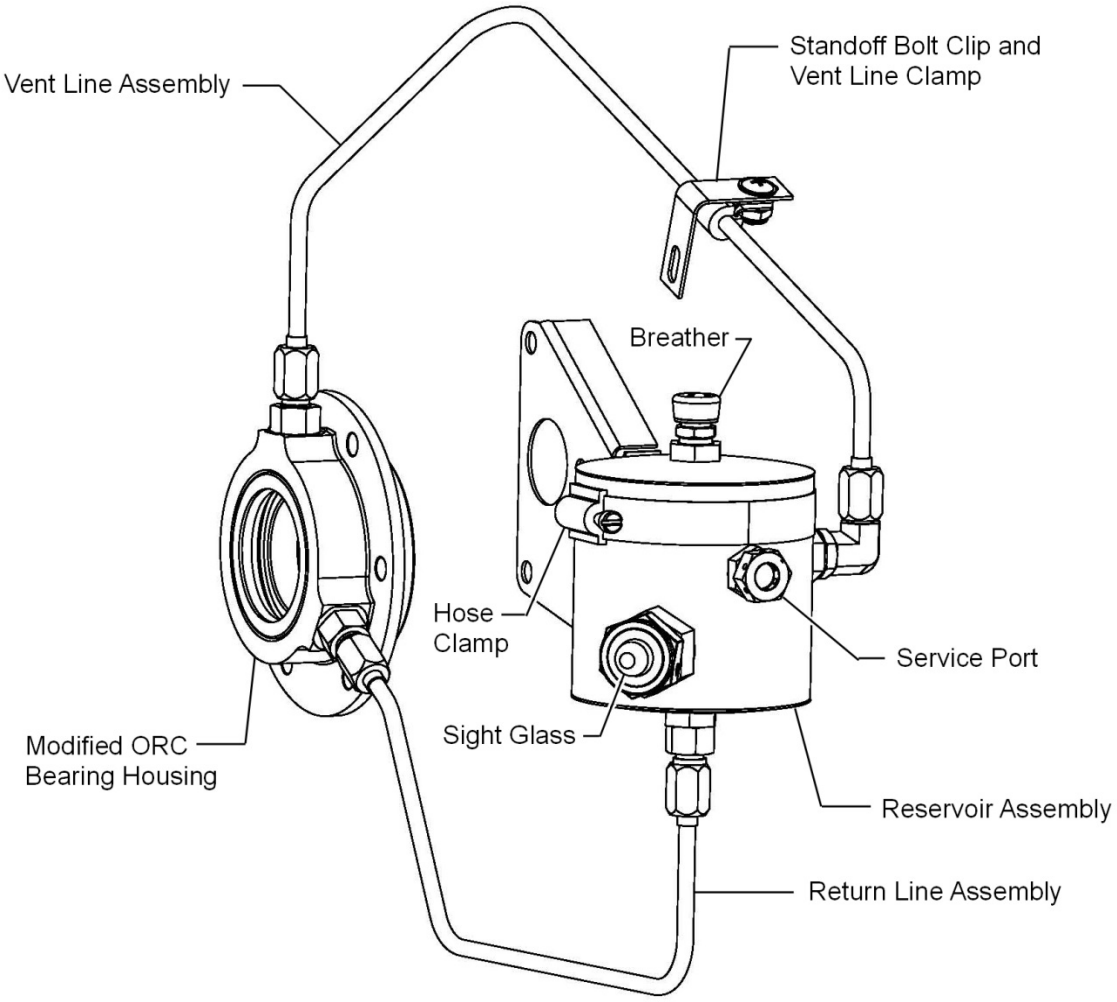


Figure 11-1.2. Vented Clutch Oil Reservoir

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11-9. Power Output Shaft

11-10. Description - Power Output Shaft

The power output shaft transmits engine power from the overrunning clutch to the lower pulley drive shaft. The power output shaft is installed on the power output pad on the rear side of the accessory gearbox. The shaft has a splined interface with the overrunning clutch (ORC) and is coupled to the lower pulley drive shaft by a flex pack coupling.

11-11. Removal - Power Output Shaft (Figure 11-1.1)

CAUTION

Prior to removing the power output shaft assembly, inspect the gearbox housing for a decal indicating that an offset bearing housing is installed. Maintenance records may also indicate if an offset bearing housing is installed. If a decal is present or maintenance entries indicate that an offset bearing housing is installed, visually verify that the notches in the bearing housing are orientated in accordance with the maintenance entry.

NOTE

The engine access panels do not need to be removed if the optional panel openers are installed.

A. Remove the left and right side engine access panels and the left and right aft side cowlings.

B. Disconnect the battery.

C. Remove the lower pulley assembly (para. 11-19).

D. Remove the safety from the service plugs (18) in the ORC cover (16). Place a suitable container under the clutch cover, remove one of the service plugs and drain the oil from the clutch by rotating the open port to the 6 o'clock position.

E. Remove the clutch cover retaining ring (21) and the clutch cover (16).

F. Remove the retaining ring (14), spacer (12), and shims (13) from the end of the power output shaft (22).

G. Remove the special bolts (32) and washers (33) securing the power output shaft bearing housing (23) to the accessory gearbox.

H. Using a suitable plastic hammer, remove the power output shaft assembly from the accessory gearbox by tapping the end of the shaft in the ORC. When the gasket and o-ring release, remove the power output shaft assembly from the accessory gearbox.

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I. Remove the gasket (30) from the bearing housing assembly.

NOTE

Cover the open overrunning clutch and rear power output pad on the engine.

11-12. Inspection - Power Output Shaft

A. Inspect the power output shaft for cracks, corrosion, bending, nicks, scratches, and spline wear.

B. Inspect the bearing and bearing housing for roughness, excessive wear, and seal leakage.

11-13. Repair - Power Output Shaft

A. See Table 11-1 for damage limit and repair criteria for the power output shaft (22) and the bearing housing (23).

NOTE

If replacing a bearing housing seal, the bearings must also be replaced. Pressing the bearings housings from the clutch and power output shaft while removing a seal will damage the bearings. Do not reuse the bearings.

B. Replace the bearing housing seal (24) and bearing (27) as follows:

(1) Remove the power output shaft (para. 11-11).

(2) Remove the retaining ring (29) from the power output shaft.

(3) Place the drive shaft assembly in the T-0186-11 and T-0186-9 tool. Press the shaft from the bearing housing assembly (23) (Figure 11-1.3a).

(4) Remove the retaining ring (28) from the bearing housing assembly.

(5) Place the bearing assembly in the T-0186-11 and T-0186-9 tool. Using tool T-0186-15, press the bearing from the bearing housing assembly (Figure 11-1.3b).

(6) Remove the seal (24) by inserting a small screw driver or pick under the seal and prying it out.

C. Assemble a new seal and bearing into the bearing housing.

(1) Place a new seal (24) on the stepped end of T-0186-3. Press the seal into the bearing housing (23) (Figure 11-1.3c and Figure 11-1.3d).

(2) Determine the amount of shims required for assembly.

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a. Measure the distance from the seating surface in the bearing housing to the bottom of the retaining ring groove in the bearing housing (dimension is etched on newer bearing housings). Measure the height of the new bearing. Determine the amount of shims required to allow .000/.003 inch (.000/.076 mm) pinch fit between the bearing and the retaining ring.

(3) Install the shim stack-up from step (2) into the bearing housing (23).

CAUTION

When installing the bearing into the bearing housing, pressure may be applied to only the outer race. Damage to the bearing will occur if pressure is applied to the inner race.

(4) Place the bearing housing with the shims installed in the press. Use T-0186-3 to push the bearing (27) into the bearing housing.

(5) Install the retaining ring (28) into the bearing housing (23).

D. Install the drive shaft (22) into the bearing housing (23).

(1) Place the bearing housing on the T-0186-5 tool with the stepped end up (Figure 11-1.3e).

(2) Press the shaft into the bearing housing until the shoulder on the shaft seats into the bearing inner race (Figure 11-1.3f).

E. Install the retaining ring (29) onto the power output shaft.

F. If a different engine and/or accessory gearbox has been installed in the aircraft, determine if an offset bearing housing is required in accordance with paragraph 13-117, I and install the correct offset bearing housing on the power output shaft (para. 11-13, B).

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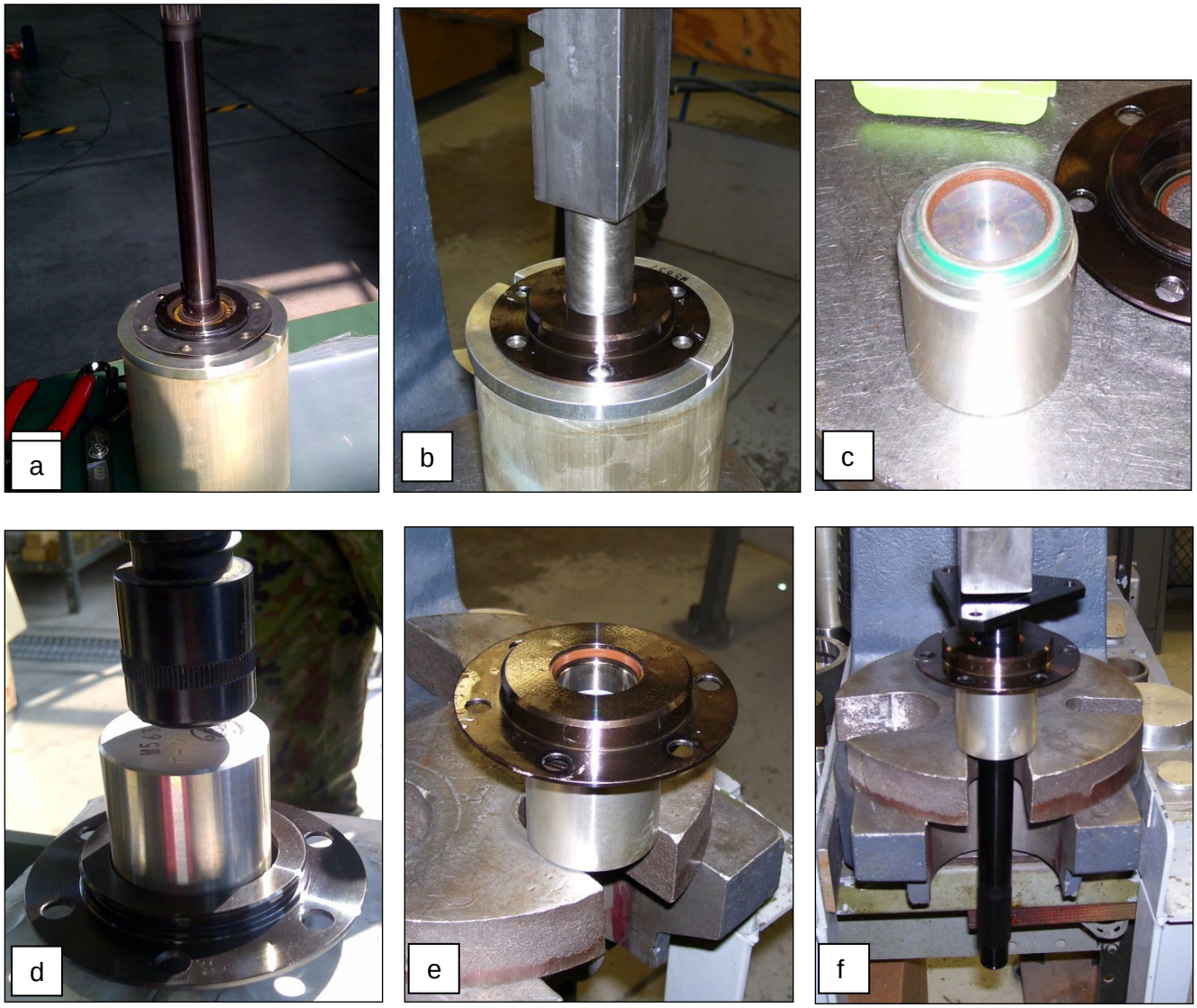


Figure 11-1.3. Examples of using tool T-0186 for the power output shaft and ECD4017 bearing: (a) removing the power output shaft from the bearing housing, (b) removing the bearing from the bearing housing, (c, d) installing the seal into the bearing housing, and (e, f) installing the bearing housing assembly onto the power output shaft.

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Table 11-1. Overrunning Clutch and Power Output Shaft Assemblies

			Inspection Requirements*			
P/N	Fig. 11-1 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
4131002	1	Splined Outer Shaft	Bearing Housing Seal Surface Dia. 1.495 to 1.505	-.002	Not Repairable	Replace Shaft
			Support Bearing Surface Dia. 1.3781 to 1.3785	-.0005	Not Repairable	Replace Shaft
			Cracks	None Allowed	Not Repairable	Replace Shaft
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
4131006	3	Bearing Housing	Seal Bore Dia. 1.918 to 1.922	+.002	Not Repairable	Replace Housing
			Bearing Bore Dia. 2.1648 to 2.1654	+.0003	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
			Nicks, scratches, or pits	.030 deep	≤ .030 deep	Blend out smooth
ECD4014	6	Bearing	Roughness, spalling, pits, or corrosion	None Allowed	Not Repairable	Replace Bearing
4131003	22	Splined Drive Shaft	Seal and Support Bearing Surface Dia. .9844 to .9849	-.0003	Not Repairable	Replace Shaft

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Table 11-1. Overrunning Clutch and Power Output Shaft Assemblies

P/N	Fig. 11-1 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
4131003	22	Splined Drive Shaft (Cont'd)	Pilot Bushing Surface Dia. .7788 to .7792	-.0002	Not Repairable	Replace Shaft
			Cracks	None Allowed	Not Repairable	Replace Shaft
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Bent Flanges	.002	Not Repairable	Replace Shaft
			Threads (rolled or missing)	None Allowed	Not Repairable	Replace Shaft
4131007	23	Bearing Housing	Seal Bore Dia. 1.375 to 1.379	+.002	Not Repairable	Replace Housing
			Bearing Bore Dia. 1.8498 to 1.8504	+.0003	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
ECD4017	27	Bearing	Roughness, spalling, pits, or corrosion	None Allowed	Not Repairable	Replace Bearing

* All dimensions are in inches.

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11-14. Installation - Power Output Shaft

CAUTION

If an offset bearing housing is installed on the power output shaft, ensure that the notches in the bearing housing are orientated in accordance with the previous maintenance entry or in accordance with the new orientation for the new engine/accessory gearbox combination from paragraph 13-117, I.

NOTE

Replace all used O-rings/packings and gaskets.

A. Lubricate (MIL-PRF-23699) the O-ring (31) on the power output shaft bearing housing (23). Install a new gasket on the bearing housing assembly. Install the power output shaft (22) into the accessory gearbox.

B. Install and torque the special mounting bolts (32) and washers. Tighten and lockwire (.025) in pairs.

C. Install the spacer (12) and/or required amount of shims (13) to have a .004" to .006" distance/clearance between the spacer/shims and the retaining ring. Install the retaining ring (14).

NOTE

Install the spacer/shim and/or shims so that the thickest item is against the retaining ring.

D. Install the clutch cover (16), o-ring (15), and retaining ring (21).

E. Install the lower pulley assembly (para. 11-24).

F. Verify the engine to lower pulley assembly alignment (para. 11-17).

G. Service the overrunning clutch (para 4-10).

H. Install the left and right side engine access panels and the left and right aft side cowlings.

WARNING

The following step to be performed by authorized personnel only.

I. Perform a limited maintenance test flight (para. 4-61).

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11-15. Lower Pulley Drive System

11-16. Description – Lower Pulley Drive System (Figure 11-2)

The lower pulley drive system consists of the lower pulley drive shaft and hub, lower pulley, "H"- strut, and flex pack couplings. The lower pulley drive shaft, located in the hollow center of the lower pulley assembly, is connected to the power output shaft and the lower pulley assembly via flex pack couplings. The lower pulley shaft is also used to drive the oil cooler blower fan by a hub attached to the aft end of the lower pulley drive shaft. The lower pulley has two positioning links attached to the right side of the bearing housings. The links are used to laterally align the lower pulley to the engine. Thermocouples are installed in the lower pulley bearing housings to provide temperature input for the drive bearing hot caution panel segment (DRIVE BRG HOT). The "H"- strut, used to tension the drive belt, is connected to the lower pulley at the lower end and to the pinion bearing support truss and the main rotor transmission at the upper end. The flex pack couplings consist of multiple stainless steel plates bolted to the drive flanges. The flex pack couplings will allow up to 1.5° of misalignment between the power output shaft and the lower pulley drive shaft.

11-17. Alignment – Lower Pulley Drive

NOTE

Work Aid Document (WAD) T-001; Aligning the TH-28/480 Series Lower Drive System provides additional reference information for aligning the lower drive system in the TH-28/480 Series helicopters. Use **WAD T-001** as additional reference information for the procedures that follow in this paragraph (para. 11-17).

A. Prepare to align the lower pulley drive system using the following steps:

(1) Remove the left and right side engine access panels, baggage compartment door, forward baggage compartment panels, and oil cooler/step access panel.

(2) Remove the upper plenum/air inlet (para. 13-28).

(3) Remove the air exit duct center panel from the pylon.

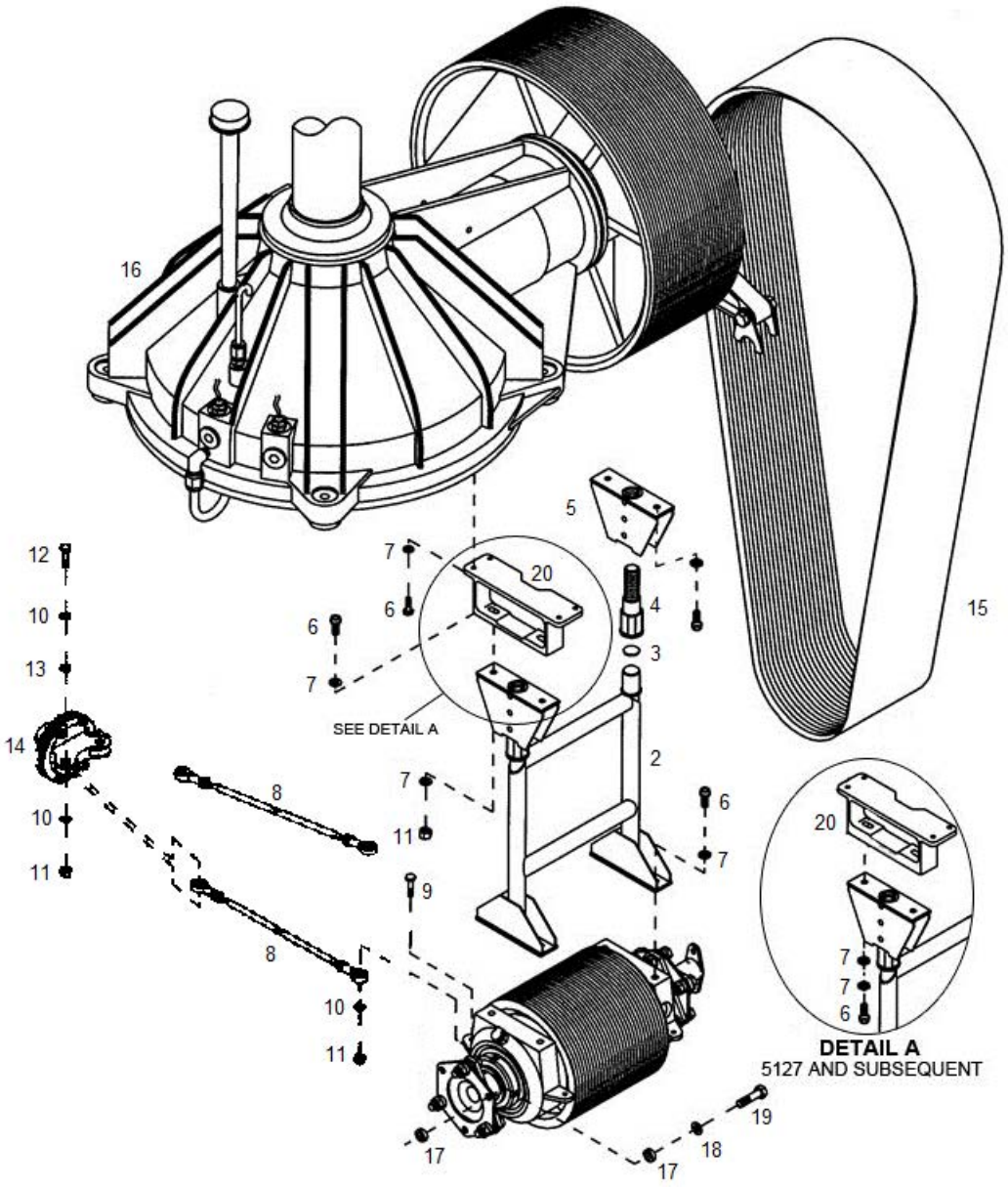
(4) Disconnect the battery. Disconnect the electrical leads from the ignition module. Remove the ignition module from its mounts. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

(5) Remove the intermediate oil cooler blower drive shaft (para. 13-75).

(6) Remove the oil cooler inlet ducting (para. 13-82).

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1.	Lower Pulley Assembly	11.	Nut
2.	H-Strut	12.	Bolt
3.	Bearing	13.	Spacer
4.	Jackscrew	14.	Isolation Mount
5.	Tension Mount	15.	Drive Belt
6.	Bolt	16.	Main Rotor Transmission
7.	Washer	17.	Spacer
8.	Tie Rod	18.	Washer
9.	Bolt	19.	Special Bolt
10.	Washer	20.	Fitting

Figure 11-2. Lower Pulley Drive System

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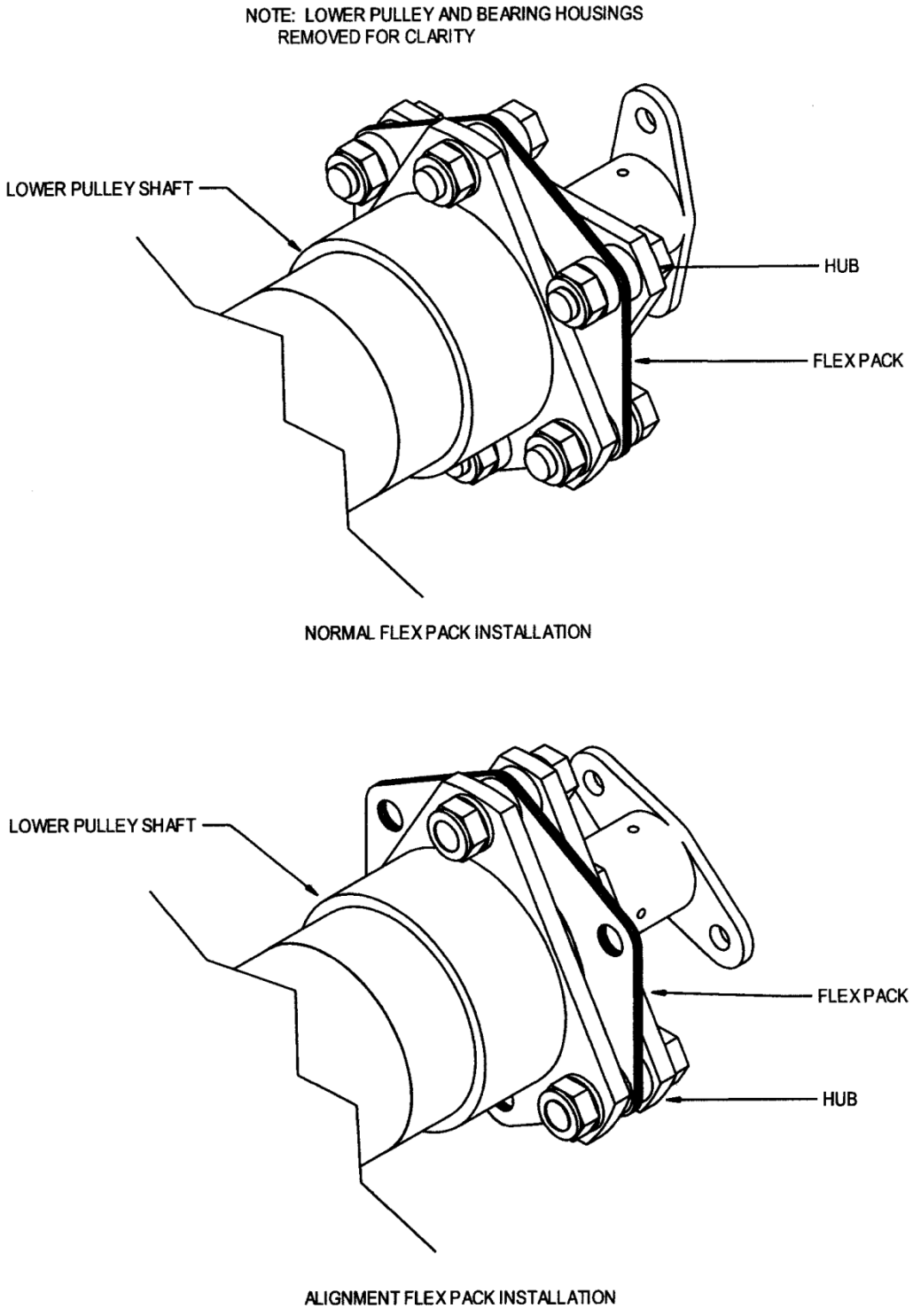
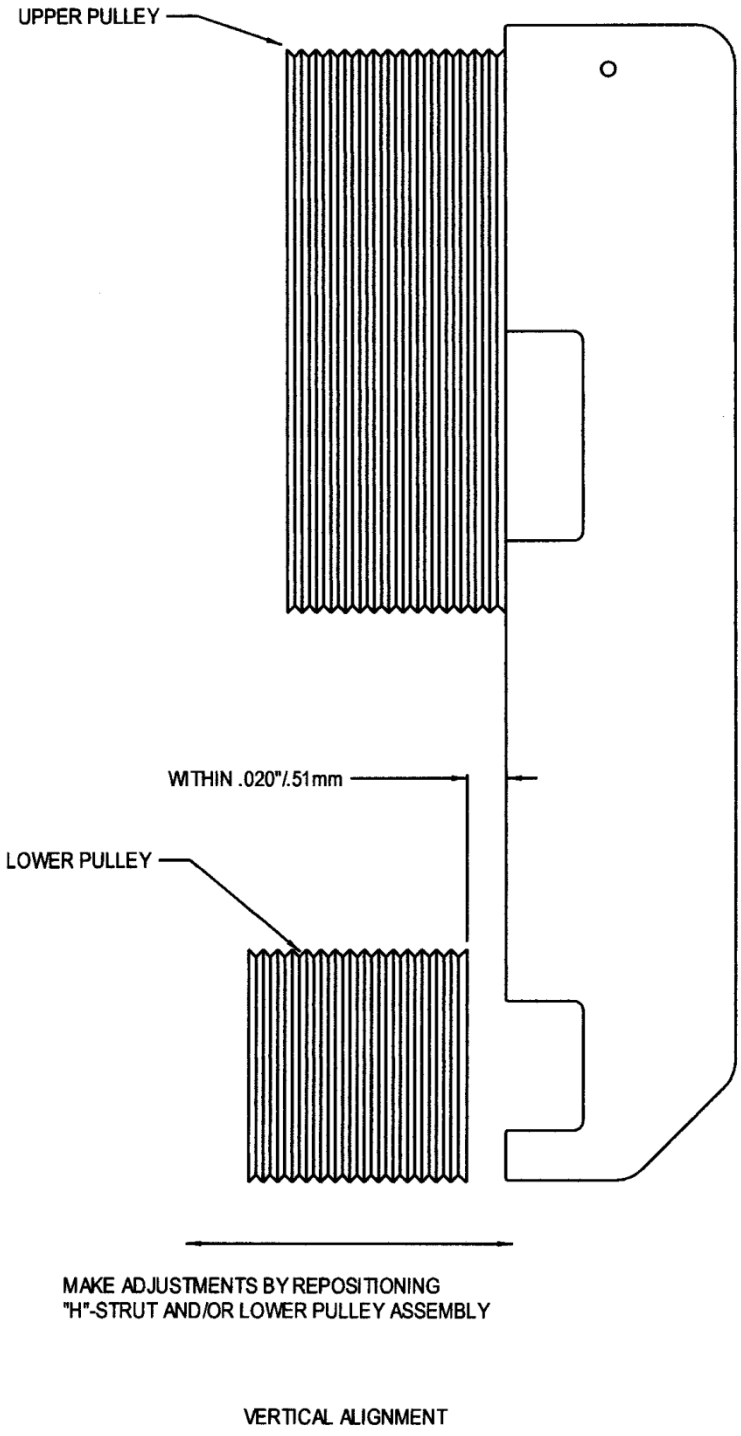


Figure 11-3. Lower Pulley Alignment Preparation

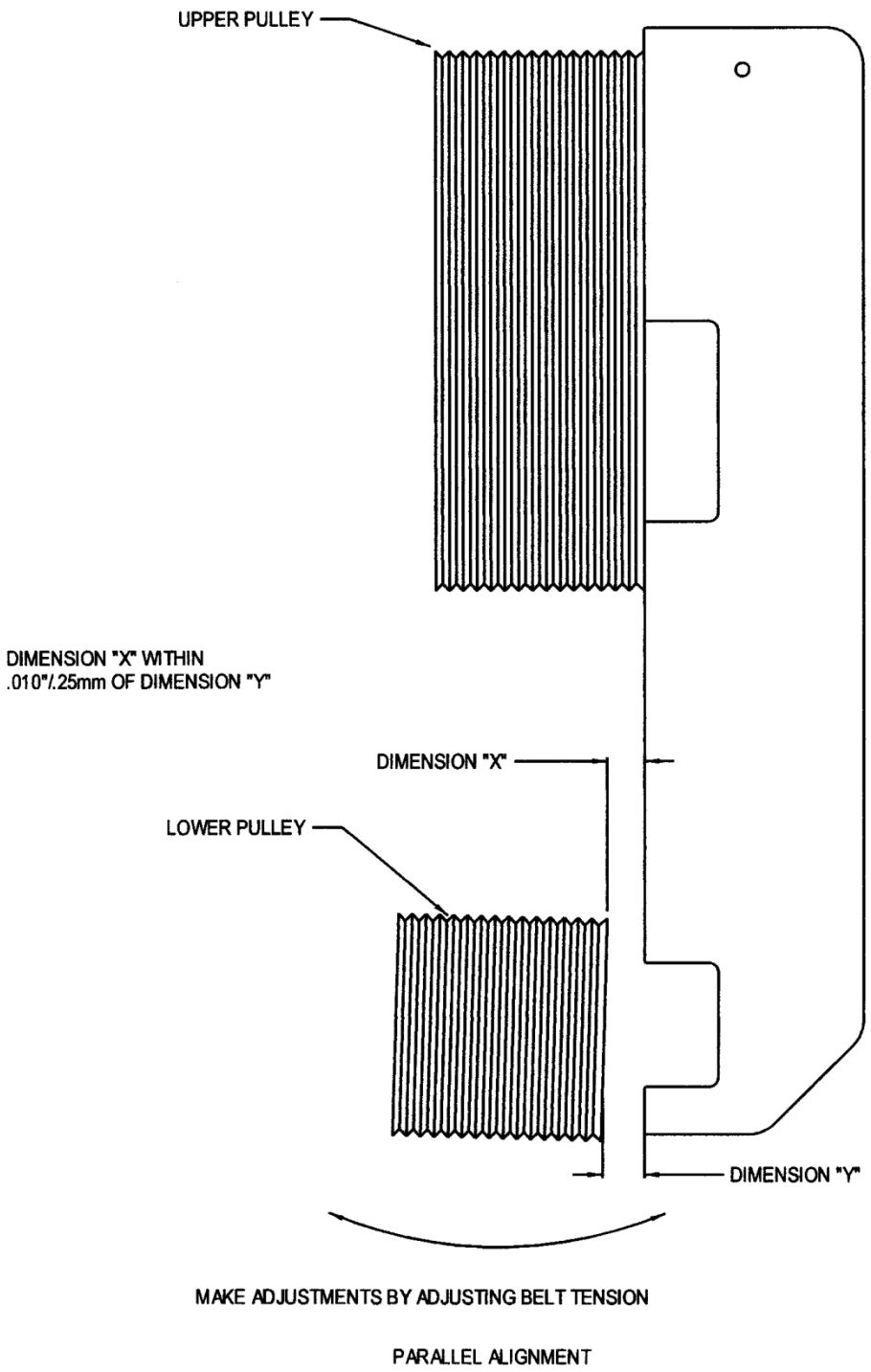
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Figure 11-4. Lower Pulley Alignment

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Sheet 2 of 2

Figure 11-4. Lower Pulley Alignment

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CAUTION

The bolts connecting the forward flex pack to the power output shaft have shortened thread grip lengths. Do not replace with standard hardware.

(7) Disconnect the forward flex pack from the power output shaft. Keep the bolts, washers, and spacers together.

(8) Remove the forward flex pack from the lower pulley drive shaft. Keep the bolts, washers, and spacers together.

(9) Disconnect the lower pulley drive shaft hub from the aft flex pack coupling.

(10) Disconnect the flex pack coupling from the lower pulley shaft.

(11) Install one of the forward flex pack coupling bolts in the forward end of the lower pulley drive shaft.

(12) Reassemble the aft flex coupling so the flex pack coupling is bolted directly to both the lower pulley shaft and the lower pulley drive shaft hub. Install equal thickness spacers between the flex pack and the shaft/hub flanges (Refer to Figure 11-3).

(13) Disconnect the positioning links from the right side of the lower pulley bearing housings.

B. Align the upper and lower pulleys using the following procedure:

(1) Tension the drive belt to the proper tension (para. 11-29,E).

NOTE

"H"-struts have been manufactured with both elongated and non-elongated holes for attaching the "H"-strut to the lower pulley assembly. For non-elongated hole "H"-struts, the vertical misalignment may up to approximately .030"/.76 mm and cannot be adjusted.

(2) Check the alignment of the upper and lower pulleys using the alignment tool (T-0141). The pulleys must be within .020"/.51 mm vertical alignment and within .010 "/.25 mm parallel alignment (Refer to Figure 11-4).

(3) If the alignment is acceptable, proceed to step C. If the vertical alignment is not acceptable, remove the tension from the belt and reposition the lower pulley assembly by loosening the torque on the bolts securing the "H"-strut to the lower pulley assembly or to the main rotor transmission and truss assembly, repositioning the pulley assembly and torque the bolts. Tension the drive belt and recheck the vertical alignment. If the parallel alignment is not acceptable, the tension on the front and/or back side of the belt may be adjusted to bring the alignment within limits. The belt tension range is from 1,750-2,500 lbs.

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NOTE

The tension on the front and aft side of the belt does not have to be the same. The maximum difference allowed is 250 lbs.

C. Align the lower pulley drive shaft to the power output shaft using the following procedure:

(1) Attach the positioning links to the right side of the lower pulley bearing housings.

(2) Position the lower pulley drive shaft so that the bolt is at the 12 o'clock position. Rotate the power output shaft so one of its flanges is at the 12 o'clock position. Check the vertical alignment by observing the position of the bolt in relation to the bolt hole in the power output shaft and attempting to install the bolt into the power output shaft using finger pressure. If excessive vertical misalignment is apparent, proceed to step (3). Rotate the bolt to either the 3 or 9 o'clock position and rotate one of the power output shaft flanges to the same position. Observe the lateral alignment of the shafts again by observing the relation of the bolt to the bolt hole in the power output shaft and attempting to install the bolt into the power output shaft using finger pressure. Adjust the positioning links to laterally align the shafts. Recheck the vertical alignment. The alignment of the lower pulley to the power output shaft is correct when the bolt can be installed into the power output shaft using finger pressure. Proceed to step (3) if the engine requires reshimming.

(3) Loosen the jam nut and the mount nut on the top engine mount. Loosen the hardware securing the left and right side engine mounts to the pylon. Add/subtract the required amount of shims to align the power output shaft to the lower pulley drive shaft. Tighten the hardware securing the engine mounts to the pylon. Ensure the washer stack-up is sufficient to prevent the nuts from bottoming on the engine mount bolts. Retighten the top mount nut until it contacts the pylon mount and tighten one more flat. After acceptable alignment has been verified, tighten the jam nut against the mount nut and lockwire the mount nut and jam nut.

(4) If the engine is shimmed, verify the rigging of the droop compensator system (para. 13-109).

(5) Recheck the vertical and lateral alignment of the shafts. Readjust the positioning links or engine shims as required until the shafts are aligned.

(6) Position the power output shaft and lower pulley drive shaft so they both have a flange at the 3 or 9 o'clock position. Using a telescoping gauge and a micrometer or a feeler gage, measure the distance between the shaft flanges. Record the measurement and rotate the shafts 180°. Measure the gap and compare the two measurements. Adjust the aft positioning link until the flange faces are parallel within .010 "/.25 mm. Recheck the vertical and lateral alignment. If the alignment is acceptable, proceed to step D. If the alignment is not acceptable, make adjustments.

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D. Align the oil cooler blower shaft to the lower pulley using the following procedure:

(1) If installed, remove the inlet duct and the cover from the back of the impeller shroud on the TH-28. If installed, remove the inlet duct and the forward sheet metal panels from the baggage compartment on the 480/480B.

(2) If installed, remove the intermediate drive shaft from between the blower assembly and the lower pulley. Remove the flex packs from the intermediate drive shaft and the oil cooler blower shaft assembly as applicable. Reconnect the intermediate drive shaft to the drive hub on the lower pulley assembly with the flanges of the drive hubs bolted together through tool T-0166.

(3) Loosen the split clamps (bearing housings) securing the oil cooler blower shaft bearings.

(4) Rotate the shafts so that the flanges are at the 12 and 6 o'clock positions. Using one of the bolts from the flex pack installation, attempt to insert the bolt through both drive hubs. The bolt should fit without having to force it into the hubs (“slip fit” tolerance). Adjust the vertical position of the oil cooler blower shaft assembly by adding/removing shims between the bearing housings and the bearing mounts. After the vertical alignment is complete, measure the distance between the flange faces at the 12 and 6 o'clock position. Add/Remove shims as required until the flange faces are parallel to within .005"/.13 mm. Using one of the bolts from the flex pack installation, attempt to insert the bolt through both drive hubs (intermediate drive shaft and oil cooler blower shaft) with the flanges positioned at 3 and 9 o'clock. The bolt should fit without having to force it into the hubs (“slip fit” tolerance). Adjust the oil cooler blower shaft lateral alignment by repositioning the bearing mounts on the oil cooler shelf. If required, the adjustment slots in the oil cooler bearing housing supports may be elongated to allow for more lateral adjustment of the oil cooler blower assembly. (Refer to Figure 11-5.1 for the slot limits.) After the lateral alignment adjustments are made, measure the distance between the flanges at the 3 and 9 o'clock positions. Adjust the position of the aft bearing mount until the flange faces are parallel to within .005"/.13 mm. Recheck the vertical and lateral alignment and make any adjustments as required.

CAUTION

Ensure the oil cooler blower fan does not contact the blower fan shroud.

(5) Retighten bearing clamps (bearing housings) after shaft alignment is accomplished.

(6) Remove the intermediate drive shaft and tool T-0166.

(7) Install the cover onto the aft side of the impeller shroud on the TH-28. Install the forward sheet metal panels of the baggage compartment on the 480/480B.

E. Reassemble the lower pulley drive system as follows:

(1) Disassemble the aft flex pack coupling.

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NOTE

Ensure the spacers are installed with the beveled face toward the flex pack coupling.

NOTE

If components of the lower pulley assembly have been replaced, the thickness of the spacers used on the forward flex pack coupling may have to be changed.

(2) Install the forward flex pack coupling on the lower pulley drive shaft.

NOTE

Place the thick spacers between the flex pack coupling and the lower pulley and lower pulley drive shaft hub flanges.

(3) Install the aft flex pack coupling on the lower pulley drive shaft hub and connect the hub and coupling to the lower pulley shaft.

NOTE

If components of the lower pulley assembly have been replaced, the thickness of the spacers used on the forward flex pack coupling may have to be changed.

CAUTION

The bolts connecting the forward flex pack to the power output shaft have shortened thread grip lengths. Do not replace with standard hardware.

(4) Connect the forward flex pack coupling to the power output shaft and safety wire (.032) (para. 11-24, F).

(5) Install the ignition module on the engine and connect the electrical leads. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

NOTE

Ensure the spacers are installed with the beveled face toward the flex pack coupling.

(6) Install the intermediate oil cooler blower shaft (para. 13-80).

(7) Install the oil cooler inlet ducting (para. 13-85).

(8) Install the upper plenum/air inlet (para. 13-31).

(9) Install the left and right side engine access panels and the left and right aft side cowlings.

F. Perform a limited maintenance test flight (para. 4-61).

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11-18. Lower Pulley Assembly

11-19. Removal – Lower Pulley Assembly (Figure 11-2)

A. Remove the left and right side engine access panels and the left and right aft side cowlings.

B. Remove the upper plenum/air inlet (para. 13-28).

C. Disconnect the battery. Disconnect the electrical leads from the ignition module. Remove the ignition module from its mounts. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

D. Remove the intermediate oil cooler blower drive shaft (para. 13-75)

E. Disconnect the positioning links from the right side of the lower pulley bearing housings.

CAUTION

The bolts connecting the forward flex pack to the power output shaft have shortened thread grip lengths. Do not replace with standard hardware.

F. Remove the safety wire from the bolts connecting the forward flex pack coupling to the power output shaft. Disconnect the forward flex pack coupling from the power output shaft.

G. Disconnect the drive bearing thermocouples at the quick disconnects.

H. Release the tension on the drive belt.

I. Remove the hardware that attaches the "H"- strut to the main rotor transmission and the aft pinion bearing support truss.

J. Turn the jackscrews completely into the "H"- strut tension mounts. Rotate the "H"- strut to the left and remove the tension mounts from the "H"- strut. Remove the load bearing plugs from the end of the "H"-strut (older “H”-strut assemblies) and the flat bearings.

K. Lift the lower pulley off of the drive belt and remove it from the aircraft.

L. Remove the positioning links from the attachment fitting on the pylon. Identify the links "fore" and "aft".

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11-20. Disassembly – Lower Pulley Assembly (Figure 11-6)

A. Remove the temperature thermocouples from the bearing housings.

B. Remove the "H"- strut from the pulley bearing housings.

C. Remove the intermediate oil cooler blower drive shaft hub from the pulley drive shaft.

D. Remove the forward flex pack coupling from the pulley drive shaft.

E. Install the lower pulley adapter (Refer to Figure 11-5) on the pulley drive shaft. Place the pulley assembly vertically in a vise and remove the pulley drive shaft retaining nut.

F. Lift the pulley assembly off of the pulley drive shaft.

G. Disconnect the aft flex pack coupling from the lower pulley driven shaft. Remove the aft flex pack coupling from the pulley drive shaft hub.

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

H. Remove the lower pulley adapter from the lower pulley drive shaft and reinstall the adapter on the lower pulley driven shaft. Place the lower pulley assembly vertically in a vise and remove the lower pulley assembly nut using tool T-0051. Remove the pulley assembly from the vise and remove the lower pulley adapter.

I. Remove the drain plugs from the bearing housings and drain the oil from the lower pulley bearing housings (Oil lubricated lower pulley assemblies only).

J. Heat the lower pulley assembly to approximately 250°F/121°C. Press the lower pulley driven shaft from the pulley using a hydraulic press.

NOTE

The bearing housing assembly and the spacer installed in the aft end of the pulley should come out of the pulley assembly with the drive shaft; however, depending on the amount of expansion from heating the pulley assembly they might remain in the pulley.

K. Press the drive shaft from the bearing housing assembly and the spacer if they came out of the pulley with the drive shaft.

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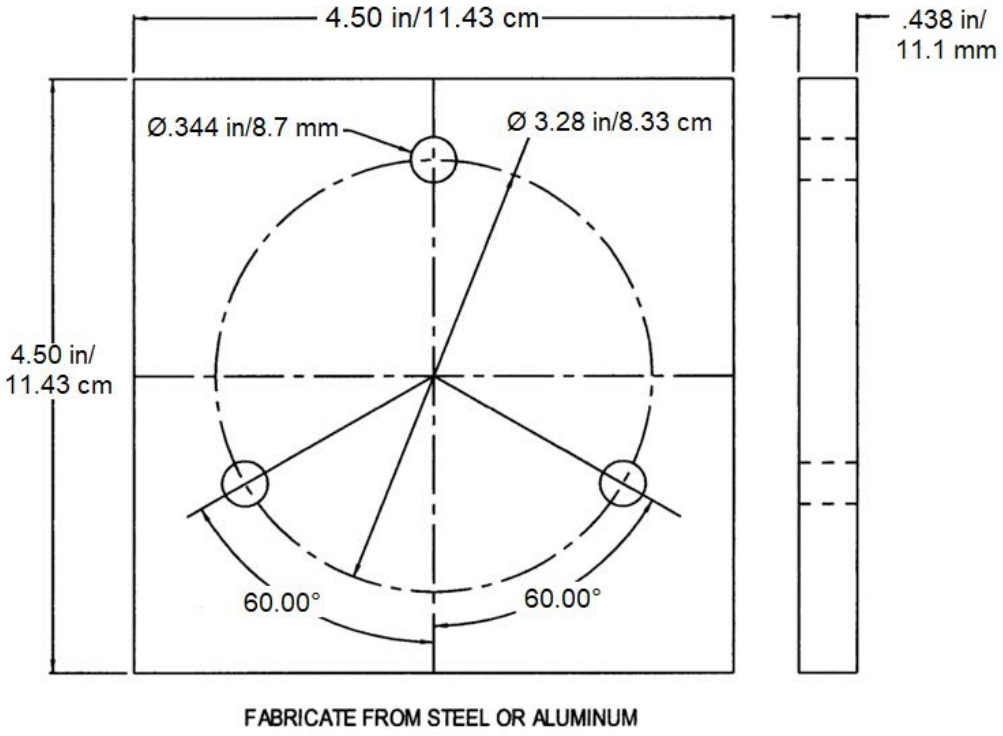


Figure 11-5. Lower Pulley Adapter

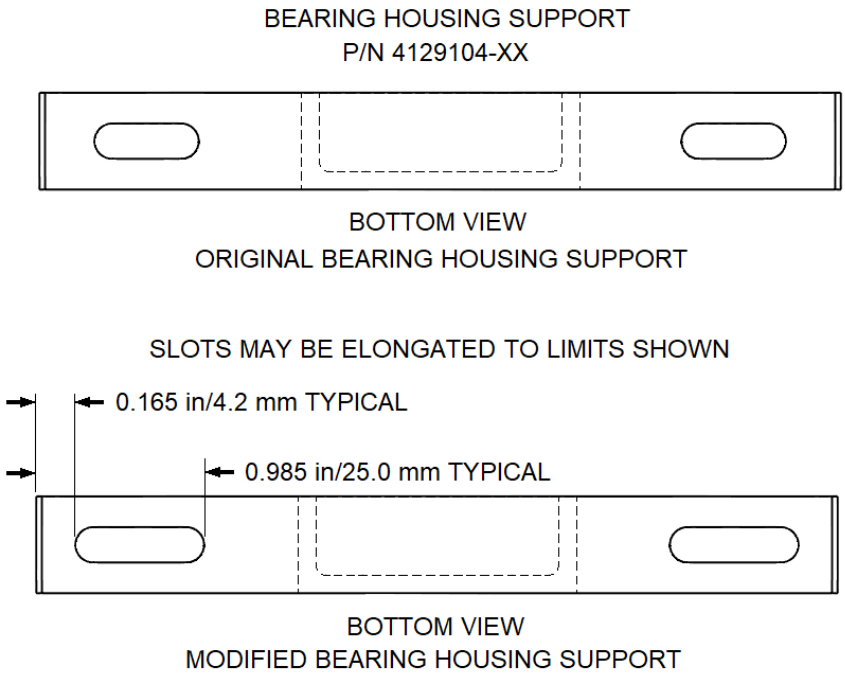
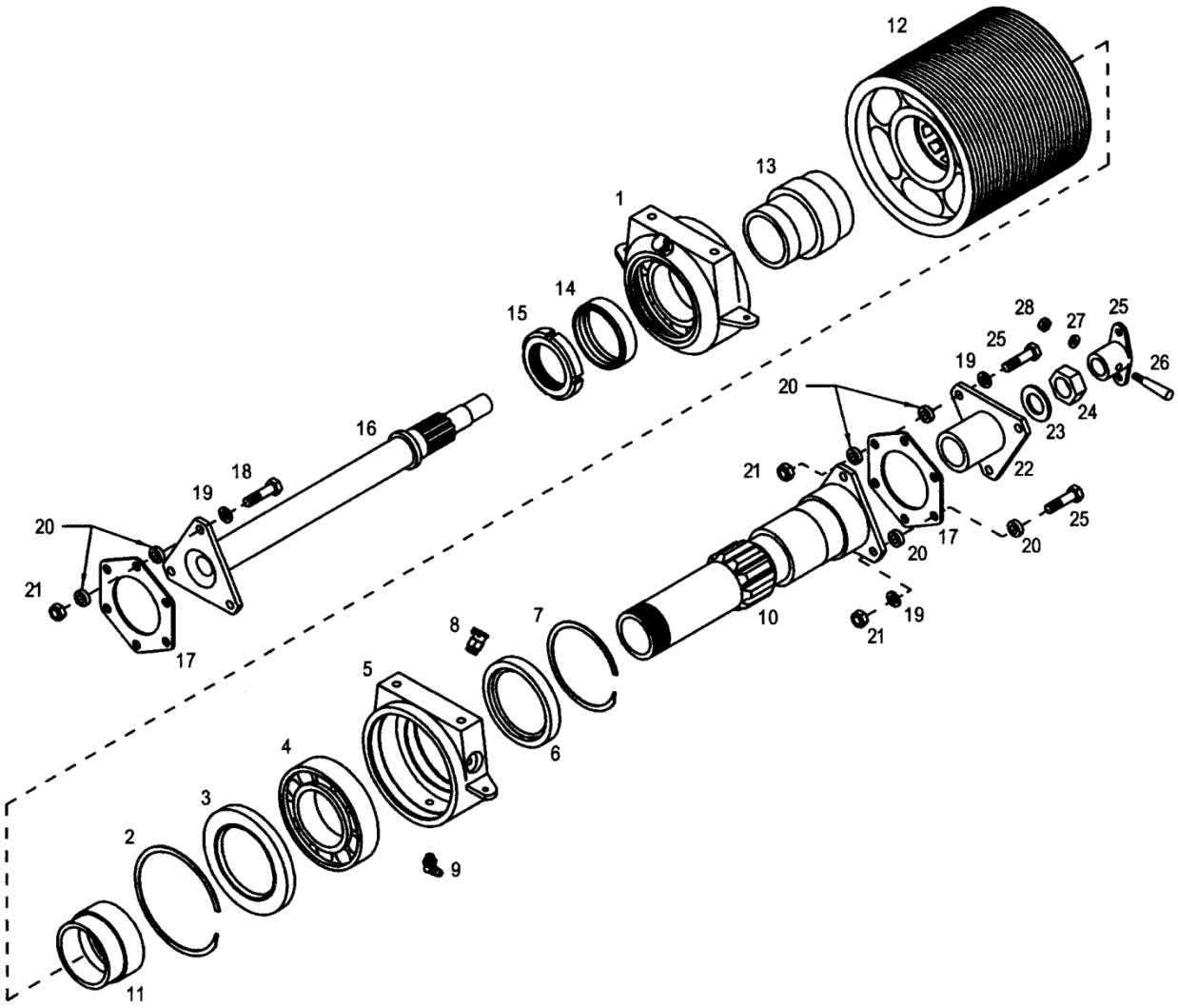


Figure 11-5.1 Modified Bearing Housing Support

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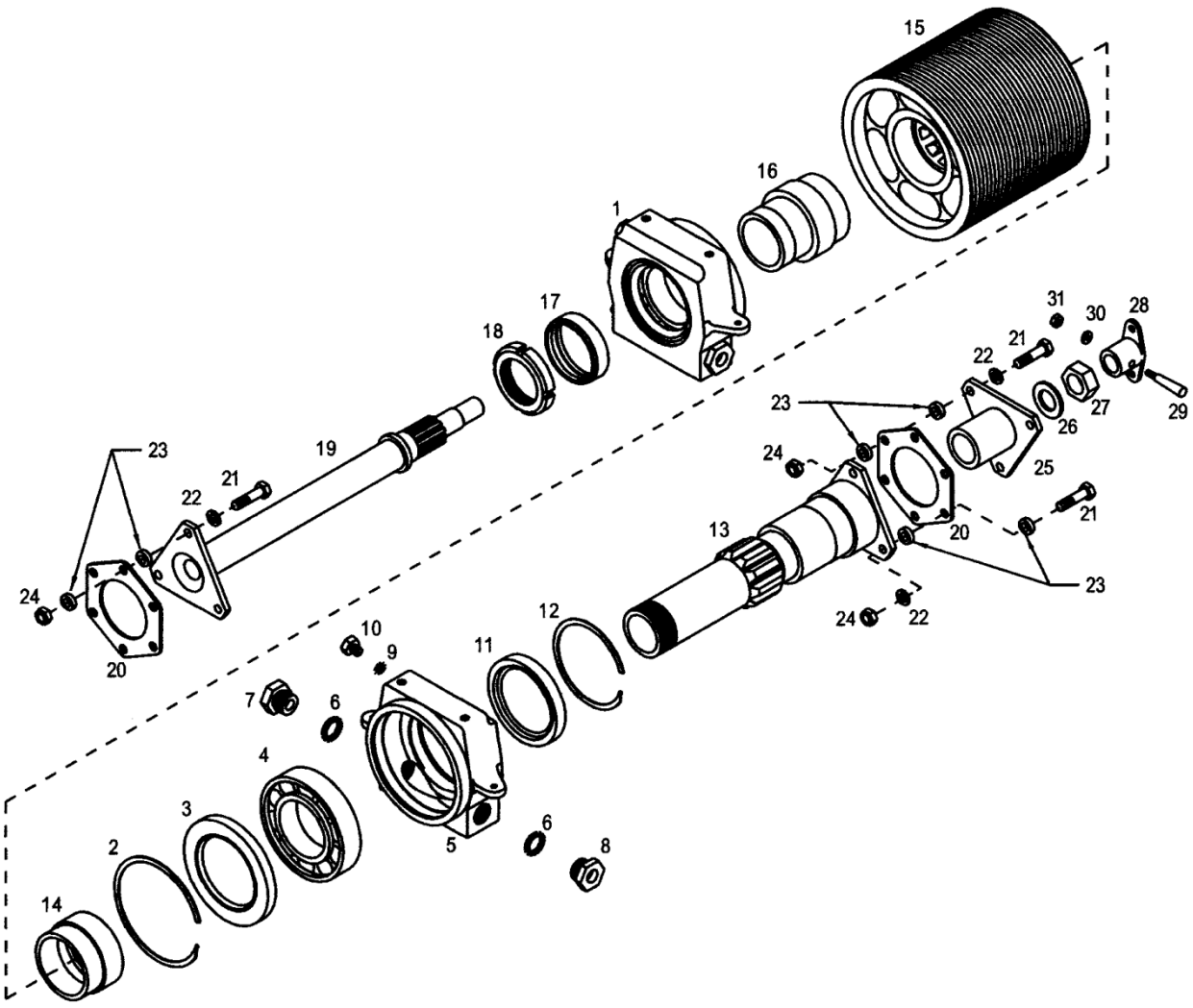


1.	Bearing Housing Assembly	15.	Nut
2.	Retaining Ring	16.	Lower Pulley Drive Shaft
3.	Seal	17.	Flex Pack
4.	Bearing	18.	Bolt
5.	Bearing Housing	19.	Washer
6.	Seal	20.	Spacer
7.	Retaining Ring	21.	Nut
8.	Vent	22.	Drive Shaft Hub
9.	Grease Fitting	23.	Washer
10.	Lower Pulley Driven Shaft	24	Drive Shaft Retaining Nut
11.	Spacer	25.	Oil Cooler Blower Shaft Hub
12.	Lower Pulley	26.	Taper Pin
13.	Bearing Retainer	27.	Washer
14.	Sleeve	28.	Nut

Figure 11-6. Lower Pulley Assembly (Grease Lubricated)

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1.	Bearing Housing Assembly	17.	Sleeve
2.	Retaining Ring	18.	Nut
3.	Seal	19.	Lower Pulley Drive Shaft
4.	Bearing	20.	Flex Pack
5.	Bearing Housing	21.	Bolt
6.	O-Ring	22.	Washer
7.	Drain Plug	23.	Spacer
8.	Sight Plug	24	Nut
9.	O-Ring	25.	Drive Shaft Hub
10.	Service Plug	26.	Washer
11.	Seal	27.	Drive Shaft Retaining Nut
12.	Retaining Ring	28.	Oil Cooler Blower Shaft Hub
13.	Lower Pulley Driven Shaft	29.	Taper Pin
14.	Spacer	30.	Washer
15.	Lower Pulley	31.	Nut
16.	Bearing Retainer		

Figure 11-6. Lower Pulley Assembly (Oil Lubricated)

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L. Press the bearing housing assembly and the bearing retainer out of the other end of the pulley.

M. Remove the sleeve and press the bearing retainer from the bearing housing retainer. Remove the spacer from the other bearing housing assembly.

N. Disassemble the bearing housing assemblies as follows:

(1) Remove the grease fitting and the vent from the grease lubricated bearing housings. Remove the service plug, drain plug, and sight plug from oil lubricated bearing housings.

(2) Remove the seal retaining rings.

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

(3) Heat the bearing housing assembly to approximately 250°F/121°C and press the bearing and the inboard seal from the assembly.

(4) Remove the outboard seal from the other side of the housing.

11-21. Inspection – Lower Pulley Assembly

A. Inspect the lower pulley and bearing housings for corrosion, cracks, damage, nicks, scratches, and security.

B. Inspect the lower pulley bearings for roughness, excessive wear, and seal leakage.

C. Inspect the pulley drive shaft and hub for bends, cracks, corrosion, elongated bolt holes, nicks, scratches, spline wear, and elongated roll pin holes.

D. Inspect the flex pack coupling for correct number of plates, bends, cracks, corrosion, elongated bolt holes, nicks, scratches, and security.

(1) Any of the three following methods may be used to count the number of elements. The number of elements must be eight.

a. Use a borescope or a magnifying glass with a suitable light source and count the number of elements in each flex pack.

b. Use a bright light source and a high resolution digital camera and photograph the flex packs. View the pictures on the camera or download the pictures to a suitable computer software program and count the number of elements.

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c. Fabricate a gage having a 0.110” wide slotted opening. Align the slot of the gage with the edge of the flex pack. If the flex pack fits in the slot, the pack contains fewer than eight elements. If the flex pack does not fit in the slot, the flex pack contains eight elements.

(2) A detailed inspection of the flex packs for cracks is as follows:

a. Mark one edge of the flex pack with a magic marker to maintain disassembly order or secure with a loose-fitting cable tie or equivalent device.

b. Using a ten power glass, inspect each flex pack element for cracks originating from the bolt holes.

NOTE

Maintain the order of the flex plates in the stack.

c. In no cracks are found, remove the cable tie or equivalent device, and return flex pack to service. If any flex pack elements are found cracked, replace the entire flex pack with a new flex pack.

F. Inspect the "H"- strut for bends, cracks, corrosion, condition of the load plugs, condition of the belt tensioning assemblies, and security.

G. Inspect the positioning links for bends, cracks, corrosion, condition of the rod-end bearings, nicks, scratches, and security.

11-22. Repair – Lower Pulley Assembly

A. See Table 11-2 for damage limit and repair criteria for the components of the lower pulley assembly.

B. Repair damage to the "H"-strut assembly I/A/W AC 43.13-1B. Replace components of the “H”-strut that cannot be repaired.

C. Replace the bearing seals if worn or leaking.

D. Replace worn tie rod bearings and the tie rods if bent or damage is more than .020 inches/.51 mm deep.

E. Elongated roll pin holes in the lower pulley drive shaft and/or oil cooler blower shaft hub are not repairable.

F. A flex pack coupling exhibiting an incorrect number of elements, bent or cracked elements, elongated bolt holes, or deformation requires replacement of the flex pack coupling.

G. A flex pack coupling exhibiting nicks, scratches, or corrosion less than 0.0015 in deep (limit of 2 elements) may be repaired by blending smooth and polishing. Repair is limited to less than or equal to 0.0015 in deep.

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Table 11-2. Lower Pulley Assembly

			Inspection Requirements			
P/N	Fig. 11-6 Item #	Part Name	Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
4130509-1 or 4130537-11, -12	5	Bearing Housing	Outboard Seal Bore Dia. 3.249 to 3.253	+.002	Not Repairable	Replace Housing
			Bearing Bore Dia. 3.9354 to 3.9363	+.0003	Not Repairable	Replace Housing
			Inboard Seal Bore Dia. 4.001 to 4.006	+.002	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
			Nicks, scratches, or corrosion	.030 Deep	≤ .030 Deep	Blend out smooth
ECD4056-3 ECD4056-5	4	Bearing	Roughness, spalling, pits, or corrosion	None Allowed	Not Repairable	Replace Bearing
4130508-13	10 (Sheet 1) 13 (Sheet 2)	Pulley Driven Shaft	Outer Seal Surface Dia. 2.415 to 2.422	-.002	Not Repairable	Replace Shaft
			Bearing Inner Race Surface Dia. 2.1654 to 2.1660	-.0003	Not Repairable	Replace Shaft
			Spacer Surface Dia. 2.1602 to 2.1608	-.0003	Not Repairable	Replace Shaft
			Bearing Retainer Surface Dia. 1.7800 to 1.7810	-.0005	Not Repairable	Replace Shaft
			Cracks	None Allowed	Not Repairable	Replace Shaft

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Table 11-2. Lower Pulley Assembly

P/N	Fig. 11-6 Item #	Part Name	Inspection Requirements* Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
4130508-13	10 (Sheet 1) 13 (Sheet 2)	Pulley Driven Shaft (Cont'd)	Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Threads (rolled or missing)	None Allowed	Not Repairable	Replace Shaft
			Bent Flanges	.002	Not Repairable	Replace Shaft
4130513-13	11 (Sheet 1) 14 (Sheet 2)	Spacer	Seal Surface Dia. 2.684 to 2.692	-.0003	Not Repairable	Replace Spacer
			Pulley Surface Dia. 2.499 to 2.500	-.001	Not Repairable	Replace Spacer
			I.D. 2.1598 to 2.1604	+.0003	Not Repairable	Replace Spacer
			Cracks	None Allowed	Not Repairable	Replace Spacer
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
4130510-17 or 4130510-19	12 (Sheet 1) 15 (Sheet 2)	Lower Pulley	Spacer and Pilot Bores Dia. 2.498 to 2.499	+.001	Not Repairable	Replace Pulley
			Cracks	None Allowed	Not Repairable	Replace Pulley
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Depth of grooves	≥.176	Not Repairable	Replace Pulley
			Nicks and gouges in belt grooves	None Allowed	≤ .25 long and ≤ .025 deep	Blend out smooth

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Table 11-2. Lower Pulley Assembly

P/N	Fig. 11-6 Item #	Part Name	Inspection Requirements* Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
4130512-13, -17	13 (Sheet 1) 16 (Sheet 2)	Bearing Retainer	Sleeve Surface Dia. 2.1604 to 2.1610	-.0003	Not Repairable	Replace Retainer
			Bearing Inner Race Surface Dia. 2.1654 to 2.1660	-.0003	Not Repairable	Replace Retainer
			Inner Seal Surface Dia. 2.684 to 2.690	-.002	Not Repairable	Replace Retainer
			Spline Pilot Surface Dia. 2.499 to 2.500	-.0005	Not Repairable	Replace Retainer
			(-13) I.D. 1.7800 to 1.7805	+.0003	Not Repairable	Replace Retainer
			(-17) I.D. 1.7806 to 1.7810	+.0003	Not Repairable	Replace Retainer
			Cracks	None Allowed	Not Repairable	Replace Retainer
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
4130517-13	14 (Sheet 1) 17 (Sheet 2)	Sleeve	O.D. 2.415 to 2.422	-.002	Not Repairable	Replace Sleeve
			I.D. 2.1598 to 2.1604	+.0003	Not Repairable	Replace Sleeve
			Cracks	None Allowed	Not Repairable	Replace Sleeve
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
4130524-13	15 (Sheet 1) 18 (Sheet 2)	Nut	Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut
			Cracks	None Allowed	Not Repairable	Replace Nut

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Table 11-2. Lower Pulley Assembly

P/N	Fig. 11-6 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
4130506-13, -15	16 (Sheet 1) 19 (Sheet 2)	Lower Pulley Drive Shaft	Hub Surface Dia. .659 to .661	-.0005	Not Repairable	Replace Shaft
			Coupling Surface Dia. 1.0840 to 1.0845	-.0003	Not Repairable	Replace Shaft
			Cracks	None Allowed	Not Repairable	Replace Shaft
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Bent Flanges	.002	Not Repairable	Replace Shaft
			Threads (rolled or missing)	None Allowed	Not Repairable	Replace Shaft
ECD4024-1	17 (Sheet 1) 20 (Sheet 2)	Flex Pack	8 Elements	None Allowed	Not Repairable	Replace Flex Pack
			Cracked Elements	None Allowed	None Allowed	Replace Flex Pack
			Nicks, scratches, or corrosion	.0015 Deep on 2 elements	≤ .0015 deep	Blend out smooth and polish
			Bent Elements	None Allowed	Not Repairable	Replace Flex Pack
			Elongated Bolt Holes	None Allowed	Not Repairable	Replace Flex Pack
			Deformation	None Allowed	Not Repairable	Replace Flex Pack
4130504-13	22 (Sheet 1) 25 (Sheet 2)	Lower Pulley Drive Shaft Hub	Inner Shaft Bore Dia. 1.0845 to 1.0850	+.0003	Not Repairable	Replace Hub
			Cracks	None Allowed	Not Repairable	Replace Hub
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Bent Flanges	.002	Not Repairable	Replace Hub

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Table 11-2. Lower Pulley Assembly

P/N	Fig. 11-6 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
NAS509-12	24 (Sheet 1) 27 (Sheet 2)	Drive Shaft Retaining Nut	Cracks	None Allowed	Not Repairable	Replace Nut
			Threads (rolled or missing)	None Allowed	Not Repairable	Replace Nut
4130516-17	25 (Sheet 1) 28 (Sheet 2)	Oil Cooler Blower Shaft Hub	I.D. .662 to .663	+.0005	Not Repairable	Replace Hub
			Cracks	None Allowed	Not Repairable	Replace Hub
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
			Bent Flanges	≤.010	Not Repairable	Replace Hub

* All dimensions are in inches.

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11-23. Assembly – Lower Pulley Assembly (Figure 11-6)

NOTE

Heat is used to aid in assembly of the lower pulley assembly. Using an oven is the preferred method of heating parts. Heat guns can be used to heat parts but temperature control is very difficult to maintain.

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

NOTE

Lubricate the splines of the lower pulley and the lower pulley driven shaft upon assembly with grease (MIL-PRF-81322).

NOTE

For 480 model equipped with grease-lubricated lower pulley assemblies, lubricate the seal lips, the inner diameter of the bearing and bearing housing, and the outer diameter of the lower pulley driven shaft with grease (MIL-PRF-81322) upon assembly.

NOTE

For any 480 converted via SIL T-022 and all 480B with oil-lubricated lower pulley assemblies, lubricate the seal lips, the inner diameter of the bearing and bearing housing, and the outer diameter of the lower pulley driven shaft (except splines) with oil (MIL-PRF-23699) upon assembly.

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A. Assemble the bearing housing assemblies as follows:

NOTE

Lubricate the seal lips before installation.

(1) Remove the “garter” springs from the seals if assembling oil lubricated lower pulley bearing assemblies.

(2) Heat the bearing housing to approximately 250°F/121°C and install the bearing with the notches facing into the bearing housing and with notch in the outboard race at the bottom of the housing. Install the inboard seal and retaining ring into the housing.

(3) Install the outboard seal and retaining ring into the bearing housing.

NOTE

If using an oven to heat the parts, place all the parts that require heat in the oven at the same time.

NOTE

If required, use a press (manual or hydraulic) and pressing aids to assemble the lower pulley assembly.

NOTE

The lower pulley bearing assemblies used on a grease lubricated lower pulley assembly are interchangeable. Assemble an oil lubricated lower pulley assembly so that the bearing housing sight plugs will be on the left side of the aircraft when the lower pulley assembly is installed.

B. Heat the aft bearing housing to approximately 250°F/121°C. Install the bearing housing assembly that is going on the aft side of the pulley assembly onto the lower pulley driven shaft. Ensure the inner race of the bearing is seated against the driven shaft.

C. Heat the spacer to approximately 250°F/121°C. Install the spacer onto the lower pulley driven shaft and seat against the bearing in the bearing housing assembly.

D. Heat the pulley to approximately 250°F/121°C. Lubricate the lower pulley driven shaft and install the pulley onto the lower pulley driven shaft. Seat the pulley against the spacer.

E. Heat the bearing retainer to approximately 250°F/121°C. Install the bearing retainer onto the lower pulley driven shaft and seat against the pulley.

F. Heat the remaining bearing housing to approximately 250F°/121°C. Install the remaining bearing housing assembly onto the lower pulley driven shaft and seat against the bearing retainer.

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G. Heat the sleeve to approximately 250°F/121°C. Install the sleeve onto the lower pulley driven shaft and seat against the bearing retainer.

H. Install the pulley adapter (Figure 11-5) the lower pulley driven shaft and place the pulley assembly vertically in a vise.

I. Install the retaining nut and torque to 190-200 ft-lbs/259.1-272.7 Nm using tool T-0051. Allow the pulley assembly to cool and retorque the retaining nut. Install two safeties (.032 lockwire) between the lower pulley bearing retaining nut and the pulley drive shaft. Secure the wire tails under the wire wrap.

J. Install the grease fittings and vents in the grease lubricated bearing housings. Install the drain plugs and sight plugs in the oil lubricated bearing housings. Torque the sight plugs to 150 in-lbs/17 Nm and install a torque slippage mark.

K. Using a standard grease gun, lubricate the grease lubricated bearing assemblies with 6-8 pumps/squirts of grease (MIL-PRF-81322). Refer to paragraph 4-33 for lubrication procedures to use during normal scheduled servicing. Service each oil lubricated bearing assembly with .27 U.S. Ounces/8 ml of oil (MIL-PRF-23699). Install the service plugs. Refer to paragraph 4-24 for servicing procedures to use during normal scheduled servicing.

L. Remove the pulley assembly from the vise and remove the pulley adapter.

NOTE

Ensure the spacers are installed with the beveled face toward the flex pack coupling.

NOTE

Place the thick spacers between the flex pack coupling and the lower pulley and lower pulley drive shaft hub flanges.

M. Install the aft flex pack coupling on the pulley drive shaft hub.

CAUTION

Ensure the hardware in the aft flex pack coupling does not contact the lower pulley bearing housing.

N. Attach the aft flex pack coupling/drive shaft hub to the lower pulley driven shaft.

O. Install the lower pulley adapter on the lower pulley drive shaft and place the shaft vertically in a vise.

P. Apply a light coat of grease (MIL-PRF-81322) to the splines of the lower pulley drive shaft. Place the lower pulley assembly on the lower pulley drive shaft. Install the drive shaft hub onto the splines of the lower pulley drive shaft. Install the washer (P/N C148740) and retaining nut and torque to 90-100 ft-lbs/122.0-135.6 Nm.

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Q. Install the intermediate oil cooler blower drive shaft hub on the lower pulley drive shaft and install the roll pins/taper pin. Install the oil cooler blower drive shaft hub wet with epoxy primer. If installing new roll pins, it is permissible to trim the roll pins after they are installed. Install a safety (.032 lockwire) from the retaining nut to the roll pins/taper pin.

NOTE

If components of the lower pulley assembly have been replaced, the thickness of the spacers used on the forward flex pack coupling may have to be changed.

R. Install the forward flex pack coupling on the lower pulley drive shaft.

S. Install the "H"- strut onto the lower pulley bearing housings.

T. Install the bearing temperature thermocouples into the bearing housings.

11-24. Installation – Lower Pulley Assembly (Figure 11-2)

A. Install the positioning links onto their fittings.

B. Install the lower pulley assembly into the drive belt.

C. Rotate the pulley so the "H"- strut is toward the left side of the aircraft. Install the load bearing plugs (older “H”-strut assemblies) and the flat bearing (DU side up) into the "H"- strut and install the tensioning assemblies onto the "H"- strut.

D. Rotate the "H"- strut into position and attach the tensioning assemblies to the main rotor transmission and the aft pinion bearing support truss.

E. Align the lower pulley drive system (para.11-17).

NOTE

Ensure the spacers are installed with the beveled face toward the flex pack coupling.

NOTE

If components of the lower pulley assembly have been replaced, the thickness of the spacers used on the forward flex pack coupling may have to be changed.

CAUTION

The bolts connecting the forward flex pack to the power output shaft are special bolts that have shortened thread grip lengths. Do not replace with standard hardware.

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CAUTION

Ensure the hardware in the forward flex pack coupling does not contact the bolts securing the power output shaft bearing housing.

F. Connect the forward flex pack coupling to the power output shaft. Adjust the thickness of the spacers to prevent the bolts connecting the flex pack coupling to the power output shaft from bottoming out on the power output shaft flange.

G. Install a single strand continuous safety (.032 lockwire) in the bolts connecting the flex pack coupling to the power output shaft.

H. Install the ignition module on its mounts and connect the electrical leads. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

I. Connect the bearing thermocouples at the quick disconnects.

J. Install the upper plenum/air inlet (para. 13-31).

K. Install the left and right side engine access panels and the left and right aft side cowlings.

L. Perform a limited maintenance test flight (para. 4-61).

11-25. Drive Belt

11-26. Description – Drive Belt

The drive belt is a one piece synthetic rubber Poly-V belt with a series of parallel V-ribs molded lengthwise around the inside circumference with Kevlar tension cords that makes it extremely strong and fail safe. The belt diameter, width, and number of grooves are all computed for stress in relation to the amount of horsepower required. The belt itself is made of a high strength shock resistant Kevlar cord, which provides dimensional stability and long flex life. This chord runs in a continuous fashion around the circumference of the belt and is imbedded in a fiber reinforced rubber compound backed by 3 ply fabric for maximum cord support and adhesion. The rubber compound is both heat and oil resistant and is also used to form the rubber ribs. The belt is installed under a constant 2000 pounds/909 kg static tension and is capable of accepting well over 350 SHP/261 kW without slipping. The belt is installed over the upper and lower pulleys then tensioned by means of two jackscrew adjustment mechanism within the center of the "H"- strut. Belt tension is measured by means of a tension meter (T-0139-1).

11-27. Removal – Drive Belt

A. Remove the left and right side engine access panels and the left and right aft side cowlings.

B. Remove the upper plenum/air inlet (para. 13-28).

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C. Remove the lower pulley assembly (para. 11-19).

D. Remove the tail rotor drive short shaft (para. 11-63).

E. Remove the aft pinion bearing support truss (para. 11-46).

F. Remove the drive belt from the upper pulley.

11-28. Inspection – Drive Belt

A. Back of Belt: The back of the belt should be examined for cuts or damage and blisters which may indicate separation of the fabric plies. The belt should be removed if there is any damage which appears to penetrate the fabric cover and if any blisters are present. A small crack in the back of the belt at the fabric splice is not significant. The belt should be removed, however, if there is any loosening or peeling of the fabric in the splice area.

B. Edges of Belt: The edge of the belt should be examined for signs of wear. This does not affect the belt directly but would indicate that there is a tracking or interference problem. There may be some fraying of the fabric backing or slight fraying of the edge cord and this is not significant. The belt should be removed, however, if an entire cord is beginning to emerge from the belt. The belt edge should also be examined for signs of rubber separation. The belt should be removed if there is any sign of rubber separation from the cord.

NOTE

Do not turn the belt inside out to perform this inspection. Unnecessary damage may result.

C. Belt Rib Surface: Rib cracking is a normal occurrence on this belt. The cracks normally extend to the base of the rib and go no further. Numerous cracks of this type are not significant. The belt should be examined for cracks which have extended below the base of the ribs and, if this has occurred, the belt should be removed. This is very important if the cracks extend to the cord line and the cord is exposed when the crack is opened. Loss of small pieces or rib section may accompany the rib cracking. This is normally a random occurrence. The belt should be replaced if there is a loss of three or more adjacent ribs for a length of two inches or more. The belt should be replaced if there is any piece of rib missing which is of sufficient depth to leave the cord exposed.

D. The belt should be replaced:

(1) Whenever it has been determined that chord failure exists.

(2) Whenever edge damage goes beyond the first "V" groove.

(3) When missing pieces of the "V" area become large enough to cause vibration in the drive system.

11-29. Installation – Drive Belt

A. Install the drive belt on the upper pulley.

B. Install the aft pinion bearing support truss (para. 11-52).

C. Install the tail rotor short shaft (para. 11-67).

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D. Install the lower pulley assembly (para. 11-24).

E. Tension the belt in the following manner (tool T-0139-1):

NOTE

Checking or adjusting the belt tension should only be performed when the engine and drive system components are cold (ambient temperature).

(1) Turn the jackscrews in the "H"-strut clockwise (viewed from top) to increase the tension on the belt.

(2) Tension the belt evenly and check the tension with a tension meter (T-0139-1). The belt tension upper limit is 2,500 pounds and the lower limit is 1,750 pounds.

NOTE

When setting belt tension, tension the drive belt to the upper limit. Maintain the tension between the front and aft side of the drive belt within 250 pounds or less without exceeding the upper limit when adjusting for parallel alignment of the upper and lower pulleys.

NOTE

A new (zero-time) belt will require re-tensioning within a few flight hours due to initial wear in of the belt. A one-half turn of the jackscrews in the "H"-strut is allowed without having to realign the lower pulley assembly; however, both jackscrews must be turned equally.

(3) If the belt requires re-tensioning and the jackscrews have already been turned a half turn or the belt tension is not within limits after a half turn, turn the jackscrews to bring the tension within limits. Keep track of the total turns required to bring the belt into limits. For every complete turn of the jackscrew (including the first half turn), add a .050"/1.27 mm shim to each of the side engine mounts and remove the same .050"/1.27 mm from the shims under the oil cooler blower bearing housings.

F. Align the lower pulley assembly (para. 11-17).

G. Lockwire (.025) the jackscrew in the "H"-strut after belt tensioning and lower pulley alignment are complete.

H. Install the upper plenum/air inlet (para. 13-31).

I. Install the left and right side engine access panels and the left and right aft side cowlings.

J. Perform a limited maintenance test flight (para. 4-61).

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11-30. Main Rotor Transmission Assembly

11-31. Description – Main Rotor Transmission Assembly

The main rotor transmission assembly consists of the main rotor transmission and the upper pulley. The main rotor transmission is a splash lubricated ring and pinion geared transmission that changes the direction of drive, reduces the rotational speed by a 7.154 to 1 gear ratio, transmits power to the main rotor and tail rotor, and carries all flight loads from the main rotor to the pylon. An oil level sight gage is located on the right rear of the transmission and can be viewed by looking between the spokes of the upper pulley below the right rear of the upper plenum chamber. A filler cap and a bayonet type chip detector installed in the drain plug are incorporated. The transmission also has two magnetic pick-ups (N_R and low rotor warning) and a bayonet type temperature probe installed. Starting with 480 Serial Number 5042 and all 480Bs, the main rotor transmission is equipped with an oil filtration/cooling system. Total oil capacity in the transmission is 6 pints/2.84 liters, total capacity is 6.5 pints/3.1 liters if equipped with the filtration/cooling system. The upper drive pulley is either keyed or splined to the main rotor transmission drive pinion and is designed with internal fan blades providing cooling air to the main rotor transmission from the inlet on the top of the cabin forward of the main rotor mast. 480B serial numbers 5114 and subsequent and 5087 through 5113 equipped with the Increased Cooling Kit, P/N 4230031, do not have the baffle (Fig. 11-7, Item 4) installed underneath the main rotor transmission.

11-32. Removal – Main Rotor Transmission Assembly (Figure 11-7)

A. Remove the main rotor blades (para. 9-34).

B. Remove the left and right side engine access panels and left and right aft side cowlings.

C. Remove the upper plenum/air inlet (para. 13-28).

D. Remove the lower pulley assembly (para. 11-19).

E. Remove the tail rotor drive short shaft (para. 11-63).

NOTE

The bracket (13) for the fuel crossover is not used on later serial number aircraft.

F. Disconnect the fuel crossover from the bracket (13).

G. Disconnect the following electrical connections:

(1) N_R magnetic pick-up.

(2) High-Low rotor warning magnetic pick-up.

(3) Temperature probe.

(4) Chip detector.

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(5) Oil pump.

(6) Oil pressure switch.

NOTE

Removal of the main rotor hub is not required to remove the main rotor transmission; however, if the main rotor hub is going to be removed after removal of the transmission, loosen the main rotor retaining nut before removing the transmission.

H. Remove the main rotor hub (para. 9-7).

NOTE

If removing the upper pulley assembly, loosen the aft pinion bearing nut before removing the aft pinion bearing support truss.

I. Remove the aft pinion bearing support truss (para. 11-46).

J. Remove the drive belt from the upper pulley.

NOTE

Removal of the upper pulley is not required to remove the main rotor transmission from the aircraft.

K. Remove the upper pulley (para. 11-46).

L. Disconnect the following flight controls:

(1) Collective control tube from the collective walking beam.

(2) Lateral control tube from the lower swashplate uni-ball.

(3) Longitudinal control tube from the lower swashplate uni-ball.

M. Remove the lower swashplate assembly (para. 12-76).

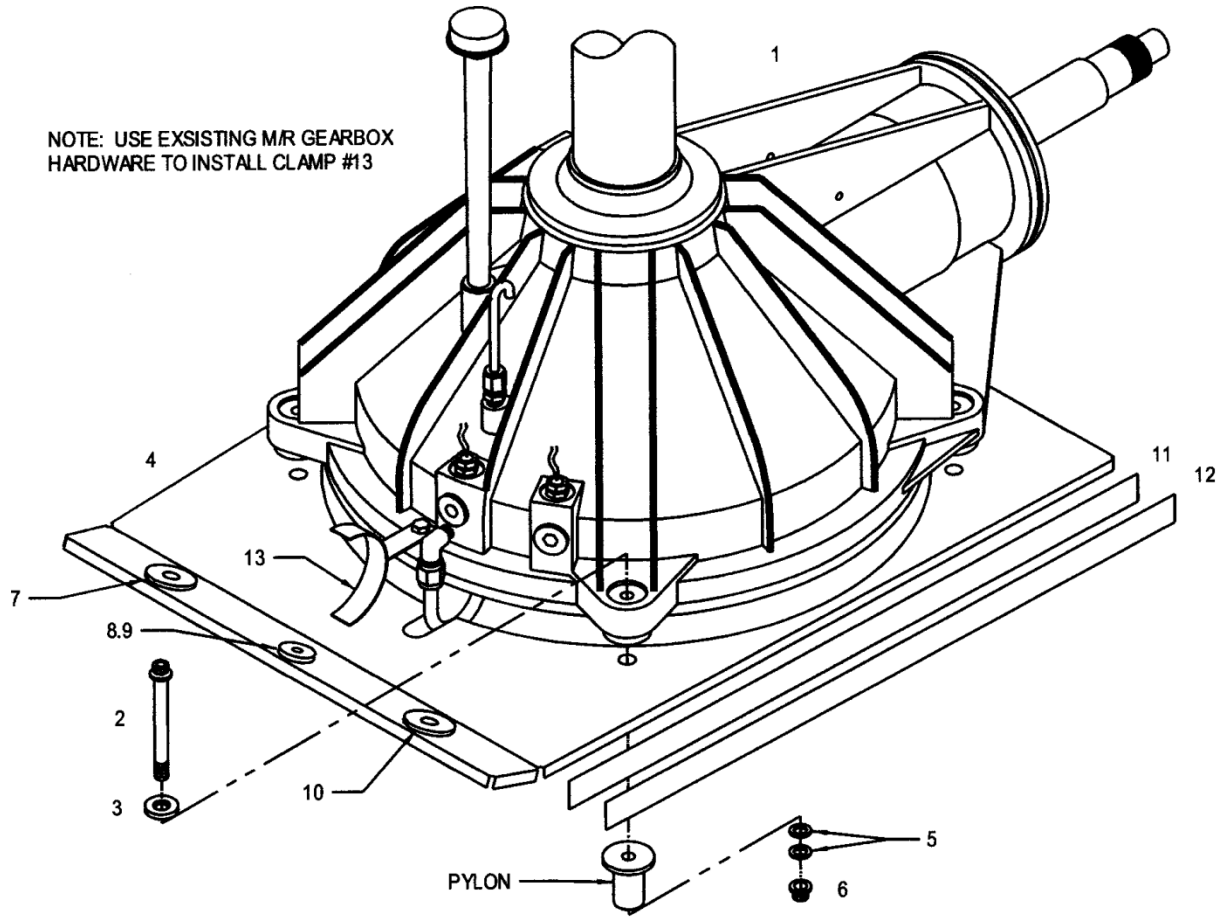
N. If equipped with the oil filtration/cooling system, drain the transmission and remove the oil filter.

O. Remove the hardware (1,2,3,and 4) securing the main rotor transmission to the pylon.

P. If the main rotor hub is removed, install the lifting eye (T-0017) on the main rotor mast. If the hub is installed, install the lifting sling (T-0011) using the following procedures:

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1.	Main Rotor Transmission	8.	Grommet
2.	Bolt	9.	Grommet
3.	Washer	10.	Grommet
4.	Baffle	11.	Hook Fastener
5.	Washer	12.	Pile Fastener
6.	Nut	13.	Clamp
7.	Grommet		

Figure 11-7. Main Rotor Transmission Installation

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CAUTION

Do not allow the pitch change bellcranks to drop onto the edge of the main rotor mast when disconnecting the pitch change links.

(1) Disconnect the pitch change links from the pitch change bellcranks.

(2) Block up the pitch change bellcranks so the main rotor control tubes are in the maximum upper position.

(3) Install the sling so the arms are between the pitch arm and the blade retention assembly, over the lead/lag retaining nut, and outboard of the main rotor damper rod-end. The sling arms are long enough to be double wrapped if preferred (Figure 4-10).

Q. Remove the main rotor transmission from the aircraft using the following procedures:

NOTE

If the lifting device is in a fixed location, install the ground handling wheels and move the aircraft to remove the transmission.

(1) Attach a suitable lifting device to the lifting eye or sling.

(2) Install the ground handling wheels and lower the tail of the aircraft to provide more clearance at the pylon while removing the transmission.

(3) Lift the transmission off of the pylon mounts enough to start moving the transmission toward the rear of the aircraft. Lift the transmission higher as clearance around the transmission allows.

(4) If the lifting eye is installed, push the main rotor control tube rod-ends (dog legs) up to clear the aft pylon tubes. If the sling is installed, monitor the dog leg clearance as they pass the pylon tubes.

R. Place the transmission on a transmission stand. Remove the lifting eye or sling.

11-33. Disassembly – Main Rotor Transmission Assembly

NOTE

Maintenance requirements will determine what components will have to be removed from the transmission.

NOTE

Omit the steps listed below that have been accomplished during the transmission removal.

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A. Remove the main rotor hub (para. 9-7).

B. Remove the upper pulley (para. 11-46).

C. Remove the collective walking beam (para. 12-40).

D. Remove the upper swashplate and the main rotor controls (para. 12-82).

E. Remove the oil filtration/cooling system (para. 11-41).

11-34. Inspection – Main Rotor Transmission Assembly

A. Inspect the main rotor transmission and mast for cracks, corrosion, nicks, scratches, and seal leakage.

B. Inspect the pinion for cracks, corrosion, nicks, scratches, damaged key recess, damaged threads, and elongated or cracked taper pin hole.

C. Remove the inspection plate from the transmission and inspect the ring and pinion for abnormal gear pattern and excessive wear (refer also to SIL T-064).

D. Inspect the chip detector for accumulation of metal particles as follows:

(1) Metal particles, flakes, or slivers exceeding 1/16 inch/1.6 mm: contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

(2) Sludge (a mixture of oil and fine metal particles resulting from normal gear operation): Clean the detector and return the transmission to service.

NOTE

New or recently overhauled transmissions will often make a magnetic "fuzz" which will collect on the magnetic plug as gray sludge. This is normal and may be cleaned off the plug. The plug may then be reinstalled and the helicopter returned to service. If any chips are found which are larger than 1/16 inch/1.6 mm in cross-section, contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

E. Inspect the filtration/cooling system for general condition, leaks, and security of installation.

F. Inspect the runout of the main rotor shaft (Figure 11-8) after a main rotor blade strike or hard landing. Maximum indication is .012"/0.3 mm.

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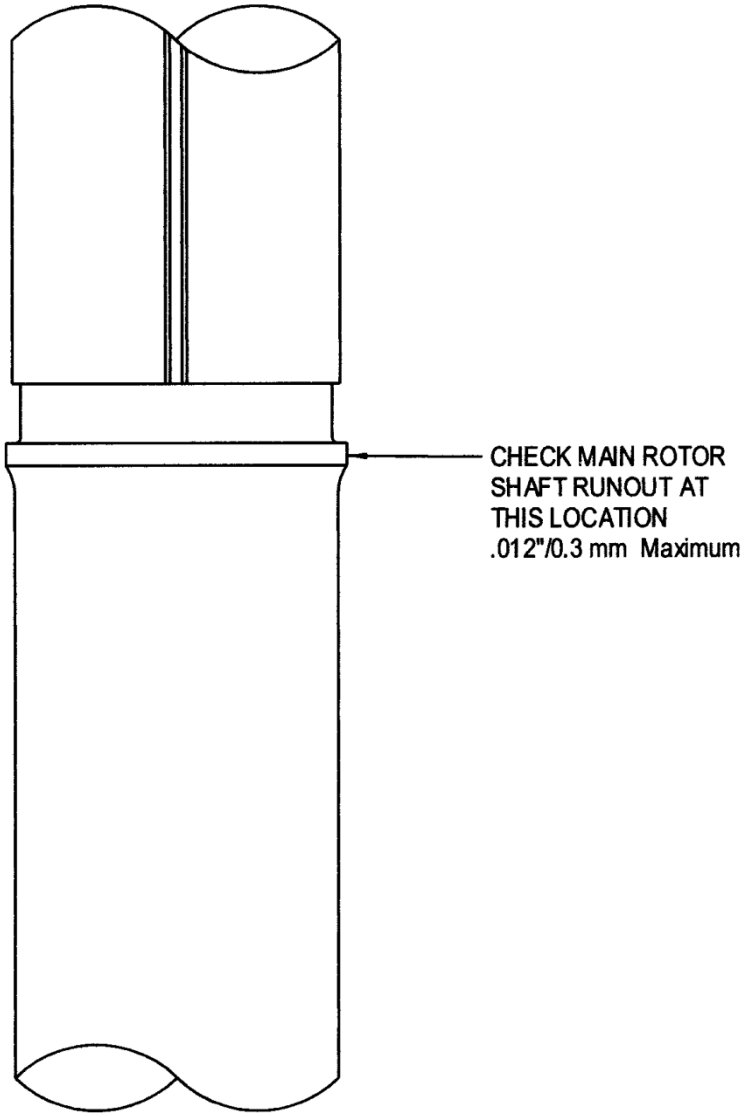


Figure 11-8. Main Rotor Mast Runout Check

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11-35. Repair – Main Rotor Transmission

NOTE

Other than the repair limits in the following text, repairs to the main rotor transmission are usually limited to repair/replacement of the seals and external components of the transmission. Contact Enstrom Customer Service Department for repair/replacement instructions for the Low Rotor Warning and N_R magnetic pickups.

A. Remove scratches, nicks, and surface corrosion from the mast or pinion if the depth of the repair will be less than .010"/.25 mm. Apply corrosion protection to the repaired area.

B. Remove scratches, nicks, and/or surface corrosion from the transmission housing if the depth of the repair will be less than .020"/.51 mm. Apply corrosion protection to the repaired area.

C. Replace leaking seals as required (para. 11-38).

11-36. Assembly – Main Rotor Transmission

NOTE

Installation of the items listed below can be performed either with the transmission installed or removed. The upper swashplate and flight controls are easier to install when the transmission is removed from the aircraft. The main rotor hub and upper pulley are easier to install when the transmission is installed in the aircraft.

A. Install the upper swashplate and main rotor controls (para. 12-86).

B. Install the collective walking beam (para. 12-42).

C. Install the oil filtration/cooling system except the oil filter (para. 11-44).

D. Install the upper pulley (para. 11-52).

E. Install the main rotor hub (para. 9-12).

11-37. Installation – Main Rotor Transmission (Figure 11-7)

A. Install the lifting sling (T-0011) or the lifting eye (T-0017).

NOTE

If the lifting device is in a fixed location, install the ground handling wheels and move the aircraft to install the transmission.

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B. Using suitable lifting device, position the transmission aft of the pylon mounts.

C. Carefully lower and maneuver the transmission onto its mounts. If the upper swashplate and the main rotor controls are installed, monitor the clearance of the dog legs as they pass over the pylon tubes.

D. Disconnect the lifting device and remove the lifting sling or lifting eye.

CAUTION

Do not reuse the self locking nuts used to secure the main rotor transmission.

E. Install the mounting hardware (2, 3, 5 and 6). Torque the nuts (4) to 240 in-lbs/27.3 Nm and slippage mark.

F. If not installed, install the upper swashplate and main rotor flight controls.

G. Connect the pitch change links to the pitch change bellcranks.

H. Install the lower swashplate (para. 12-80).

I. Connect the following flight controls:

(1) Collective control tube to the collective walking beam.

(2) Lateral control tube to the lower swashplate uni-ball.

(3) Longitudinal control tube to the lower swashplate uni-ball.

J. If not installed, install the upper pulley (para. 11-52).

K. Install the drive belt on the upper pulley.

L. Install the aft pinion bearing support truss (para. 11-52).

M. Install the lower pulley assembly (para. 11-24).

N. Install the short tail rotor drive shaft (para. 11-67).

O. Connect the following electrical connections:

(1) N_R magnetic pick-up.

(2) High-Low rotor warning magnetic pick-up.

(3) Temperature probe.

(4) Chip detector.

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(5) Oil pump.

(6) Oil pressure switch.

P. Connect the crossover bracket.

Q. If required, install the oil filter and service the transmission (para. 4-12).

R. Install the upper plenum/air inlet (para. 13-31).

S. If not installed, install the main rotor hub (para. 9-12).

T. Check the rigging of the main rotor flights controls (para. 12-46).

U. Install the left and right side engine access panels and the left and right aft side cowlings.

V. Install the main rotor blades (para. 9-38).

W. Perform a preflight control check (para. 4-60).

X. Check the main rotor track (para. 9-5).

Y. Check the autorotational rpm (para. 9-4).

Z. Perform a maintenance test flight (para. 4-61).

11-38. Seal Replacement – Main Rotor Transmission

A. Replace the upper mast seal as follows:

(1) Remove the main rotor hub.

(2) Remove the slinger from the mast.

(3) Remove the seal from the transmission housing.

NOTE

Wrap a piece of shim stock around the upper portion of the mast to protect the seal from damage during installation. Reposition the shim stock to the lower end of the mast when installing the seal into the transmission housing.

(4) Lubricate the lip of the new seal (MIL-PRF-81322). Install the seal into the transmission housing. Tap the seal into the housing as required to seat the seal.

(5) Install the slinger into position and secure in place using RTV-732 Sealant.

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(6) Reinstall the main rotor hub.

B. Replace the pinion seal as follows:

(1) Remove the upper pulley assembly.

(2) Raise the aircraft using the ground handling wheels. Block the aft end of the skid tubes so the aircraft will not rock back onto the tail rotor guard.

NOTE

Later production transmissions incorporate a seal retainer with a retaining ring to secure the pinion seal. Transmissions returned to Enstrom for overhaul/repair will have the new seal retainer incorporated.

(3) Remove the retaining ring and pinion seal from the seal retainer.

NOTE

Wrap a piece of shim stock around the bearing adapter in the pinion assembly to protect the seal from damage during installation.

(4) Lubricate the lip of the new seal (MIL-PRF-81322). Install the seal onto the pinion shaft and install the seal into the seal retainer. Tap as required to seat the seal in the retainer and install the retaining ring. If not equipped with a retaining ring, use RTV-732 Sealant to secure the seal.

C. Replace the lower mast seals as follows:

NOTE

It is recommended to remove the main rotor transmission from the aircraft to replace the lower mast seals. If the main rotor transmission is not to be removed, install the lifting sling onto the main rotor hub assembly and hoist the aircraft until the skids are lightly touching ground before removing the seal retainer from the main rotor transmission.

(1) Drain the main rotor transmission.

(2) Remove the lower swashplate assembly.

(3) Remove the upper swashplate and guidetube assembly.

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CAUTION

Use extreme care when removing the nuts that secure the seal retainer. The transmission will have to be returned for repair if any of the retaining bolts are pushed into the transmission.

(4) Remove the nuts securing the seal retainer and remove the retainer.

(5) Remove the seals from the retainer.

(6) Install the new seals in the retainer.

NOTE

Wrap a piece of shim stock around the mast retaining nut to protect the seal from damage during installation.

(7) Lubricate the lips of the new seals (MIL-PRF-81322). Apply a bead of sealant (Loctite 587) to the seal retainer flange.

(8) Install the seal retainer. Install the retaining nuts and torque in a crossing pattern to standard torque.

(9) Service the main rotor transmission.

(10) Install the upper swashplate and guidetube assembly.

(11) Install the lower swashplate assembly.

11-39. Oil Filtration/Cooling System

11-40. Description – Oil Filtration/Cooling System (Figure 11-9)

Starting with 480 Serial Number 5042 and all 480Bs, the main rotor transmission is equipped with an oil filtration/cooling system. This system consists of a heat exchanger, an electric pump, a pressure switch, a filter assembly, connecting oil lines, and the mounting brackets and hardware. For aircraft S/N 5114 and subsequent, the electric pump includes a drain line assembly. The heat exchanger is located on the transmission forward of the upper pulley assembly. The electric pump is a 24 Vdc unit located on the left side of the pinion area of the transmission. The pressure switch is installed between the heat exchanger and the inlet port of the pump. The pressure switch controls a segment light in the caution panel that indicates when the pump pressure is below 4.4-5.9 psi/30.2-40.7 kPa of vacuum. The filter assembly, located at the left aft area on the bottom of the transmission, incorporates a 10-12 micron spin-on oil filter. The filter assembly also incorporates the chip detector and a check valve that is used to prevent loss of oil in the transmission due to a break in the system between the filter housing outlet and the pump inlet. The oil filtration/cooling system does not provide pressure lubrication for the main rotor transmission; failure of the pump does not adversely affect the lubrication of the ring and pinion or the bearings in the main rotor transmission.

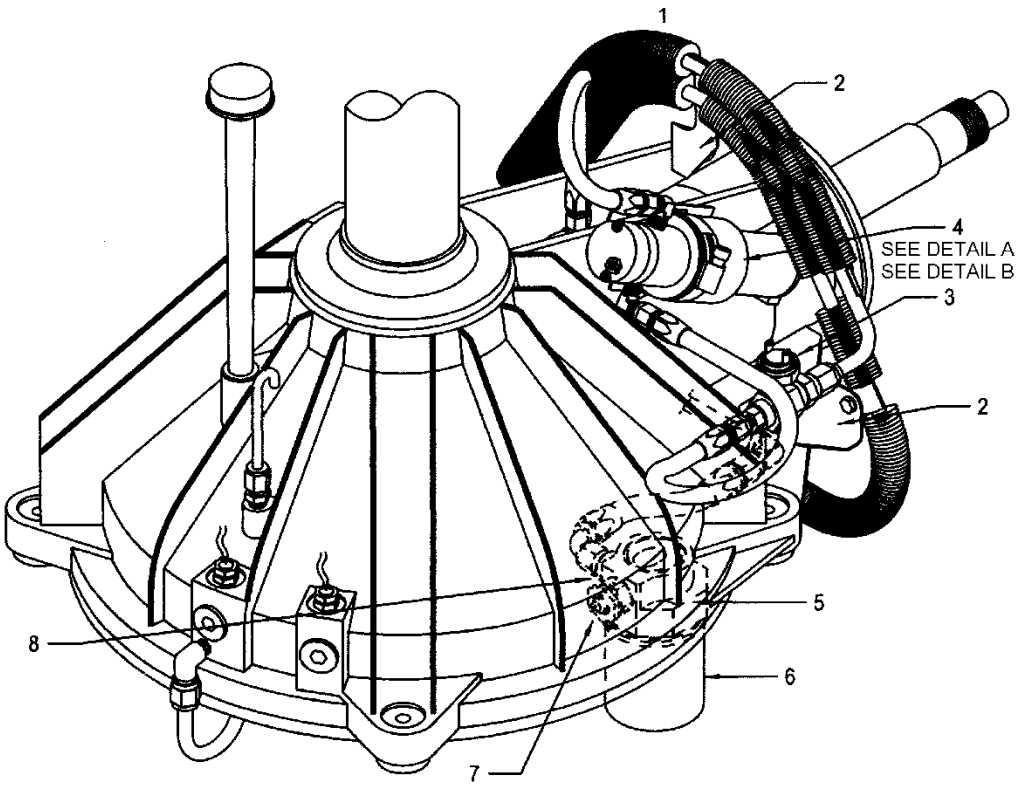
11-41. Removal – Oil Filtration/Cooling System (Figures 11-9 & 11-10)

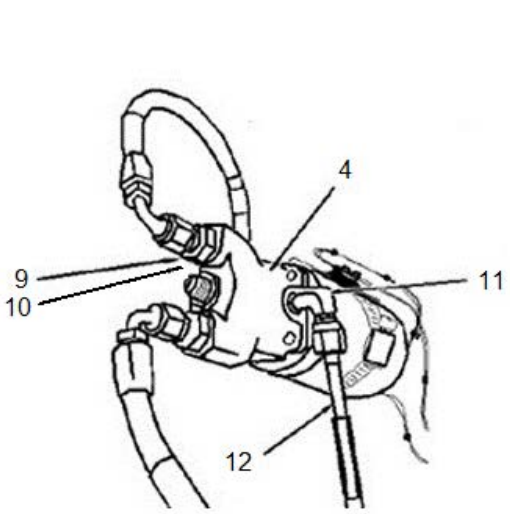
A. Drain the oil from the main rotor transmission (para 4-13).

B. Remove the upper pulley assembly (para. 11-46).

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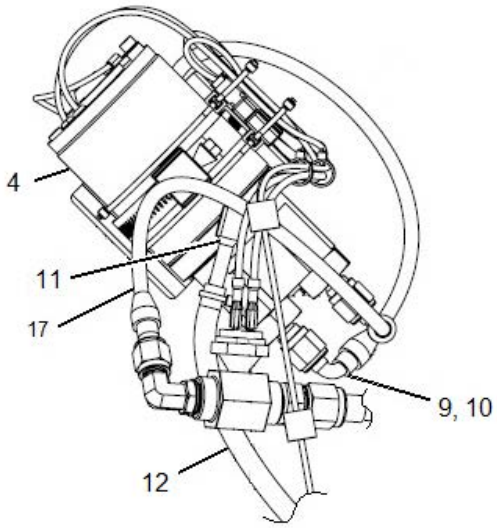
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DETAIL A

(S/N 5114 THROUGH S/N 5245 OR S/N MODIFIED PER SIL T-063, ORIGINAL ISSUE)



DETAIL B

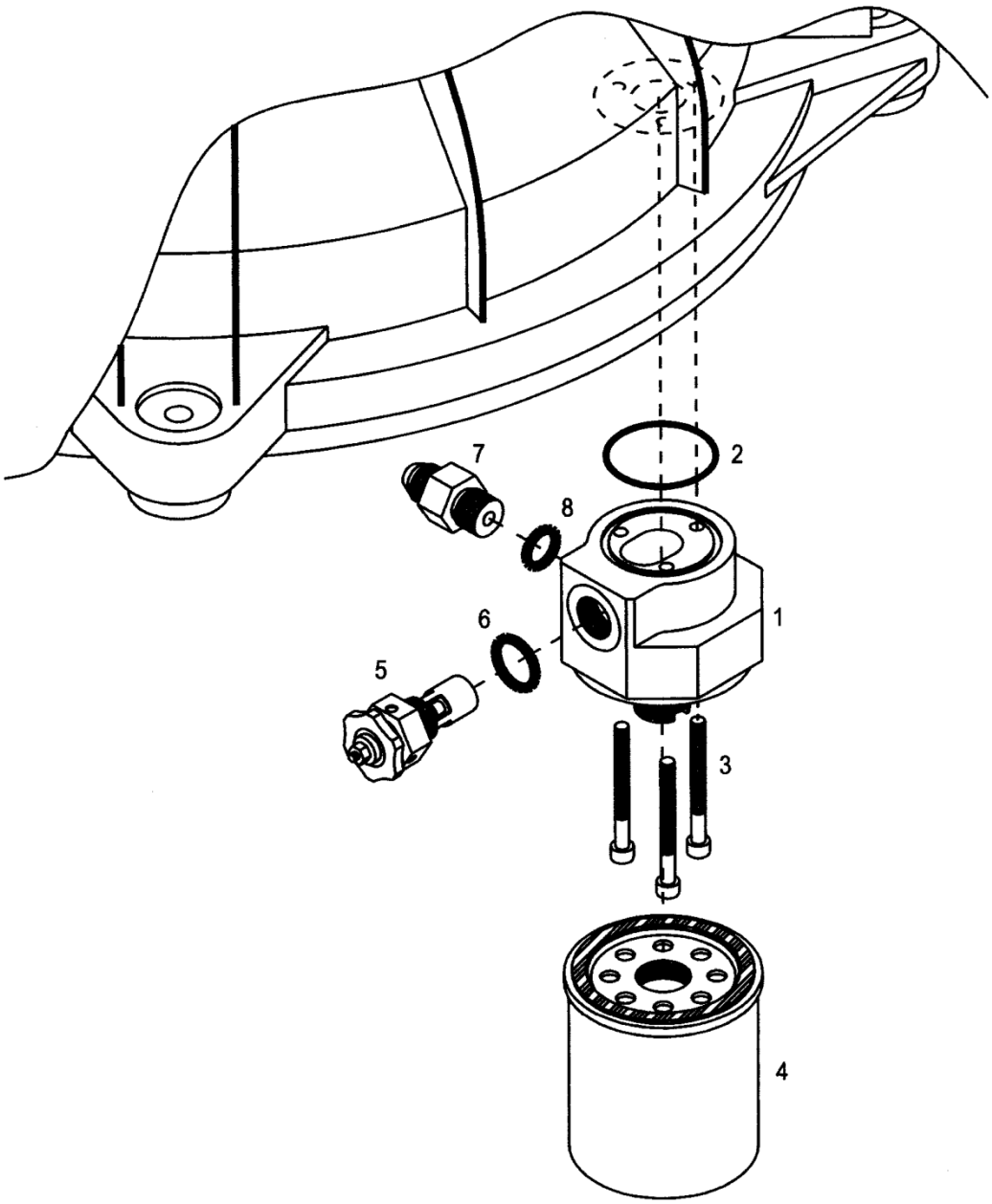
(S/N 5246 AND SUBSEQUENT, AND EARLIER S/N MODIFIED PER SIL T-063 OR SIL T-070, LATEST REVISION)

1. Heat Exchanger
2. Mounting Brackets
3. Pressure Switch
4. Electric Pump
5. Filter Housing
6. Filter
7. Chip Detector
8. Check Valve
9. Straight Fitting
10. O-Ring
11. Elbow
12. Drain Line

Figure 11-9. Oil Filtration/Cooling System

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1.	Filter Housing	5.	Chip Detector
2.	O-Ring	6.	Gasket
3.	Mounting Screws	7.	Check Valve
4.	Oil Filter	8.	O-Ring

Figure 11-10. Oil Filter Assembly Installation

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C. Disconnect the electrical leads from the oil pump, pressure switch, and chip detector.

D. Remove the heat exchanger using the following procedure:

(1) Disconnect the oil lines from the heat exchanger.

(2) Remove the hardware securing the heat exchanger to the mount brackets and remove the heat exchanger.

(3) Remove the heat exchanger mounting brackets from the main rotor transmission.

E. Remove the filter assembly using the following procedure:

(1) Remove the oil filter from the housing.

(2) Disconnect the oil line from the outlet port.

(3) Remove the three screws securing the filter housing to the main rotor transmission and remove the filter housing.

a. If required, remove the chip detector assembly and the check valve from the filter housing.

F. Remove the electric pump using the following procedure:

(1) Disconnect the oil lines from the inlet and outlet ports.

(2) Disconnect the drain line, if equipped.

(3) Remove the safety wire from the clamp, loosen the clamp, and remove the pump.

a. If required, remove the elbow(s) and straight fittings, as applicable, from the pump.

(4) Remove the hardware securing the mounting bracket to the main rotor transmission and remove the mounting bracket.

G. Remove the pressure switch from the tee adapter.

11-42. Inspection – Oil Filtration/Cooling System

A. Inspect the heat exchanger for kinks, cracks, bent cooling fins, and general condition.

B. Inspect the filter housing for general condition. Cut open the oil filter and inspect the filter element for metal particles, flakes, or slivers exceeding 1/16 inch/1.6 mm. If metal particles, flakes, or slivers exceeding 1/16 inch/1.6 mm are found, contact Enstrom Customer Service Department and discontinue use until further instructions are received from Enstrom Customer Service Department.

C. Inspect the oil pump for general condition.

D. Inspect the pressure switch for general condition.

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E. Inspect the oil lines, drain line (if equipped), fittings, and mounting brackets for general condition.

11-43. Repair – Oil Filtration/Cooling System

A. Replace the heat exchanger if cracked, kinked, or the oil line fittings are damaged beyond repair. Straighten bent cooling fins as required.

B. Replace the oil filter housing if the threads on the chip detector port, check valve port, and/or the filter stem are damaged beyond repair. Replace the filter housing if the filter seal surface is damaged and will not seal after repair.

C. Replace the oil pump if inoperable or leaking from the housing seams. Repair/ Replace wire harness as required.

D. Replace the pressure switch if inoperable. Repair/Replace the wire harness as required.

E. Replace the oil lines, drain line (if equipped), fittings, and mounting brackets if damaged beyond repair.

11-44. Installation – Oil Filtration/Cooling System (Figures 11-9 & 11-10)

A. Apply a light coat of thread sealant to the pressure switch and install the switch into the tee adapter.

B. Install the electrical pump using the following procedure:

NOTE

Note the orientation of the pump for the P/N specified.

(1) Install the pump mounting bracket onto the transmission.

(2) If required, apply a light coat of thread sealant to the elbow fitting(s) and straight fittings (as required), and install the fittings into the pump.

a. If required, install new O-rings when installing the fittings.

(3) Install the pump onto the mounting bracket.

a. P/N 8116-B: Inlet/Outlet ports forward with the outlet port up.

b. P/N 4130039-1: Inlet/Outlet ports aft with the inlet port up.

(4) Tighten and lockwire (.025") the clamp.

(5) Connect the inlet and outlet oil lines.

(6) Connect the drain line (if equipped).

(7) Apply torque stripes to the fittings, as required.

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C. Install the filter assembly using the following procedure:

(1) If required, lubricate (MIL-PRF-2105) and install a new O-ring onto the check valve. Install the check valve into the filter housing.

(2) If required, install a new gasket onto the chip detector assembly. Install the chip detector assembly until tightened finger tight and then an additional 90°.

(3) Install a new lubricated (MIL-PRF-2105) O-ring along with the filter housing into position on the transmission and install the mounting screws. Torque the mounting screws and lockwire (.025").

(4) Lubricate (MIL-PRF-2105) the seal on a new oil filter and install the filter until the seal contacts the seal surface. Turn the filter an additional ¾ turn and lockwire (.025") the filter to the chip detector assembly.

D. Install the heat exchanger using the following procedure:

(1) Install the mounting brackets onto the transmission.

(2) Install the heat exchanger onto the mounting brackets and torque the hardware.

(3) Connect the oil lines to the heat exchanger.

E. Connect the electrical connectors for the oil pump, pressure switch, and chip detector.

F. Service the main rotor transmission (para. 4-12).

G. Turn the battery switch on.

(1) Check the system for oil leaks and proper operation of the oil pump and pressure switch. Proper operation is indicated by the caution segment MRGB PRESS or MAIN XMSN PRESS. Verify the segment is illuminated once power is applied and then extinguishes. If required, turn battery switch off and prime the oil pump by disconnecting the oil line between the pressure switch tee and the pump inlet and filling the line with oil. Reconnect the line, turn the battery switch on, and check the oil pump and pressure switch for proper operation

H. Install the upper pulley assembly (para. 11-52).

11-45. Upper Pulley Assembly

11-46. Removal – Upper Pulley Assembly (Figure 11-11)

A. Remove the left and right side engine access panels and the left and right aft side cowlings.

B. Remove the upper plenum/air inlet (para. 13-28).

C. Remove the lower pulley assembly (para. 11-19).

D. Remove the short tail rotor drive shaft (para. 11-63).

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E. (Keyed Pinion) Remove the tail rotor drive shaft hub from the main rotor transmission pinion shaft using a taper pin remover (T-0092-5).

F. (Splined Pinion) Remove the tail rotor drive shaft hub by removing the bolt and washer from the end of the main rotor transmission pinion shaft.

G. Remove the aft bearing retaining nut (16) from the pinion using the following procedure:

(1) Install the upper pulley wrench (T-0164-1) onto the upper pulley and rotate the upper pulley until the wrench contacts the aft pinion bearing support truss (Figure 11-11.1).

(2) Remove the aft bearing assembly retaining nut using a breaker bar and special socket (T-0135-1).

H. Remove the hardware attaching the aft bearing assembly to the support truss (21). Remove the hardware attaching the support truss to the pylon and remove the support truss.

I. Remove the aft pinion bearing assembly using a bearing puller.

J. Remove the upper pulley (1) from the transmission pinion.

K. Remove the key (7) from the pinion, if applicable.

NOTE

If the key was shimmed, save the shim.

11-47. Disassembly – Upper Pulley Assembly (Figure 11-11)

NOTE

The upper pulley assembly is dynamically balanced as an assembly including the key. If the upper pulley assembly must be disassembled, index mark the components so that the dynamic balance will be maintained after reassembly.

NOTE

The upper pulley, P/N 4130514-17 & 4130538-11, do not use the hub adapter.

A. Remove the hardware securing the center hub (3) and the hub adapter (2) in the upper pulley (1).

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

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WARNING

Use protective gloves when handling heated parts.

B. Heat the pulley (1) to approximately 250°F/121°C and remove pulley hub (3) and hub adapter (2), if applicable.

11-48. Cleaning – Upper Pulley Assembly

A. Clean all parts with kerosene, toluol or equivalent solvent, or vapor degrease before inspection.

11-49. Inspection – Upper Pulley Assembly

A. See Table 11-3 for the detailed inspection requirements for the upper pulley assembly.

11-50. Repair – Upper Pulley Assembly

A. See Table 11-3 for the damage limits and repair criteria for the components of the upper pulley assembly.

11-51. Assembly – Upper Pulley Assembly (Figure 11-11)

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

NOTE

The upper pulley P/N 4130514-17 & 4130538-11 do not use the hub adapter (2).

A. Clean the upper pulley (1), hub adapter (2), if applicable, and the pulley hub (3) with toluene or a similar solvent.

B. Heat the upper pulley (1) to approximately 250°F/121°C.

C. Spread a 1 in/25 mm wide bead of retaining compound (Loctite 635, or equivalent) on the cylindrical end of the pulley hub (3), about 0.5 in/13 mm from the end.

NOTE

The upper pulley assembly is dynamically balanced. If the parts were not index marked for reassembly, the pulley assembly with the key must be dynamically balanced to within .2 inch-ounce.

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Table 11-3. Upper Pulley and Aft Pinion Bearing Assemblies

P/N	Fig. 11-11 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
4130514-15 4130514-17 4130538-11	1	Pulley	I.D. 4.2490 to 4.2495 (4130514-15)	+.0003	Not Repairable	Replace Pulley
			I.D. 2.1866 to 2.1871 (4130517-17, 4130538-11)	+.0003	Not Repairable	Replace Pulley
			Cracks	None Allowed	Not Repairable	Replace Pulley
			Depth of grooves	≤ .176	Not Repairable	Replace Pulley
			Nicks and gouges in belt grooves	None Allowed	≤ .25 long and ≤ .025 deep	Blend out smooth
4142009	2	Hub Adapter	O.D. 4.2497 to 4.2499	-.0002	Not Repairable	Replace Adapter
			I.D. 2.185 to 2.186	+.001	Not Repairable	Replace Adapter
			Cracks	None Allowed	Not Repairable	Replace Adapter
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
4142010-11 4142010-1	3	Pulley Hub Pulley Hub Assembly	O.D. 2.188 to 2.189	-.001	Not Repairable	Replace Hub
			I.D. 1.5630 to 1.5640 (4142010-11)	+.0003	Not Repairable	Replace Hub
			I.D. (bushing) 1.2484 to 1.2489 (4142010-1)	+.0003	Not Repairable	Replace Hub
			I.D. (gearbox side) 1.5004 to 1.5009 (4142010-1)	+.0003	Not Repairable	Replace Hub
			Keyway Width .3105 to .3125	+.0005	Not Repairable	Replace Hub
			Cracks	None Allowed	Not Repairable	Replace Hub
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth

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Table 11-3. Upper Pulley and Aft Pinion Bearing Assemblies

P/N	Fig. 11-11 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-13142	7	Key	Width .3105 to .3125	-.001	Not Repairable	Replace Key
			Visible wear on side of key	None Allowed	Not Repairable	Replace Key
4130501	8	Bearing Housing	I.D. 3.5428 to 3.5434	+.001	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
			Nicks, scratches, or corrosion	.030 deep	≤ .030 deep	Blend out smooth
608-2RS, ECD014-11	10	Bearing	Roughness, spalling, pits, or corrosion	None Allowed	Not Repairable	Replace Bearing
28-13323-11 (keyed) 4130046-11 (spined)	11	Bearing Adapter	O.D. 1.5746 to 1.5749	-.0002	Not Repairable	Replace Adapter
			I.D. 1.3116 to 1.3118 (28-13323-11)	+.0002	Not Repairable	Replace Adapter
			I.D. 1.2084 to 1.2089 (4130046-11)	+.0002	Not Repairable	Replace Adapter
			Fretting wear on end surfaces	None Allowed	Not Repairable	Replace Adapter
28-13184	16	Nut	Threads (no rolled or missing threads)	None Allowed	Not Repairable	Replace Nut
			Cracks	None Allowed	Not Repairable	Replace Nut

* All dimensions are in inches.

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D. Install the six bolts (for alignment) in the pulley hub (3) and the hub adapter (2), if applicable, and install the hub and adapter into the pulley using the following procedure:

(1) Set the pulley (1) in a press with the aft side up.

(2) While the pulley (1) is hot, insert the pulley hub (3) into the pulley (1) and immediately use pressure to ensure that the pulley hub (3) is completely seated in the upper pulley (1).

NOTE

Alternate sides when torqueing the pulley hardware.

(3) Install the remaining hardware into the pulley hub (3) and upper pulley (1). Torque the nuts to standard torque. Alternate sides when torqueing the pulley hardware.

E. Use the following procedure if the pulley assembly has to be dynamically balanced:

(1) Dynamically balance the pulley within .2 inch-ounces; include the key when balancing.

(2) Use Dyna Weight two part epoxy for the balance material.

WARNING

Acetone and Methylethylketone (MEK) are toxic and must be used with extreme caution. Make sure adequate ventilation is provided. Repeated or prolonged contact with the skin should be avoided. Low-volatile substitutes, such as Extreme Simple Green or Citra-Safe, are preferred solvents.

(3) Remove all grease and dirt from the pulley surface using MEK, or equivalent, and rough sand the surface with 150 grit sand paper.

11-52. Installation – Upper Pulley Assembly (Figure 11-11)

A. Before installing the key (7) into the pinion, check that the key slides freely through the keyway in the upper pulley. If it does not slide through, the key must be filed slightly on one side to allow proper fit. A clearance of .0005-.001 inch/.013-.025 mm between the key and the pulley keyway is required. If the key is loose in the pinion keyway, proceed to step 1 below:

(1) Install the key on the pinion and using a feeler gauge, measure the gap between the side of the key and the pinion keyway.

(2) Divide the measurement in half to get the thickness of the stainless steel shim stock required.

(3) Cut a shim 2" long X 1.25" wide.

(4) Wrap the shim around the key. With the chamfered side of the key down, tap the key and shim into the pinion keyway.

(5) Using a razor knife, trim the shim stock along the sides of the key flush with the pinion. The key must be secure in the pinion.

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CAUTION

Apply lubricant to the bore of the pulley hub and aft pinion bearing adapter, not to the pinion shaft.

CAUTION

Ensure the aft face of the pinion bearing adapter is clean and does not have lubricant on it.

B. Lubricate (MIL-G-25537 or MIL-PRF-81322) the bore of the pulley hub (3) and install the upper pulley onto the pinion.

C. Lubricate (MIL-G-25537 or MIL-PRF-81322) the bore of the aft pinion bearing adapter (11) and install the aft pinion bearing assembly onto the pinion.

D. Install the bearing retaining nut (16). Do not torque the retaining nut at this time.

E. Install the drive belt on the upper pulley.

F. Install the pinion bearing support truss (20) in the pylon mounts. Install the mounting hardware and torque the nuts to standard torque.

G. Install the hardware attaching the aft pinion bearing housing to the support truss. If required, shim between the bearing housing and support truss to remove any gap (gap tolerance ±.010 in/.25 mm).

(1) Using 2 sets of feeler gauges (one for each end of the bearing housing-truss assembly), insert equal combination of gauge thicknesses between the bottom of the bearing housing and the top beam of the truss up to the bolt hole until the clearance is zero.

(2) The thickness of gauges required to fill the gap equals the required thickness of shims required. Maximum combination of shims must be less than .060 in/1.52 mm.

NOTE

Retorque the aft pinion bearing retaining nut 20-25 hours after installation of a new or overhauled main rotor transmission or after any maintenance requiring removal or replacement of the pinion nut.

H. Torque the aft pinion bearing retaining nut (16) using the following procedure:

(1) Install the upper pulley wrench (T-0164-1) onto the upper pulley and rotate the upper pulley until the wrench contacts the aft pinion bearing support truss (Figure 11-11.1).

(2) Using special tool T-0135-1-SET, torque the aft pinion bearing retaining nut to 250 ft-lb/340.9 Nm.

I. Mount a dial indicator on the support truss and measure the runout of the aft face of the upper pulley. Maximum FIM (Full Indicator Movement) is .005 in/.13 mm. If the FIM is more than maximum allowed, remove the upper pulley and inspect the components for the cause of the runout.

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NOTE

(Keyed pinion) If a cup washer is installed, torque to 15-18 in-lb/1.7-2.0 Nm (AN364 nut), otherwise torque to 25 in-lb/2.8 Nm (AN365 nut).

J. (Keyed Pinion) Install the tail rotor drive shaft hub into the pinion shaft. Install the taper pin and torque the nut.

K. (Splined Pinion)

(1) Lubricate (MIL-G-25537 or MIL-PRF-81322) the splines of the main rotor gearbox pinion shaft.

(2) Install the tail rotor drive shaft hub onto the pinion shaft.

(3) Apply a coating of Vibra-Tite VC-3, or equivalent (para. 11-94) to the bolt before installation.

NOTE

P/N 4130533-15 washer is intended to deform on installation, which is normal. The washer may be reused for reinstallation. Reverse the washer so the convex side is toward the bolt head on reinstallation.

(4) Install washer (P/N 4130533-15) and bolt (torque 100-140 in-lb/11.3-15.8 Nm).

K. Lockwire (.041) the pinion bearing retaining nut to the drive shaft hub taper pin or to the bolt (P/N AN4H7A) connecting the tail rotor coupling to the flex pack.

L. Install the short tail rotor drive shaft (para. 11-67).

M. Install the lower pulley assembly (para. 11-24).

N. Align the lower pulley drive system (para. 11-17).

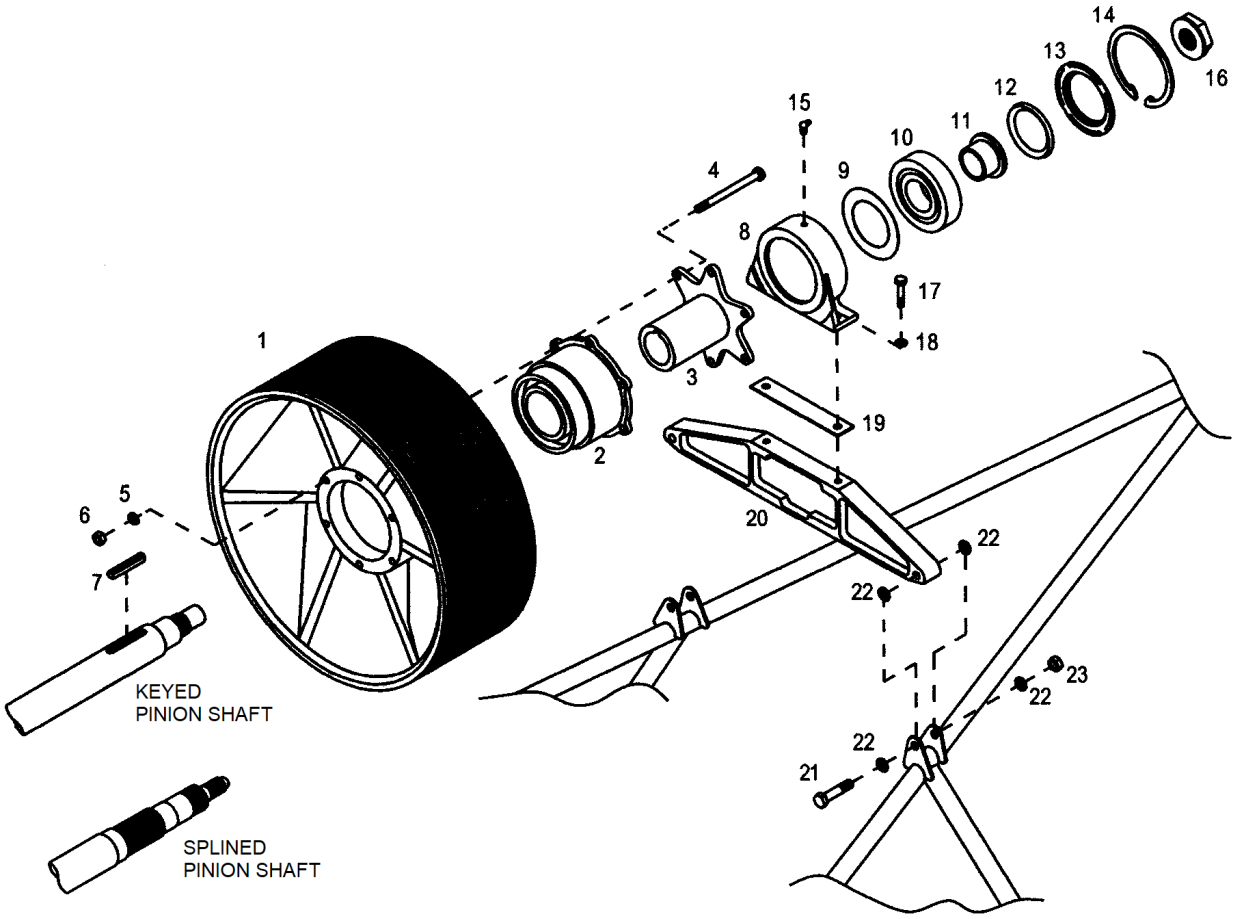
O. Install the upper plenum/air inlet (para. 13-31).

P. Install the left and right side engine access and the left and right side access panels.

Q. Perform a limited maintenance test flight (para. 4-61).

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1.	Upper Pulley	13.	Seal Retainer
2.	Hub Adapter (Keyed only)	14.	Retaining Ring
3.	Pulley Hub	15.	Grease Fitting
4.	Bolt	16.	Nut
5.	Washer	17.	Bolt
6.	Nut	18.	Washer
7.	Key (Keyed only)	19.	Shim
8.	Bearing Housing	20.	Truss
9.	Shield	21.	Bolt
10.	Bearing	22.	Washer
11.	Bearing Adapter	23	Nut
12.	Seal		

Figure 11-11. Upper Pulley and Aft Pinion Bearing Assemblies
(Keyed and Splined Pinion Configurations)

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11-53. Aft Pinion Bearing Assembly

11-54. Disassembly – Aft Pinion Bearing Assembly (Figure 11-11)

A. Remove the retaining ring (14), retainer (13), and seal (12) from the aft side of the bearing housing (8).

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel. Use protective gloves when handling heated parts.

B. Heat the bearing housing (8) to approximately 250°F/121°C and remove the bearing (10) and forward seal retainer (9) from the housing.

C. Press the bearing adapter (11) from the bearing.

11-55. Cleaning – Aft Pinion Bearing Assembly

A. Clean all parts with kerosene, toluol or equivalent solvent, or vapor degrease before inspection.

11-56. Inspection – Aft Pinion Bearing Assembly

A. See Table 11-3 for the detailed inspection requirements for the aft pinion bearing assembly.

11-57. Repair – Aft Pinion Bearing Assembly

A. See Table 11-3 for the damage limits and repair criteria for the components of the aft pinion bearing assembly.

11-58. Assembly – Aft Pinion Bearing Assembly (Figure 11-11)

A. Press the bearing adapter (11) into the bearing.

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel. Use protective gloves when handling heated parts.

B. Heat the bearing housing (8) to approximately 250°F/121°C.

C. Install shield (9) on forward side of bearing (10).

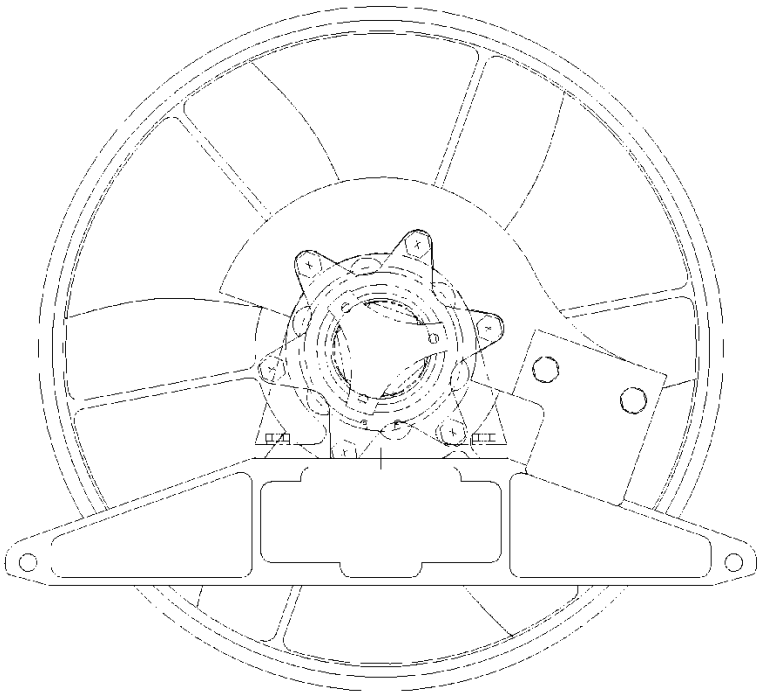
(1) Apply a thin coat of grease (MIL-PRF-81322) and ensure shield is centered over the bearing when installed.

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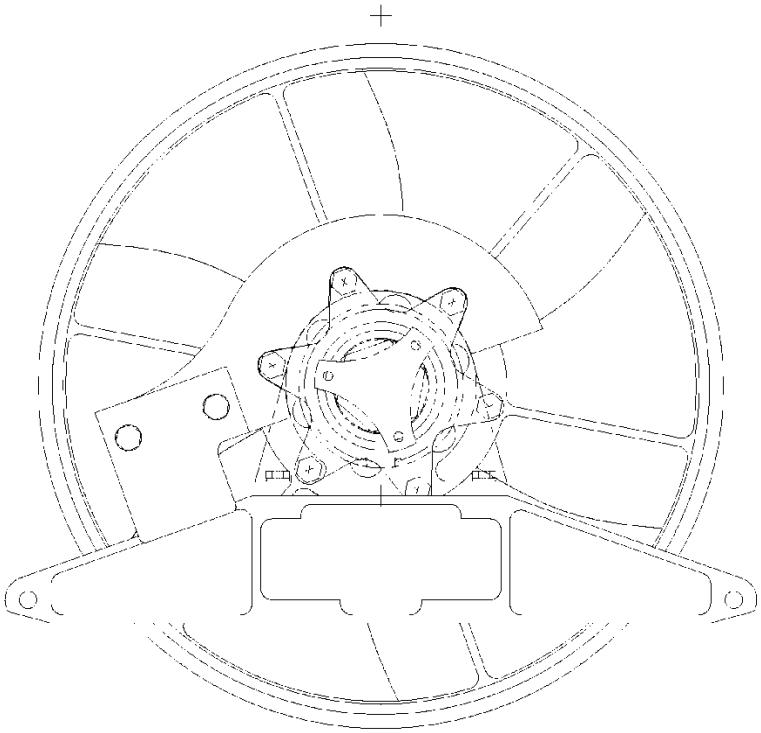
D. Lubricate (MIL-G-25537 or MIL-PRF-81322) O.D. of the bearing and install the bearing (10) in the housing with the bearing adapter (11) and the open side of the bearing facing aft.

E. Install the seal (12), retainer (13), and retaining ring (14).

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TORQUING ORIENTATION



LOOSENING ORIENTATION

Figure 11-11.1. Upper Pulley Wrench, Tool T-0164-1

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11-59. Tail Rotor Drive Shafts

11-60. Description – Tail Rotor Drive Shafts (Figure 11-12)

The tail rotor drive shafts transmit engine power via the main rotor transmission pinion to the tail rotor transmission. The two shafts are connected to each other and to the main and tail rotor transmissions by flex pack couplings. The couplings are comprised of multiple thin stainless steel plates bolted to the drive hubs. These flex pack couplings permit normal small angular misalignments caused by tail rotor thrust and aerodynamic loading on the tailcone. The short section of drive shaft directly aft of the upper pulley connects the main rotor transmission pinion shaft to the long tail rotor drive shaft and is easily removed to facilitate maintenance on the main drive system components. The long tail rotor drive shaft is a single piece shaft supported by a series of grease lubricated bearing assemblies and covered by a drive shaft cover.

11-61. Alignment – Tail Rotor Drive Shafts (Figure 11-13)

A. Remove the aft tail rotor drive shaft cover and open the remaining covers.

B. Install the tail drive shaft alignment tools (T-0143) on the forward end of the short shaft and the aft end of the long shaft. If not installed, attach the piano wire to the tools and position the piano wire vertically with the center line of the drive shafts.

C. Starting at the forward drive shaft bearing assembly, place the gauge block between the drive shaft and the piano wire. The piano wire will fit in the step in the gauge block when the proper vertical alignment is achieved. If the wire does not fit into the step or misses the block completely, add or subtract shims under the bearing assembly to bring the shaft into proper alignment (Figure 11-12).

D. Repeat the process in step C for the remaining drive shaft bearing assemblies.

E. When the proper vertical alignment is achieved, rotate the tail rotor drive shafts 90° to check the lateral alignment.

F. Starting at the forward drive shaft bearing assembly, loosen the bearing assembly hardware and shift the position of the bearing assembly to fit the piano wire in step in the gauge block. Tighten the hardware and recheck the alignment.

G. Repeat the process in step F for the remaining drive shaft bearing assemblies.

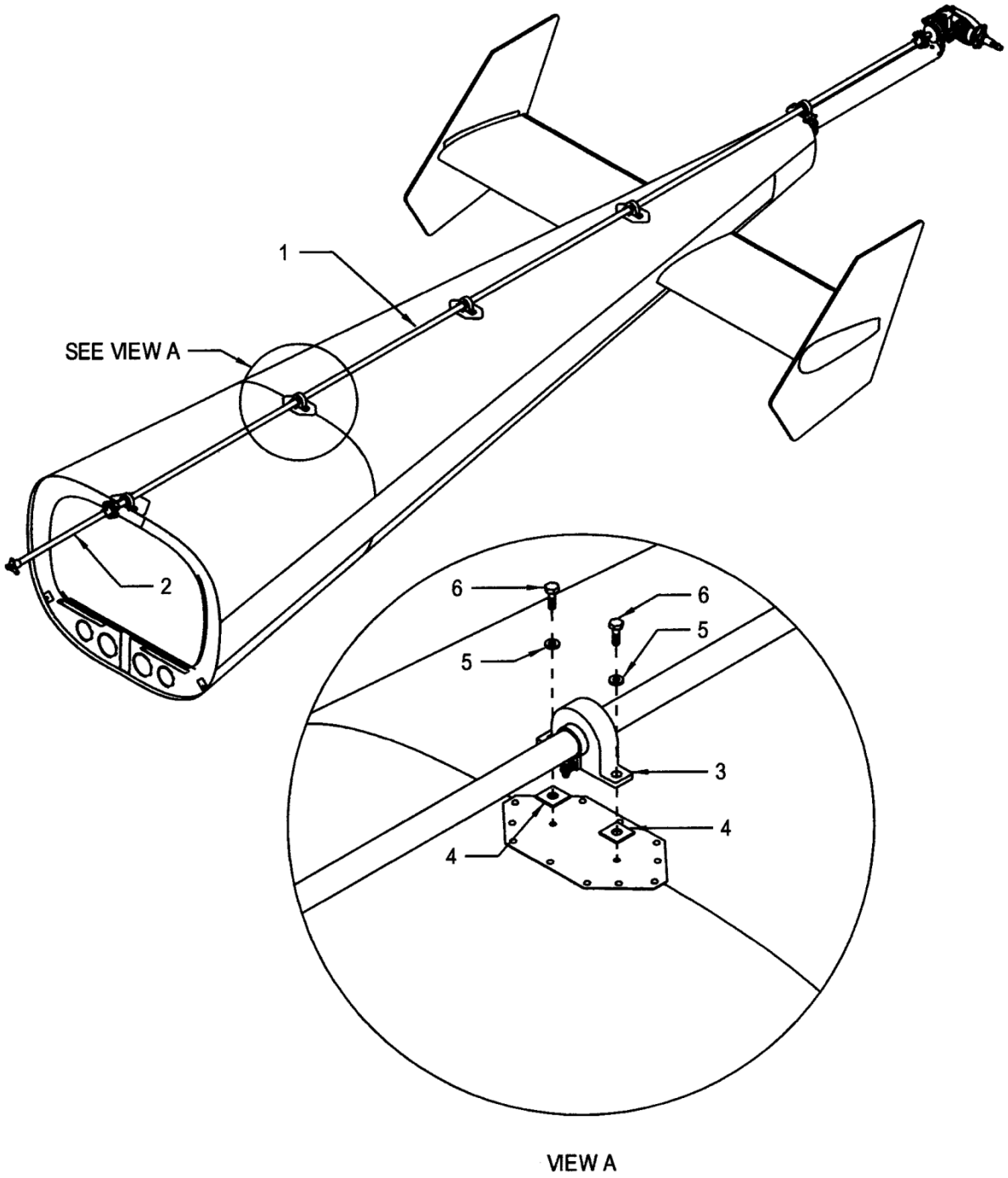
H. Check the drive shaft cover bracket alignment by temporarily installing the drive shaft aft cover. Adjust the bracket if required.

I. Torque the drive shaft bearing assembly mount bolts to 20-25 in-lbs/2.3-2.8 Nm and recheck the vertical and lateral alignment. Adjust as required.

J. Lockwire (MS20995C32) the aft drive shaft bearing assembly mounting hardware. Route the lockwire under the bearing assembly to avoid interfering with the drive shaft.

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1.	Long Tail Rotor Drive Shaft	4.	Shim
2.	Short Tail Rotor Drive Shaft	5.	Washer
3.	Drive Shaft Bearing Assembly	6.	Bolt

Figure 11-12. Tail Rotor Drive System

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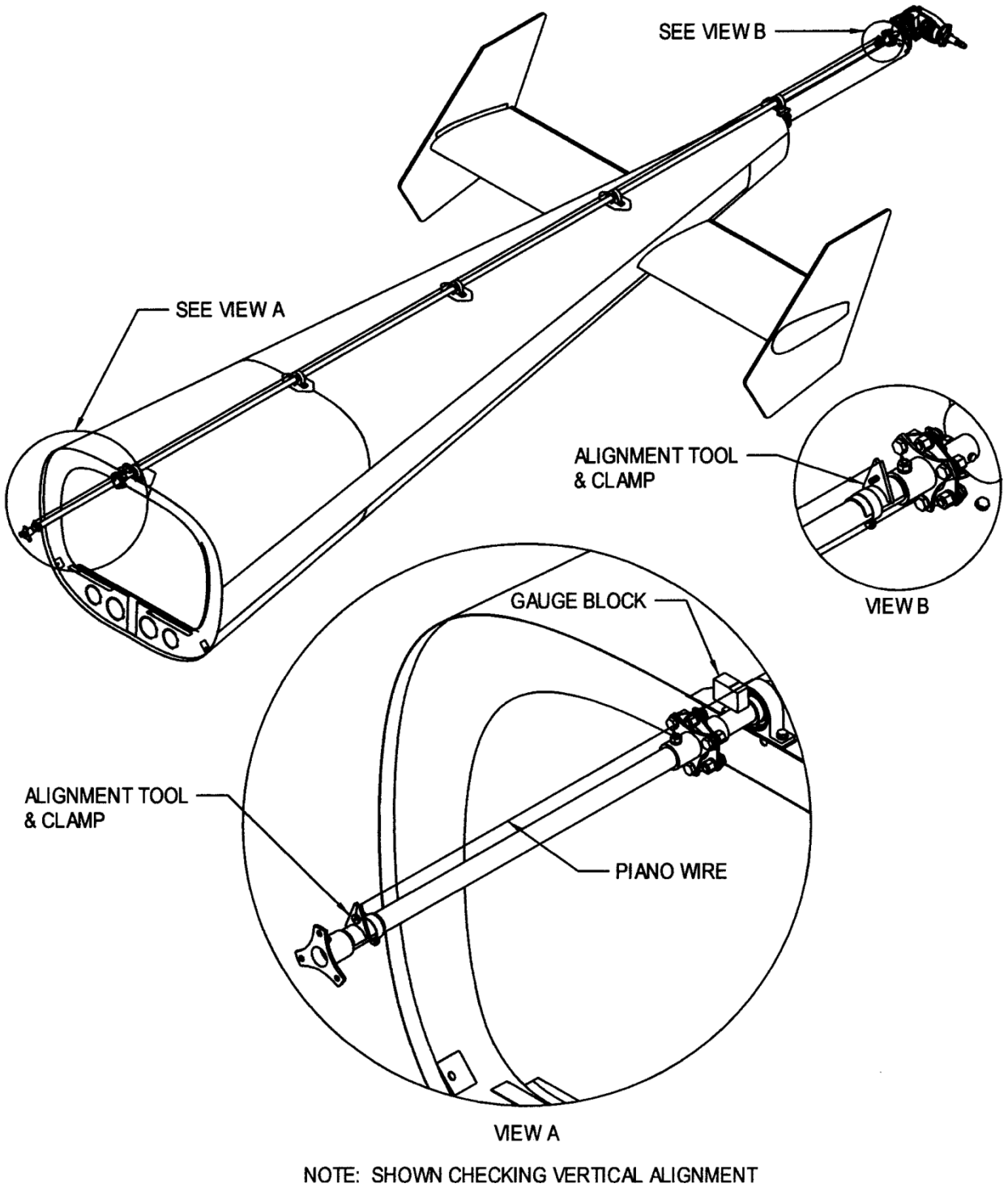


Figure 11-13. Tail Rotor Drive Shaft Alignment

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K. Remove the alignment tools from the drive shafts.

M. Close the drive shaft covers and install the aft cover.

11-62. Short Tail Rotor Drive Shaft

11-63. Removal – Short Tail Rotor Drive Shaft (Figure 11-15)

CAUTION

Account for all the hardware removed from the flex pack couplings on the short tail rotor drive shaft.

A. Remove the bolts securing the flex pack coupling to the drive hub on the main rotor transmission pinion.

B. Remove the bolts securing the flex pack coupling to the drive hub on the long tail rotor drive shaft.

C. Remove one of the bolts securing the aft flex pack to the short tail rotor drive shaft drive hub. Remove the short tail rotor drive shaft.

11-64. Disassembly – Short Tail Rotor Drive Shaft (Figure 11-15)

A. Remove the bolts securing the flex pack couplings to the drive hub.

NOTE

Removal of the drive hubs from the short tail rotor drive shaft is normally not required.

NOTE

Keep the taper pins with the corresponding drive hub and mark the hubs for reinstallation.

B. Remove the taper pins from the drive hubs using tool (T-0092-5), remove the drive hubs from the drive shaft.

11-65. Inspection – Short Tail Rotor Drive Shaft

A. Inspect the drive shaft for the following conditions:

(1) Sharp kinks or bends in excess of .010 inch/.25 mm are cause for rejection.

(2) Nicks and scratches less than .030 inch/.76 mm deep may be blended out, damage in excess of .030 inch/.76 mm is cause for rejection.

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(3) Taper pin holes for elongation, excessive diameter, and cracks. Any of the preceding conditions are cause for rejection.

(4) Corrosion. Pits in excess of .030inch/.76 mm in depth are cause for rejection.

B. Inspect the drive hubs in accordance with paragraph 11-84.

C. Inspect the flex pack couplings in accordance with paragraph 11-80.

11-66. Assembly – Short Tail Rotor Drive Shaft (Figure 11-15)

A. Install the drive hubs, taper pins, washers, and nuts. Torque the nuts to 25 in-lbs/2.8 Nm.

NOTE

Ensure the beveled washers are installed with the bevel toward the flex pack coupling.

NOTE

For short tail rotor drive shaft installation purposes, do not install one of the bolt assemblies in the aft flex pack coupling.

B. Install the flex pack couplings onto the drive hubs (para. 11-81).

11-67. Installation – Short Tail Rotor Drive Shaft (Figure 11-15)

A. Position the short shaft between the main rotor transmission and the long tail rotor drive shaft.

NOTE

Ensure the beveled washers are installed with the bevel toward the flex pack coupling.

B. Install the remaining bolt assembly in the aft flex pack coupling.

C. Connect the flex pack couplings to the main rotor transmission pinion and the long tail rotor drive shaft drive hubs (para. 11-81).

D. Lockwire (MS20995C41) the pinion nut to the flex pack coupling attachment bolt (AN4H7A).

11-68. Long Tail Rotor Drive Shaft

11-69. Removal – Long Tail Rotor Drive Shaft (Figure 11-12 & 11-15)

A. Remove the aft tail rotor drive shaft cover and open the remaining covers.

B. If installed, remove the short tail rotor drive shaft (para. 11-63).

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C. If installed, remove the short tail rotor drive shaft (para. 11-63).

NOTE

Keep the shim stack-ups together for each of the drive shaft bearing assemblies.

D. Remove the bolts securing the tail rotor drive shaft bearing housings to the tailcone and the drive shaft cover bracket from under the aft drive shaft bearing assembly.

E. Remove the long tail rotor drive shaft from the tailcone.

11-70. Disassembly – Long Tail Rotor Drive Shaft (Figure 11-15)

A. Remove the bolts securing the flex pack coupling to the aft drive hub.

NOTE

Removing the drive hubs from the long tail rotor drive shaft is normally only required for replacement of the drive shaft bearing assemblies.

NOTE

Keep the taper pins with the corresponding drive hub and mark the hubs for reinstallation.

B. Remove the taper pins from the drive hubs using tool (T-0092-5), remove the drive hubs from the drive shaft.

C. Mark the position of the drive shaft bearing assemblies.

D. Lubricate the drive shaft with liquid soap and slide the drive shaft bearing assemblies from the drive shaft.

11-71. Inspection – Long Tail Rotor Drive Shaft

A. Inspect the drive shaft for the following conditions:

(1) Sharp kinks or bends in excess of .015 inch per 3 foot section/.38 mm per 1 meter section are cause for rejection.

(2) Nicks and scratches less than .030 inch/.76 mm deep may be blended out, damage in excess of .030 inch/.76 mm is cause for rejection.

(3) Taper pin holes for elongation, excessive diameter, and cracks. Any are cause for rejection.

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(4) Corrosion. Pits in excess of .030inch/.76 mm in depth are cause for rejection.

B. Inspect the drive hubs in accordance with paragraph 11-84.

C. Inspect the flex pack coupling in accordance with paragraph 11-80.

11-72. Assembly – Long Tail Rotor Drive Shaft (Figure 11-15)

A. If a new drive shaft is being assembled, follow the steps listed below:

(1) Remove the drive hubs from the replacement shaft.

(2) Transfer the drive shaft bearing assembly location marks to the replacement shaft.

NOTE

Install the forward and aft drive shaft bearing assemblies with the open side facing forward.

B. Lubricate the drive shaft with liquid soap and install the drives shaft bearing assemblies according to the location marks.

C. Install the drive hubs, taper pins, washers, and nuts. Torque the nuts to 25 in-lbs/2.8 Nm.

NOTE

Ensure the beveled washers are installed with the bevel toward the flex pack coupling.

D. Install the flex pack coupling onto the aft drive hub (para. 11-81).

11-73. Installation – Long Tail Rotor Drive Shaft (Figures 11-12 & 11-15)

A. Place the drive shaft onto the tailcone.

NOTE

Ensure the beveled washers are installed with the bevel toward the flex pack coupling.

B. Connect the aft flex pack coupling to the tail rotor transmission drive hub (para. 11-81).

C. Check the position of the drive shaft bearing assemblies against the mounting points on the tailcone. Adjust the location of the bearing assemblies as required.

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D. Install the drive shaft cover bracket and shims under the aft drive shaft bearing assembly. Temporarily install the bearing assembly shim stack-ups and mounting hardware.

E. Install the short tail rotor drive shaft.

F. Align the tail rotor drive shafts (para. 11-61).

G. Close the drive shaft covers and install the aft cover.

11-74. Drive Shaft Bearing Assembly

11-75. Disassembly – Drive Shaft Bearing Assembly (Figure 11-14)

A. Remove and disassemble the long tail rotor drive shaft (para. 11-69 & 11-70).

B. Remove the rubber bushing.

C. Remove the retaining ring.

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

D. Heat the bearing housing to approximately 250°F/121°C and gently tap the bearing to remove.

11-76. Inspection – Drive Shaft Bearing Assembly

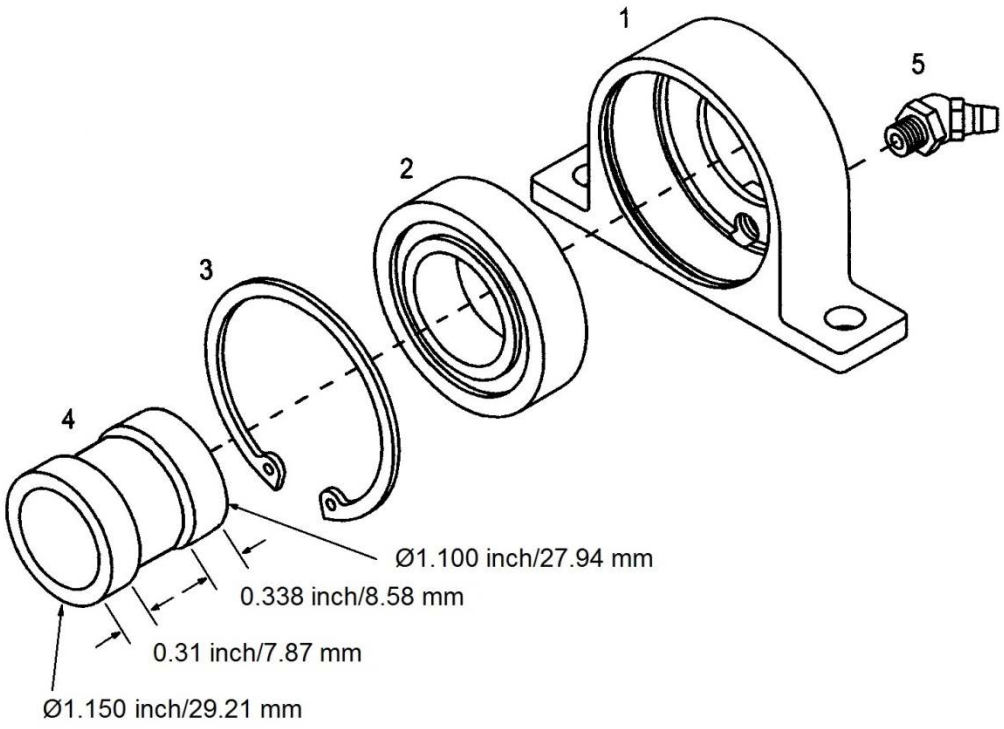
A. Inspect the bearing housing for cracks, corrosion, or nicks. Replace the housing if cracked or corrosion/damage exceeds .030 inch/.76 mm. Remove corrosion/damage not exceeding .030 inch/.76 mm.

B. Inspect the bearing for ratcheting or roughness. Replace bearings if ratcheting or roughness is found.

C. Inspect the rubber bushing for tears or deterioration. Replace bushings that are torn or deteriorated.

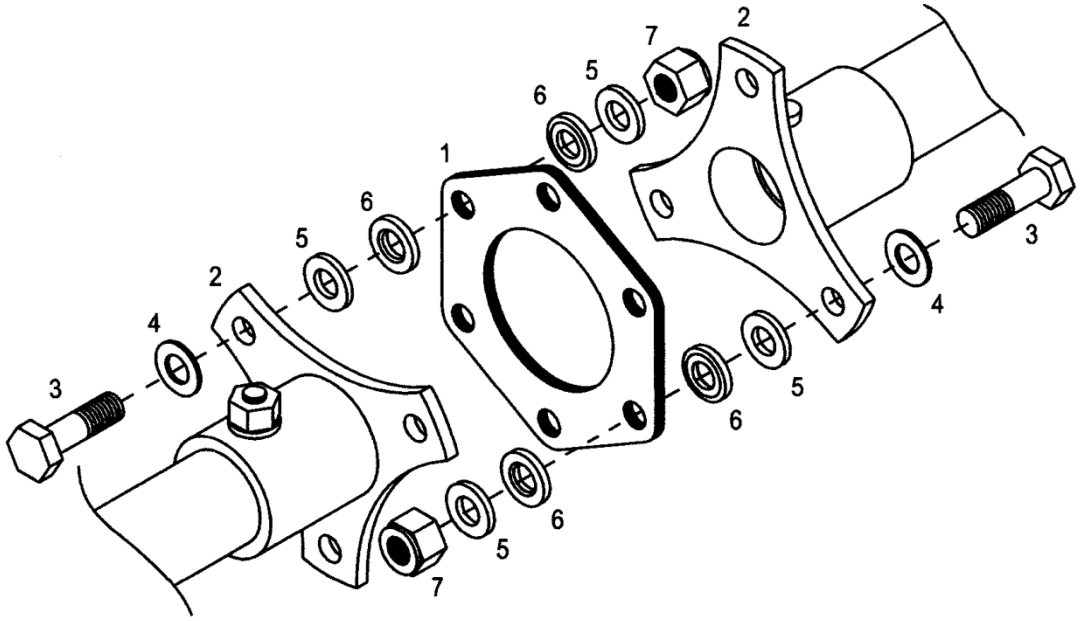
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1. Bearing Housing
2. Bearing
3. Retaining Ring
4. Rubber Bushing
5. Lube Fitting

Figure 11-14. Drive Shaft Bearing Assembly



1. Flex Pack Coupling
2. Drive Hub
3. Bolt
4. Washer (Thin)
5. Washer (Thick or Thin)
6. Beveled Washer
7. Nut

Figure 11-15. Flex Pack Coupling Installation

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11-77. Assembly – Drive Shaft Bearing Assembly (Figure 11-14)

WARNING

Use extreme caution when handling heated parts to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

A. Heat the housing to approximately 250°F/121°C.

B. Using grease (MIL-PRF-81322), lubricate the bore of the bearing housing and install the bearing.

C. Install the retaining ring and allow the housing to cool.

NOTE

Step D applies only to rubber bushing P/N 4136002-11.

D. For pillow block 1, apply Flex 80 adhesive to the rubber bushing and the inner bearing race. Install the rubber bushing with the large flange on the open side of the bearing housing. Allow the adhesive to dry and remove any adhesive from the bearing dust cover. For the remaining pillow blocks, install the rubber bushing with the large flange on the open side of the bearing housing.

E. For pillow blocks 1 through 5, install the rubber bushing with the 1.15 in/29.2 mm diameter flange (see Figure 11-14) on the open side of the bearing housing.

11-78. Flex Pack Coupling

11-79. Removal – Flex Pack Coupling (Figure 11-15)

A. Remove the hardware attaching the flex pack coupling to the drive hubs and remove the coupling.

11-80. Inspection – Flex Pack Coupling

A. Inspect the flex pack coupling for elongated bolt holes and cracked plates. Any of the preceding conditions require replacement of the flex pack coupling.

11-81. Installation – Flex Pack Coupling (Figure 11-15)

NOTE

Ensure the beveled washers are installed with the bevel toward the flex pack coupling.

A. Place the coupling between the drive hubs.

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B. Install the hardware in the following order: bolt, AN960C416L washer, drive hub, AN960C416 or C416L washer, beveled washer, flex pack coupling, beveled washer, AN960C416 or C416L washer, and nut.

NOTE

The washer(s) between the drive hub and the beveled washer are used to center the coupling between the drive hubs and might not be required. The washer(s) between the beveled washers and the nuts are used to keep the nuts from bottoming on the bolt grip and might not be required.

11-82. Tail Rotor Drive Hubs

11-83. Removal – Tail Rotor Drive Hubs

A. Remove the short or long tail rotor drive shaft (para. 11-63 or 11-69).

B. Remove the flex pack coupling from the drive hub (para. 11-79).

C. Remove the taper pin from the drive hub using tool (T-0092-5).

NOTE

Keep the taper pins with the corresponding drive hub and mark the hubs for reinstallation.

D. Remove the drive hub from the drive shaft, main rotor transmission pinion, or the tail rotor transmission input shaft.

11-84. Inspection – Tail Rotor Drive Hubs

A. Inspect the drive hubs for elongated or cracked taper pin holes, elongated bolt holes in the flanges, and bent flanges exceeding .010"/.25 mm. Any of the preceding conditions require replacement of the drive hub.

NOTE

If elongated taper pin holes are found in the drive hubs, carefully inspect the taper pin holes in the drive shafts, main rotor transmission pinion, or tail rotor transmission input shaft.

11-85. Installation – Tail Rotor Drive Hubs

A. Use the following procedures to install a new drive hub onto a serviceable drive shaft:

(1) Ream the hole in the drive hub with a #2 taper reamer until the reamer starts to come out the opposite side of the hub.

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NOTE

The hub should move freely on the drive shaft. If not, remove the hub and slightly de-burr the taper pin holes in the bore of the hub.

(2) Install the hub onto the drive shaft and coat the taper pin hole with marking dye.

(3) Continue to ream the taper pin hole until the marking dye is no longer evident in the hole (this indicates that the drive shaft and the hub are match reamed).

NOTE

A cup washer (AN975-3) or 4130541-11 or -13 taper pins may be used if the hole is over-reamed.

(4) Install an AN386-2-9A taper pin, washer, and nut. Torque to 25 in-lbs/2.8 Nm.

B. If replacing the drive hub in the main rotor transmission pinion or the tail rotor transmission input shaft, use the following procedure:

CAUTION

If the taper pin hole in the main rotor transmission pinion or the tail rotor transmission input shaft is over reamed and over size taper pins and a cup washer do not provide a proper fit, the main rotor transmission or the tail rotor transmission **must** be returned to Enstrom for repair.

(1) Ream the hole in the drive hub using a #2 taper reamer until the reamer comes out the opposite side approximately .125"/3.1 mm.

NOTE

The hub must turn freely in the pinion or input shaft.

(2) Insert the hub into the pinion or input shaft.

(3) Coat the taper pin hole with marking dye.

(4) Continue to ream the taper pin hole until the marking dye is no longer evident (this indicates that the pinion or input shaft and the hub are match reamed).

NOTE

A cup washer (AN975-3) or 4130541-11 or -13 taper pins may be used if the hole is over-reamed.

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(5) Install an AN386-2-9A taper pin, washer, and nut. Torque to 25 in-lb/2.8 Nm.

C. Install serviceable drive hubs in their original positions. Torque the taper pins to 25 in-lb/2.8 Nm.

D. Install the flex pack coupling (para. 11-81).

E. Install the tail rotor drive shaft(s) (para. 11-67 & 11-73).

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11-86. Tail Rotor Transmission

11-87. Description – Tail Rotor Transmission (Figure 11-16)

The tail rotor transmission, located at the aft end of the tailcone, supports and drives the tail rotor assembly. The transmission utilizes a splash lubrication, non-vented, closed oil system. A filler port and sight gauge are located in the aft end of the transmission. A quick release chip detector is incorporated in the drain plug which is located in the bottom aft portion of the transmission. Refer to Table 4-1 for system capacity and approved oils. An inspection plug, used to visually inspect the transmission gears, is located on the top right side of the transmission. The tail rotor transmission reduction ratio is 1:1.

11-88. Removal – Tail Rotor Transmission

A. Remove the tail rotor assembly (para. 9-44).

B. Disconnect the tail rotor control cables from the transmission.

C. Disconnect the tail rotor guard from the transmission.

D. Disconnect the electrical lead from the chip detector.

E. Remove the hardware securing the aft flex pack coupling from the transmission input drive hub.

F. Remove the screws/bolts securing the transmission to the extension (stinger) tube.

CAUTION

Guide the chip detector lead through the installation hole in the transmission when removing the transmission.

G. Remove the transmission by pulling it aft with a slight rotational motion.

11-89. Disassembly – Tail Rotor Transmission

A. Remove the tail rotor pitch control assembly (para. 12-115).

11-90. Inspection – Tail Rotor Transmission

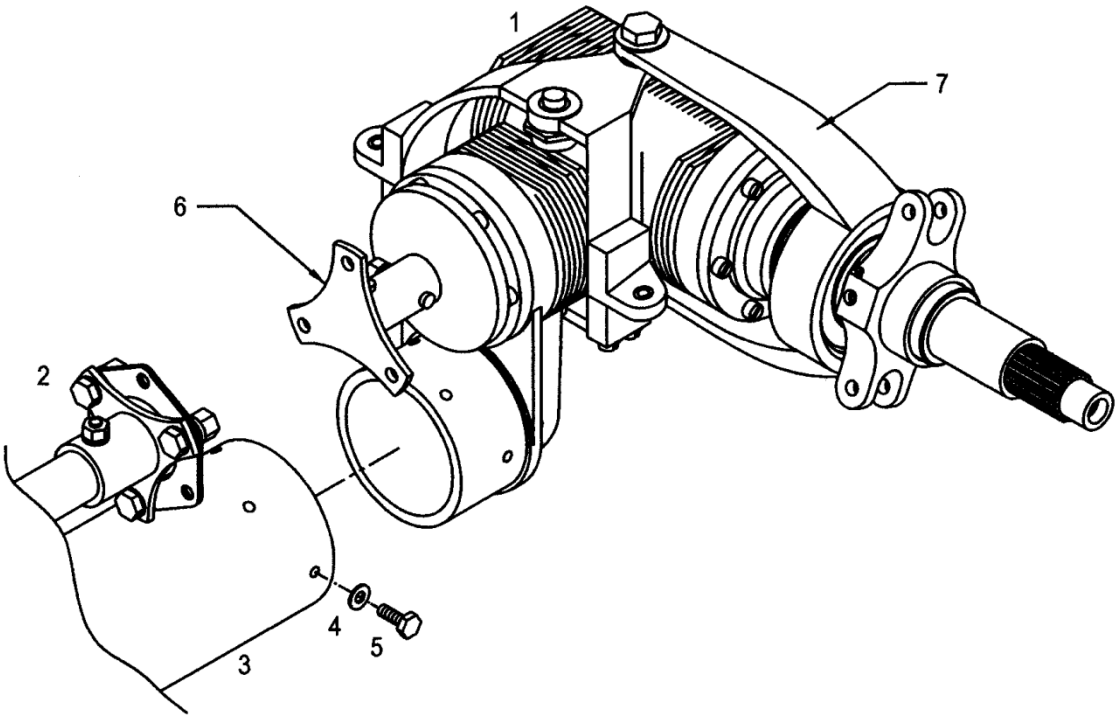
A. Rotate the output shaft and inspect for any bearing roughness; if any roughness, return the transmission for overhaul.

B. Inspect the input shaft taper pin hole for elongation or cracks; return the transmission for overhaul if either condition is found.

C. Check the output shaft FIM (Full Indicator Movement) as follows:

(1) Secure the transmission in a vise.

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1. Tail Rotor Transmission Assembly
2. Tail Rotor Drive Shaft Assembly
3. Extension (Stinger) Tube
4. Washer
5. Bolt
6. Input Drive Hub
7. Tail Rotor Rotating Controls

Figure 11-16. Tail Rotor Transmission Installation

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(2) Install the sleeve (T-0068A) on the output shaft. Install the spacer (T-0068B) and torque the bolt to 300 in-lbs/34.1 Nm.

(3) Position a height gauge and dial indicator with the indicator arm on the outboard diameter of the sleeve (T-0068A).

(4) Zero the dial indicator and rotate the input shaft. Note the output shaft FIM.

(5) If the runout exceeds .005"/.127 mm FIM, Return the transmission for overhaul.

D. Inspect the input and output shaft seals for leakage. Replace the seals if leaking (para. 11-93).

E. Inspect the chip detector for accumulation of metal particles as follows:

(1) Metal particles, flakes, or slivers exceeding .035 inch/.9 mm: Contact Enstrom Customer Service and discontinue use until further instructions are received from Enstrom Customer Service Department.

(2) Sludge (a mixture of oil and fine metal particles resulting from normal gear operation): Clean the detector and return the transmission to service.

NOTE

New or recently overhauled transmissions will often produce a sludge with slightly larger metal particles. This is normal and may be cleaned from the detector and the transmission returned to service; however, if metal particles, flakes, or slivers larger than .035 inch/.9 mm in cross section are found, contact Enstrom Customer Service and discontinue use until further instructions are received from Enstrom Customer Service Department.

11-91. Assembly – Tail Rotor Transmission

A. Install the tail rotor pitch control assembly (para. 12-119).

11-92. Installation – Tail Rotor Transmission

A. Apply Lubriplate 630-AA (MIL-PRF-81322) to the transmission mount.

B. Insert the chip detector lead through the hole in the transmission mount.

C. Install the transmission in the extension tube. Install the mounting bolts and torque to 25 in-lbs/2.8 Nm. Lockwire (.032”) the bolts.

D. Connect the flex pack coupling to the drive hub (para. 11-81).

E. Connect the electrical lead to the chip detector.

F. Connect the tail rotor guard to the transmission.

G. Connect the tail rotor control cables to the pitch control assembly (para. 12-108).

H. Install the tail rotor assembly (para. 9-51).

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NOTE

Omit steps I and J if the transmission and tail rotor control assembly being installed are the same ones that were removed.

I. Check the tail rotor control cable tension (para. 12-99).

J. Check the tail rotor control rigging (para. 12-100).

11-93. Seal Replacement – Tail Rotor Transmission (Figure 11-17)

A. Replace the input shaft seal using the following procedure:

NOTE

If the transmission is not installed on an aircraft, omit steps 1-4.

(1) Remove the bolts securing the flex pack coupling to the aft drive hub (23). Index mark the drive hub and the flex plate coupling so that flex pack coupling is installed in the identical position as previously installed.

(2) Disconnect the aft three drive shaft bearing assemblies (ref. Figure 11-12, Item (3)) from the tail cone.

NOTE

Failure to align the index marks or to return the shims to the original position will require realignment of the tail rotor drive shaft.

a. Mark the drive shaft bearing assemblies and the tail cone with an index mark so that the bearing assemblies are installed in the identical lateral positions as previously installed.

b. Remove the hardware securing the aft three drive shaft bearing assemblies to the tail cone (ref. Figure 11-12, Items (4), (5), (6)).

c. Tape the shims and hardware to the tail cone to facilitate reinstallation of the drive shaft bearing assemblies in the same position (returns the tail rotor driveshaft to the same position vertically).

(3) Remove the aft taper pin (24) (closest to the transmission) with tool T-0092-5.

CAUTION

Displace the tail rotor drive shaft the minimum amount necessary as damage to the drive shaft may result.

(4) Carefully displace and secure the tail rotor drive shaft to one side to permit removal of the hub (23) from the tail rotor transmission input shaft.

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(5) Drain the oil from the tail rotor transmission.

(6) Remove the hub (23) and the sleeve (22) from the input shaft using tool (T-0092-5).

(7) Remove the slinger (18).

NOTE

Earlier version gearboxes will have two tab washers (16) securing the input seal into the gearbox housing. Later manufactured gearboxes use a retaining ring (15).

(8) Remove the retaining ring (15) or the two tab washers (16) that secure the seal (14) into the gearbox, as applicable.

(9) Using an awl or small screw driver, carefully pry the input shaft seal (14) out of the gearbox housing.

CAUTION

Do not remove the retaining screws that secure the bearing housing to the gearbox housing. Do not remove the lead seal from the input shaft assembly. Removal of the seal will void the warranty on the tail rotor transmission.

(10) Clean the tail rotor transmission seal surface and the O.D of the new seal.

(11) Install the seal.

a. Apply a small amount of MIL-PRF-2105 to the O.D. and I.D. of the seal and the seal lip.

b. Wrap stainless steel shim stock around the input shaft nut to protect the seal lip during installation.

c. Use a soft plastic or rubber hammer or other suitable press tool to tap the seal into place.

(12) Install the retaining ring (15) or the retaining tab washers (16), as applicable.

a. Torque the tab washer screws (17) to 25 in-lb/2.8 Nm and lockwire if using the retaining tabs.

(13) Install the slinger (18).

NOTE

Install the drive hub (23) and flex pack coupling to the index marks (as previously installed). If not properly marked for reinstallation, the tail rotor assembly will require balancing.

(14) Install the drive hub (23) and taper pin (24). Torque to 25 in-lb/2.8 Nm.

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(15) Install the flex pack coupling (para. 11-81) to the drive hub (23). Ensure all flex pack hub assemblies, hardware, spacers, and washers are installed in the same position as previously installed.

(16) Install the three drive shaft bearing assemblies.

NOTE

Install the bearing assemblies to the index marks (as previously installed). If not properly marked for reinstallation, the tail rotor drive shaft will require alignment.

a. Use the same shims, spacers, and bolts (retained in place with tape) for each bearing assembly.

b. Align the bearing assemblies laterally to the index marks.

c. Torque the bolts to 35 in-lb/4.0 Nm.

(17) Service the tail rotor transmission (para. 4-16).

B. Replace the output shaft seal using the following procedure (Figure 11-17):

NOTE

If the transmission is not installed on an aircraft, omit steps 2 and 3.

(1) Drain the oil from the tail rotor transmission.

(2) Remove the tail rotor assembly (para. 9-44; omit step D).

(3) Remove the pitch control bearing assembly (Figure 12-27).

a. Disconnect the bearing housing (7) from the pivot brackets (1) and (2) by removing bolts (5), washers (6) and (8), nut (9), and cotter pin (10).

b. Index mark the position of the sleeve (21) as installed on the output shaft.

NOTE

Resistance will be felt when removing the pitch change bearing retention assembly as the seal (12) and seal retainer (13) must be forced out of the bearing (7).

c. Slide the pitch control assembly off of the sleeve (21) of the tail rotor transmission output shaft.

d. Remove the keys (11), seal (12), and seal retainer (13).

(4) Remove the retaining ring (20) from the output shaft seal (19) (Figure 11-17).

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NOTE

As the seal (19) is removed from the output shaft, the sleeve (21) will also be removed with it. Wrapping the end of the output shaft with masking tape may help prevent the sleeve from being displaced when the seal is removed. Clean the area prior to applying tape.

Otherwise, mark the sleeve spline to the output shaft spline so as to install the sleeve in the same location on the output shaft on reassembly.

(5) If preferred, wrap the end of the output shaft with masking tape, otherwise clean the spline edges of the output shaft and sleeve and apply a paint stripe across the splines.

(6) Using an awl or small screw driver, carefully remove the seal (19).

(7) Install the new seal (19).

NOTE

It may be necessary to chamfer the inboard edge of the new seal using 200 grit sandpaper, or equivalent, for ease of installation.

a. Clean the tail rotor transmission seal surface and the O.D. of the new seal.

b. Lubricate (MIL-PRF-2105) the O.D. and inside lip of the new seal (19).

c. Use a soft plastic or rubber hammer or other suitable press tool to tap the seal (19) into place.

NOTE

Positioning the sleeve on the output shaft in a location different than previously installed may affect the runout (TIR) and negatively affect the rail rotor balance. Output shaft runout may be checked in accordance with para. 11-90, C.

(8) If required, install the sleeve (21). Match the spline mark of the sleeve to the spline mark on the output shaft.

a. Lubricate (MIL-PRF-2105) the seal end of the sleeve (21).

b. Use a bushing driver or equivalent press tool, push the sleeve (21) into the seal (19). The seal (19) seats in a groove of the sleeve (21).

(9) Install the retaining ring (20).

(10) Place the seal retainer (13) and the seal (12) onto the output shaft.

(11) Install the two keys (17) into the key slots in the sleeve (21).

a. Lubricate (MIL-PRF-81322) the keys (17) during installation and prior to installing the pitch control assembly.

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NOTE

Take care to align the pitch control assembly to the index marks. If the pitch control assembly cannot be realigned to the original index marks, the tail rotor assembly must be dynamically balanced.

(12) Install the pitch control assembly (Figure 12-27).

a. Align the pitch control assembly to the index marks on the sleeve and slide the assembly onto the tail rotor transmission output shaft.

b. Insert the seal (12) into the groove in the pitch control bearing (14).

CAUTION

Be gentle when inserting the seal retainer (13). Excessive force will damage the seal retainer.

c. Use tool T-0140 to install seal and retainer. If T-0140 is not available, use a small straight screwdriver or punch and a small hammer to tap the seal retainer (13) into the groove in the pitch control bearing (14).

(13) Install the pivot brackets (Figure 12-27).

NOTE

Washer (6) must be installed between the upper pivot bracket (1) and the bearing housing (7).

a. Install the bolts (5), washers (6) and (8), and nut (9).

b. Torque the nuts to 60-85 in-lb/6.8-9.6 Nm and install the cotter pin (10).

NOTE

If the tail rotor components are installed in the exact position as removed, the dynamic balance step (para. 9-51, F) may be omitted.

NOTE

If the tail rotor components are not installed in the exact position as removed, the tail rotor must be balanced.

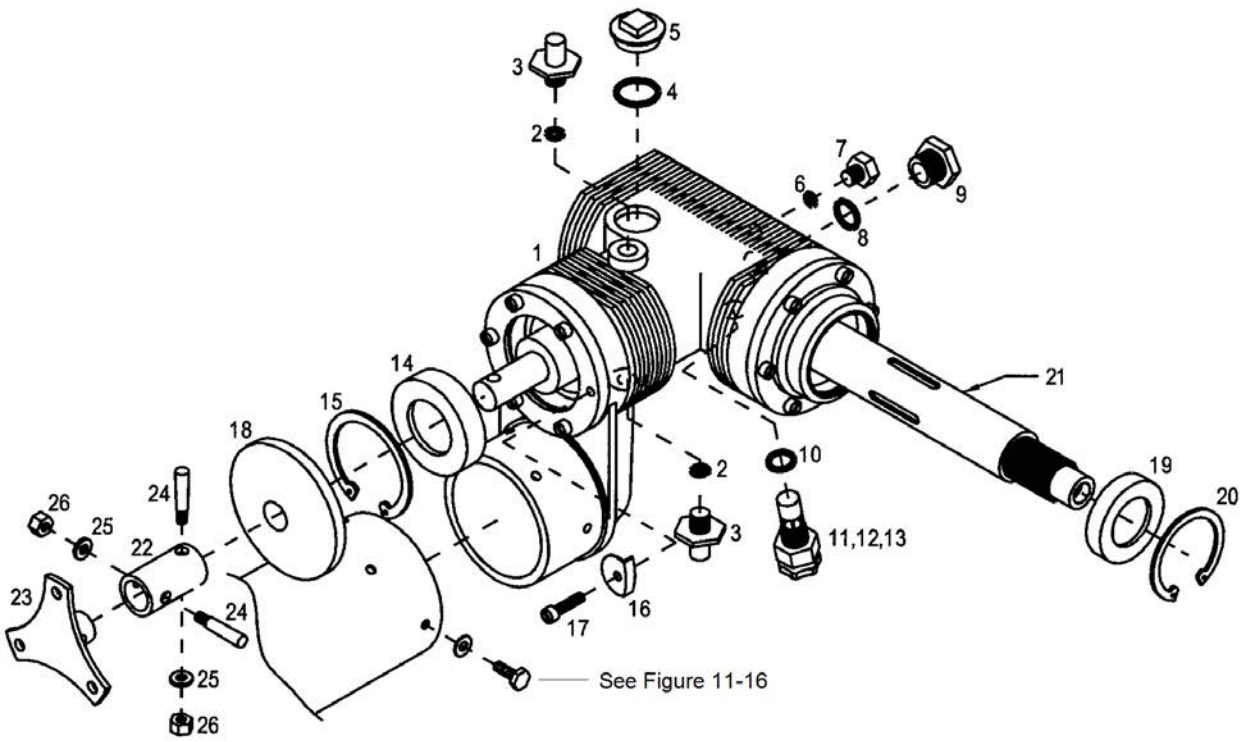
(14) Install the tail rotor assembly (para. 9-51).

(15) Cycle the tail rotor pitch full travel in both directions to ensure that the pitch change system operates correctly.

(16) Service the tail rotor transmission (para. 4-16).

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1.	Tail Rotor Gearbox Assembly	14.	Seal
2.	O-Ring	15.	Retaining Ring
3.	Bolt	16.	Tab (omitted if (15) is used)
4.	O-Ring	17.	Screw
5.	Plug	18.	Slinger
6.	O-Ring	19.	Seal
7.	Plug	20.	Retaining Ring
8.	O-Ring	21.	Spacer
9.	Sight Plug	22.	Sleeve
10.	Gasket	23.	Hub
11.	Chip Detector	24.	Taper Pin
12.	O-Ring	25.	Washer
13.	Nut	26.	Nut

Figure 11-17. Tail Rotor Transmission Assembly

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11-94. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Adhesive	Adhesive, Loctite Fixmaster Flex 80 Putty Brand	97422/97423
Grease	Grease, Lubriplate Brand	630-AA[1] (06701)
Grease	Grease	MIL-PRF-81322
Liquid Soap	Soap, Joy Brand	
Lockwire	Lockwire, .032”	MS20995C32
Lockwire	Lockwire, .041”	MS20995C41
Marking dye	Machinist’s marking dye, Devcon Brand	DYKEM 80400
MEK	Solvent, MEK	
Oil	Oil, Gear	MIL-PRF-2105
Oil	Oil, Turbine Engine	MIL-PRF-23699
Oil	Any grade internal combustion engine motor oil	
Sealant	Retaining Compound, Loctite Brand	635
Solvent	Citra-Safe, Inland Technology Incorporated	6850-01-378-( )
Solvent	Extreme Simple Green, Sunshine Makers, Inc.	13440
Solvent	Solvent, Toluene	
Tape	Masking Tape, 1-Inch	
Thread Sealant	Thread Sealant, Loctite Brand (277)	27731
Thread Sealant	Thread Sealant, Loctite Brand Threadlocker Blue 242[2]	24200
Thread Sealant	Thread Sealant, Permatex Brand	Form-A-Gasket No.3[3]
Thread Sealant	Thread sealant, Vibra-Tite Brand	VC-3

[1] MIL-PRF-81322 is an acceptable alternate.
[2] Acceptable alternate for Vibra-Tite VC-3.
[3] Acceptable alternate where thread sealant is required.

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FLIGHT CONTROLS

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SECTION 12

FLIGHT CONTROLS

12-1. Flight Controls

12-2. Description – Flight Controls

The flight controls are comprised of three primary systems: the collective, cyclic, and anti-torque or directional controls. The aircraft also has fixed horizontal and vertical stabilizers mounted on the tailcone to provide additional stability and attitude control during high speed flight.

12-3. Push-Pull Rods and Bellcranks

12-4. Description – Push-Pull Rods and Bellcranks

All three flight control systems incorporate push-pull rods and bellcranks. The procedures for removal, inspection, repair, and installation are the same for all of the control systems and will not be covered in the maintenance instructions for each control system. Use the following procedures for push-pull rod and bell crank maintenance instructions.

12-5. Push-Pull Rods

12-6. Removal – Push-Pull Rods

WARNING

If removing the push-pull rod between the collective torque tube arm and the collective bellcrank, disconnect the collective trim spring capsule (para. 12-34). Failure to do so may result in damage to the aircraft or injury to maintenance personnel.

A. Remove the left and right side keel access panels.

B. If required, remove the left and right side engine access panels.

C. Identify in which control system the push-pull rod is installed.

D. Remove the hardware connecting the rod to the bellcrank or control arm. Remove the push-pull rod and measure the length of the push-pull rod.

NOTE

Some push-pull rod and bellcrank bolts have to be removed/installed through access holes located in the cabin floor.

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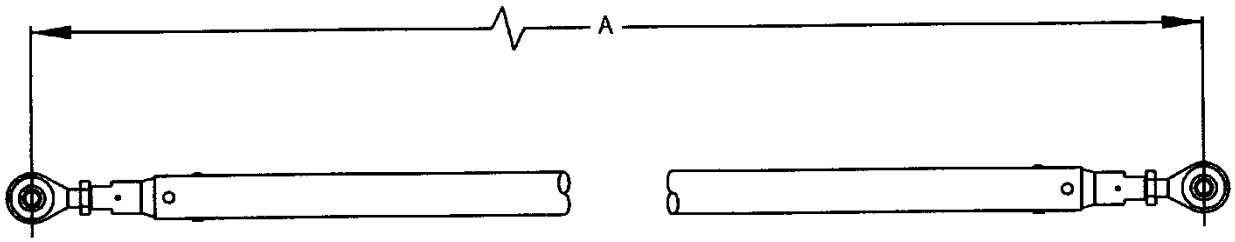
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Table 12-1. Push-Pull Rod Lengths

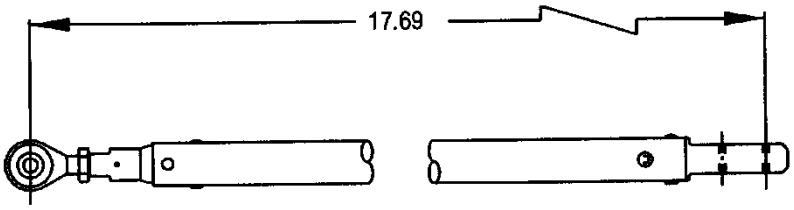
Location Item #, Fig.#	Part Number	Dimension	Dimension Location, Fig.12-1
4, Fig. 12-2	4166050-201	15.81 in./40.16 cm	Assembly A
6, Fig. 12-2	4166050-205/209	23.0 in./58.42 cm	Assembly A
4, Fig. 12-8	4166050-107	19.85 in./50.42 cm	Assembly A
5, Fig. 12-8	4166050-109	18.85 in./47.88 cm	Assembly A
7, Fig. 12-8	4166050-101	8.86 in./22.5 cm	Assembly A
9, Fig. 12-8	4166050-103	27.95 in./70.99 cm	Assembly A
12, Fig. 12-8	4166050-105	16.87 in./42.85 cm	Assembly A
14, Fig. 12-8	4166050-1	17.58 in./44.65 cm	Assembly C
15, Fig. 12-8	4166050-5	11.20 in./28.45 cm	Assembly A
17, Fig. 12-8	4166050-7	24.86 in./63.14 cm	Assembly A
20, Fig. 12-8	4166050-9	17.62 in./44.75 cm	Assembly A
22, Fig. 12-8	4166050-3	17.69 in./44.93 cm	Assembly B
8, Fig. 12-24	4166037-1	6.0 in./15.24 cm	Assembly A
3, Fig. 12-24	4166050-203/207	40.50 in./102.87 cm	Assembly A

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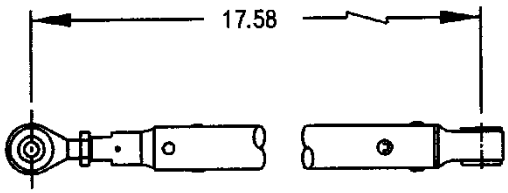
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ASSEMBLY A



ASSEMBLY B



ASSEMBLY C

Figure 12-1. Push-Pull Rod Dimensions

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12-7. Inspection – Push-Pull Rods

A. Inspect for bends, kinks, sheared fitting rivets, and cracked rod-end fittings. Replace rod if any found.

B. Inspect for corrosion, nicks, and scratches. Damage .010 inch/.25 mm deep requires rod replacement. Blend out damage less than .010 inch/.25 mm deep.

C. Inspect the rod ends for excessive play. Replace rod ends that have .005 inch/.13 mm radial play.

12-8. Installation – Push-Pull Rods

NOTE

Install push-pull rods with the HMVV-XX (right hand) rod-ends orientated to the right, top, and aft and HMLVV-XX (left hand) rod-ends orientated to the left, bottom, and forward.

NOTE

Ensure the push-pull rods are set to the lengths as when removed from the aircraft. Refer to Table 12-1 to determine the factory installation length of each push-pull rod if the length of the push-pull rod when removed from the aircraft cannot be determined. (The factory dimensions are for initial installation of the push-pull rods and does not take into account adjustments made to rig the flight control systems.)

NOTE

Some push-pull rod and bellcrank bolts have to be removed/installed through access holes located in the cabin floor.

NOTE

Install an AN960-“XXX”L washer on both sides of the rod-ends in the sheet metal bellcranks in the collective and cyclic systems up to the uni-ball assembly on the lower swashplate. If a bushing is used (machined bellcranks), only install one washer on the opposite side of the rod-end.

A. Install the push-pull rod. Install the connecting hardware, torque, and install cotter pin.

B. If removed, install the left and right side engine access panels and the left and right side keel access panels.

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NOTE

The extent of the maintenance performed should be used to determine the extent of the maintenance test flight.

C. Perform a limited maintenance test flight (para. 4-61).

12-9. Bellcranks

12-10. Removal – Bellcranks

A. Remove the keel access panels or the engine access panels as required.

NOTE

Some push-pull rod and bellcrank bolts have to be removed/installed through access holes located in the cabin floor.

WARNING

If removing the collective system bellcrank, disconnect the collective trim spring capsule (para. 12-34). Failure to do so may result in damage to the aircraft or injury to maintenance personnel.

B. Disconnect the push-pull rods from the bellcrank.

C. Remove the hardware from the bellcrank pivot point. Remove the bellcrank.

12-11. Inspection – Bellcranks

A. Inspect the sheet metal bellcranks for bends, cracks, distortion, loose or sheared rivets, elongated push-pull rod bolt holes, scratches, and nicks. Replace bellcranks that are cracked, bent, have elongated bolt holes, and/or damage exceeding .020 inches/.51 mm in depth. Polish out damage to a maximum depth of .020 inches/.51 mm.

B. Inspect the machined bellcranks for bends, cracks, nicks, scratches, and elongated bolt holes. Replace bellcranks that are cracked, bent, have elongated bolt holes, and/or damage exceeding .020 inches/.51 mm in depth. Polish out damage to a maximum depth of .020 inches/.51 mm.

C. Inspect the pivot bearing for roughness and excessive play. Replace the bellcrank if the bearing has excessive roughness or play.

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12-12. Installation – Bellcranks

NOTE

Some push-pull rod and bellcrank bolts have to be removed/installed through access holes located in the cabin floor.

CAUTION

Ensure the bellcrank is installed in the correct orientation.

A. Install the bellcrank, install the hardware in the pivot point, torque and cotter pin.

B. Connect the push-pull rods (para. 12-8).

C. Install the access panels.

D. Perform a limited maintenance test flight (para. 4-61).

12-13. Collective Control System

12-14. Description – Collective Control System

NOTE

The pilot's controls are on the right side of the aircraft in a TH-28 and on the left side for a 480. For aircraft S/N 5136 and subsequent equipped with dual collective engine start and idle stop release controls, the left and the right collective controls are identical.

The collective control system is comprised of dual collective controls mechanically interconnected and linked to the main rotor swashplate through a series of push-pull tubes, a torque tube, a bellcrank, and a collective walking beam at the base of the main rotor transmission. Both collective controls have interconnected twist grip throttles and a switch box mounted forward of the throttles.

On aircraft S/N 5136 and subsequent equipped with the dual collective engine start and idle stop controls, both the pilot and copilot switch boxes have a landing light on/off switch, a landing light attitude control switch, an engine start/ignition switch, an engine idle stop release, and an N_2 power turbine governor increase /decrease (INCR/DECR) switch. On aircraft S/N 5135 and earlier, the copilot's collective switch box only has two switches; a landing light attitude control switch, and an N_2 power turbine governor increase/ decrease (INCR/DECR) switch. In addition, only the pilot’s collective control incorporates the engine idle stop or release, which is located between the switch box and the twist grip throttle.

The collective friction system, located outboard of the pilot collective control, consists of a simple stop bracket that incorporates both the up and down collective stops and a knob/lever assembly used to clamp two friction disks to the stop bracket. When the lever is approximately aligned with the collective stick by rotating the knob/lever assembly forward, the friction is fully applied. The collective friction is fully off when the lever is

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pointed approximately straight down at the floor. The control may be positioned in any intermediate position for any desired level of friction. The collective friction system is designed so that positive locking of the collective controls cannot be obtained at the maximum friction point. Safety of flight considerations require that the pilot be able to instantly overcome the established friction without any further pilot action to adjust it in the case of engine failure.

Collective control forces are reduced by means of a collective trim system located aft of the collective bellcrank in the engine compartment. The collective trim system consists of a spring capsule, brackets, and an adjusting link.

12-15. Rigging – Collective Control System

CAUTION

Check the rigging of the collective control system if two or more components of the system are replaced (e.g., the friction/stop block and a rod-end bearing, or the walking beam and the collective control bellcrank).

NOTE

The following dimension listed for the stop assembly location is an initial assembly location and is adjusted during the main rotor control rigging.

A. Ensure the friction stop assembly is set at 7.3 ± 0.1 inches/18.5 ± 0.3 cm (measured between the aft edge of the collective friction assembly clamp and the forward edge of the collective stick socket as shown in Figure 12-6).

B. Position the collective stick full down and apply friction.

C. Adjust the length of the push-pull rod (6) until there is .025 inches/.6 mm clearance between the collective bearing housing spacer and the swashplate mount flange (Figure 12-3).

D. Tighten the check nuts on the push-pull rod.

E. Remove the collective friction and move the collective to full up and back to full down. Apply friction.

F. Check for the .025 inches/.6 mm clearance between the collective bearing housing spacer and the swashplate mount flange.

12-16. Collective Trim System Rigging – Collective Control System (Figure 12-4)

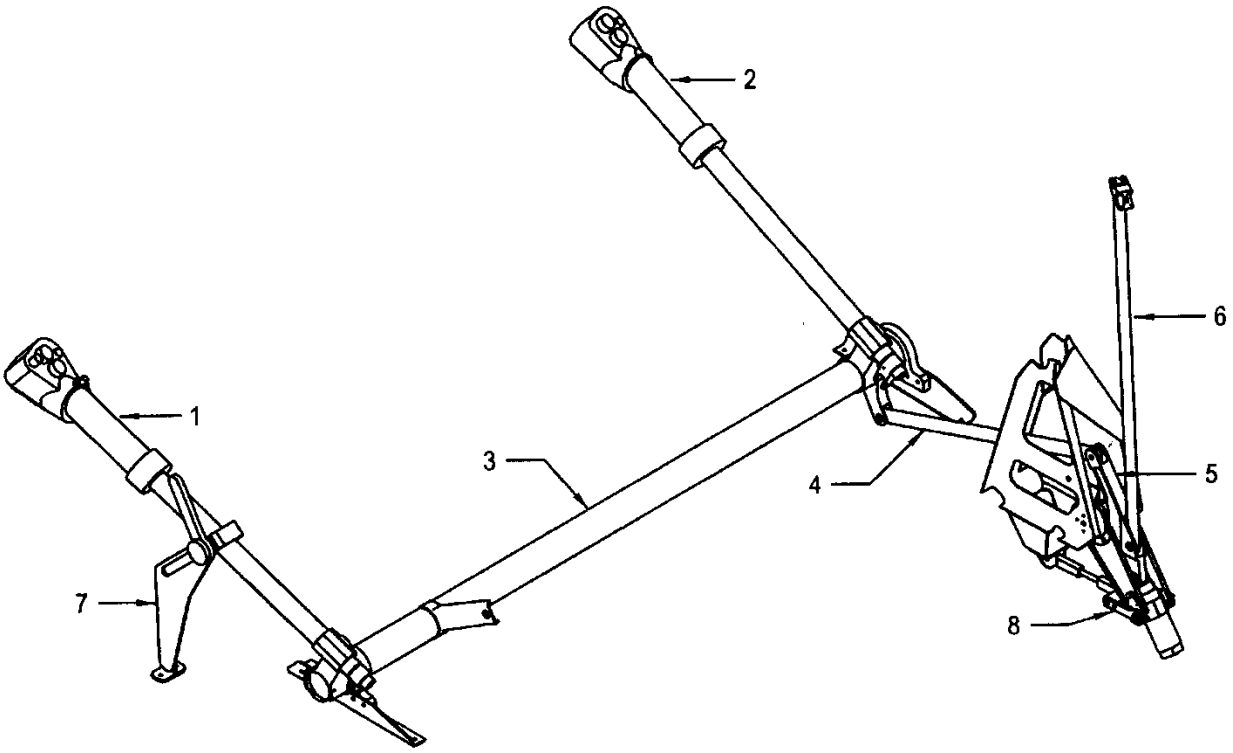
A. Position the collective controls full down and apply collective friction.

B. Turn the threaded rod in the adjusting link until the bolt connecting the spring capsule to the collective bellcrank is approximately .75 inches/19 mm forward of the spring capsule/pivot retaining strap centerline. Tighten the check nuts.

C. Test fly the aircraft and note the collective stick loads.

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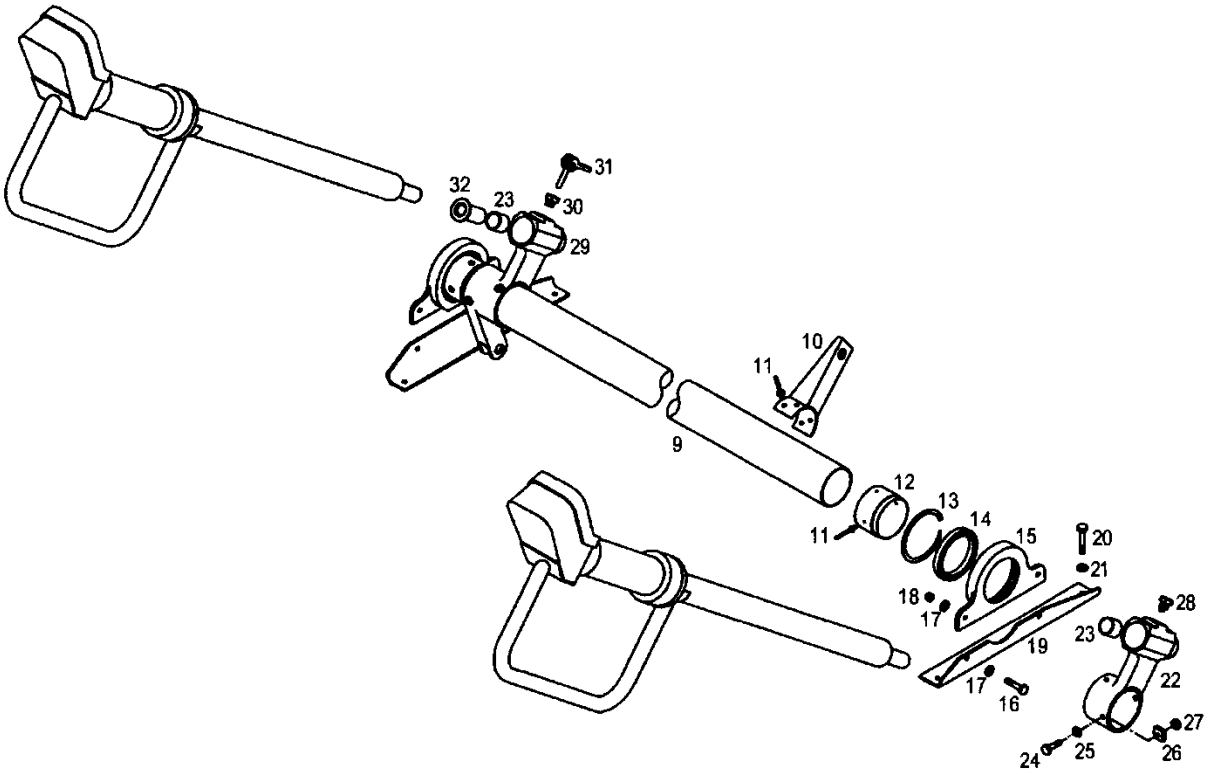


1. Pilot's Collective (480/B)
2. Copilot's Collective (480/B)
3. Collective Torque Tube
4. Push-Pull Rod
5. Collective Bellcrank
6. Push-Pull Rod
7. Collective Friction Assy.
8. Collective Trim Assy.

Sheet 1 of 3

Figure 12-2. Collective Control System

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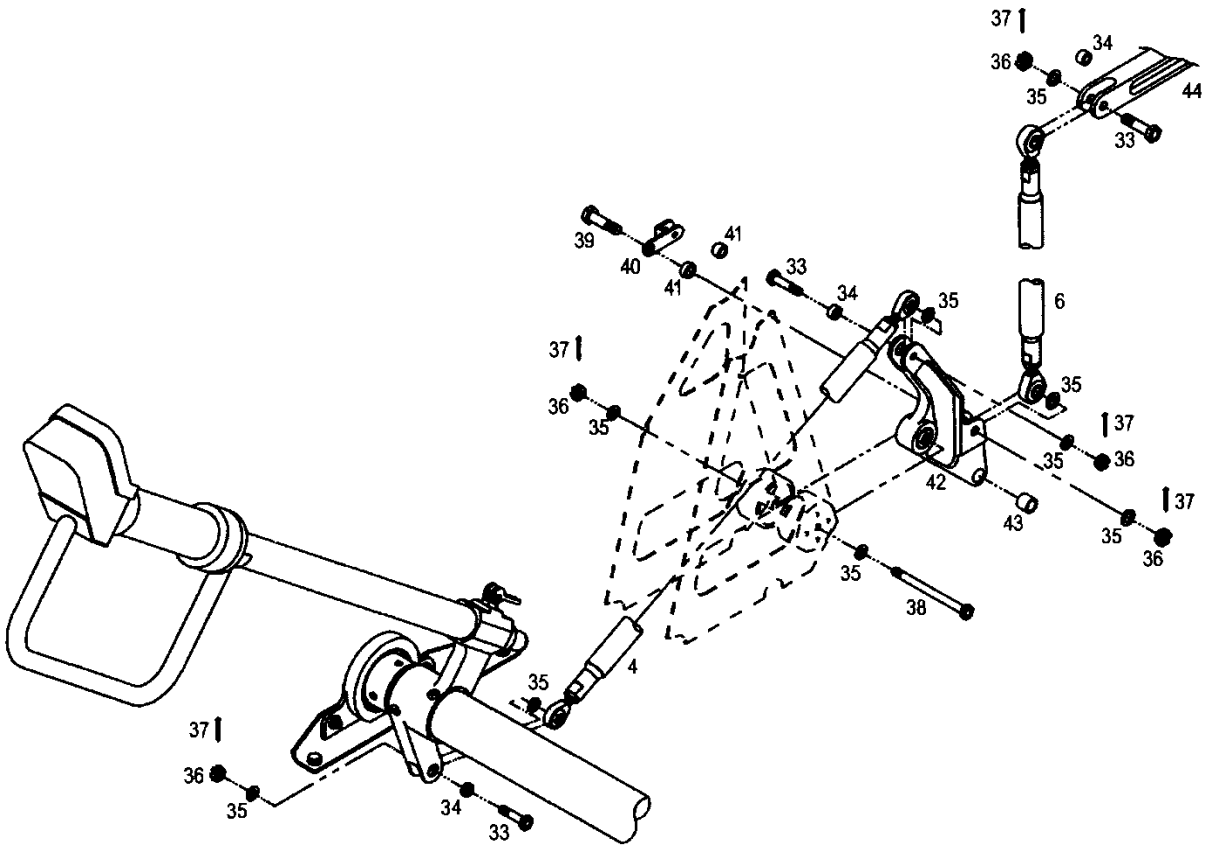


9.	Torque Tube	21.	Washer
10.	Throttle Bracket	22.	Fitting
11.	Rivet	23.	Bearing
12.	Sleeve	24.	Bolt
13.	Retaining Ring	25.	Washer
14.	Bearing	26.	Shim
15.	Bearing Housing	27.	Nut
16.	Bolt	28.	Bolt
17.	Washer	29.	Fitting
18.	Nut	30.	Insert
19.	Bracket	31.	Expando Pin
20.	Bolt	32.	Sleeve

Figure 12-2. Collective Control System

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33.	Bolt	39.	Bolt
34.	Bushing	40.	Bracket
35.	Washer	41.	Bushing
36.	Nut	42.	Bellcrank
37.	Cotter Pin	43.	Bushing
38.	Bolt	44.	Collective Walking Beam

Figure 12-2. Collective Control System

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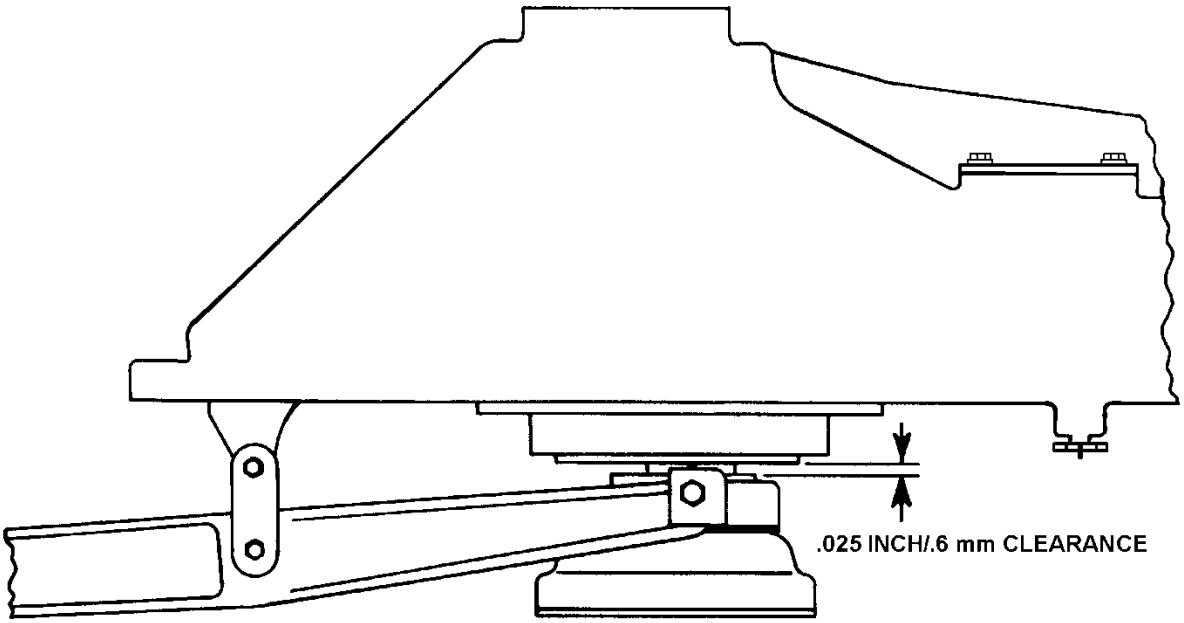


Figure 12-3. Swashplate Bearing Housing Clearance

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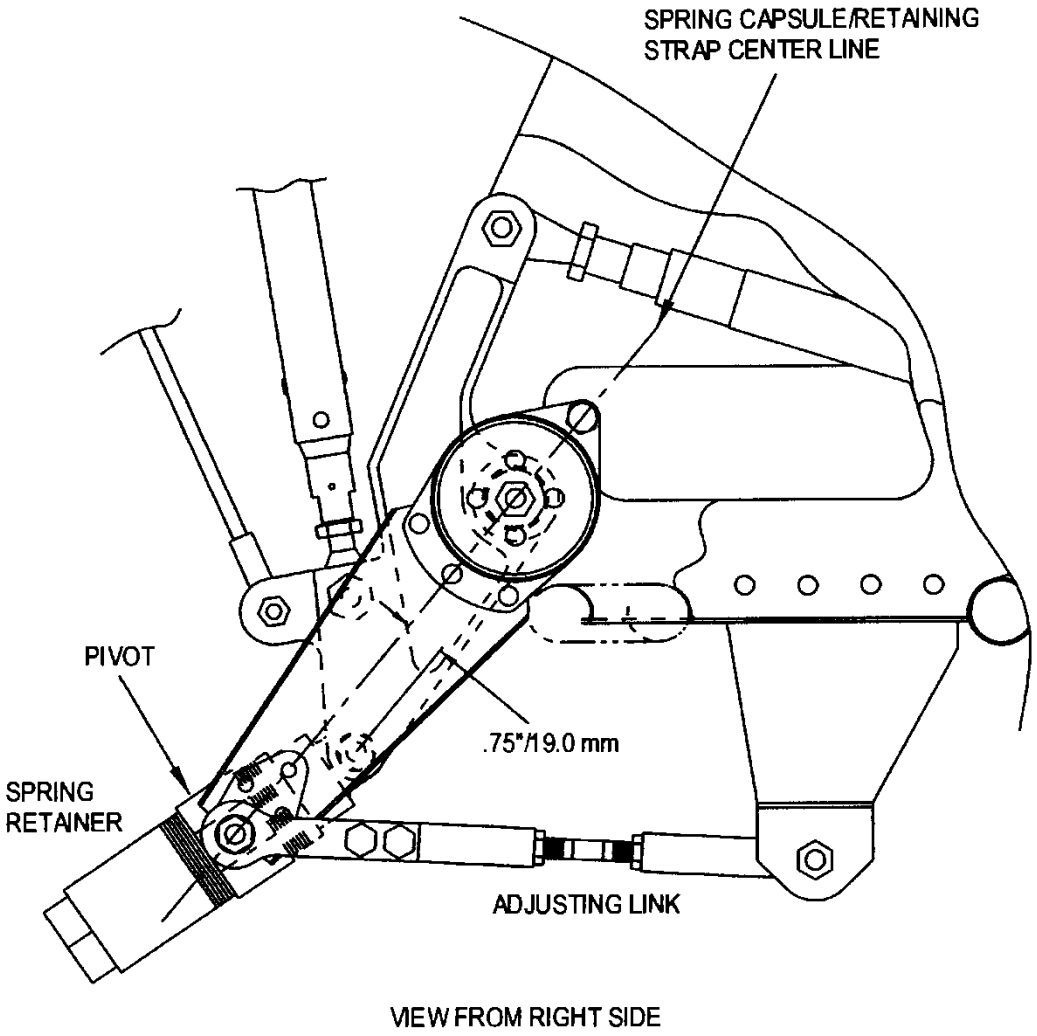


Figure 12-4. Collective Trim System Rigging

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NOTE

To balance the collective control loads, combinations of adjustments in steps D and E may be required. It may not be possible to obtain optimum control load neutralization. Make adjustments until the control loads are satisfactory and the collective does not come off of the down stop when the friction is released.

D. Adjust the position of the spring retainer in the pivot to balance the collective control loads as follows:

(1) For a light collective (easier up than down), turn the spring retainer counter-clockwise to release spring tension. The minimum adjustment is when the last thread of the spring retainer is flush with the pivot.

(2) For a heavy collective (easier down than up), turn the spring retainer clockwise. The maximum adjustment is when the retainer bottoms against the pivot.

E. If the collective loads cannot be balanced using the spring capsule, adjustments to the over center adjusting link can be made as follows:

(1) If the collective has a tendency to come off of the bottom stop when the collective friction is released, lengthen the adjustable link to move the trim spring capsule pivot forward.

(2) If the collective has a tendency to lower at higher power settings (above 45 psi torque), shorten the adjustable link to move the trim spring capsule pivot aft.

12-17. Collective Sticks

12-18. Removal – Collective Sticks

NOTE

The pilot's controls are on the right side of the aircraft in a TH-28 and on the left side for a 480/480B. For aircraft S/N 5136 and subsequent, the left and the right collective controls are identical.

A. (Copilot 480/480B Only) Disconnect the electrical harness from the electrical connector on the cockpit floor.

B. (Copilot 480/480B Only) Remove the quick release pin securing the collective stick and remove the collective stick.

C. Remove the pilot seat.

D. Disconnect the collective electrical harness from the floor connection.

E. Remove the bellcrank attached to the aft end of the collective stick.

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WARNING

Failure to disconnect the collective trim spring capsule from the collective control system may result in damage to the aircraft or injury to the maintenance personnel.

F. Disconnect the collective trim spring capsule from the collective control system (para. 12-34).

G. Disconnect the collective friction system from the pilot's collective stick (para. 12-29).

H. Remove the bolt securing the collective stick in the collective stick socket. Remove the collective stick from the collective stick socket. Retain any shims if installed in the socket.

12-19. Disassembly – Collective Sticks (Figure 12-5)

NOTE

An "*" will signify a step that only pertains to the pilot's collective stick.

A. Remove the switch box, hand guard, and electrical harness from the collective stick.

NOTE

Do not remove the collective friction/stop block from the collective if not required.

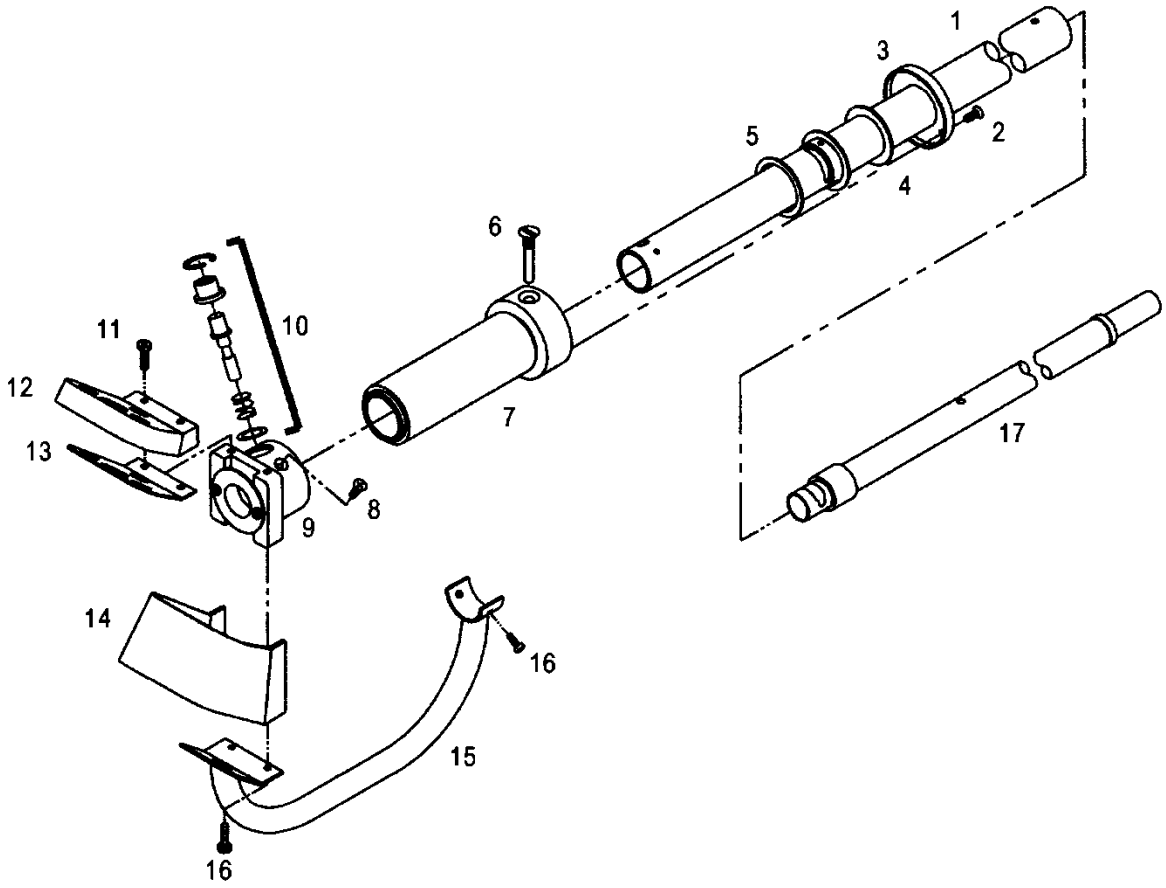
* B. Measure and mark the location of the collective friction/stop block. Remove the friction/stop block.

NOTE

Step C pertains only to aircraft S/N 5135 and earlier.

* C. Remove the engine idle release (para. 13-99).

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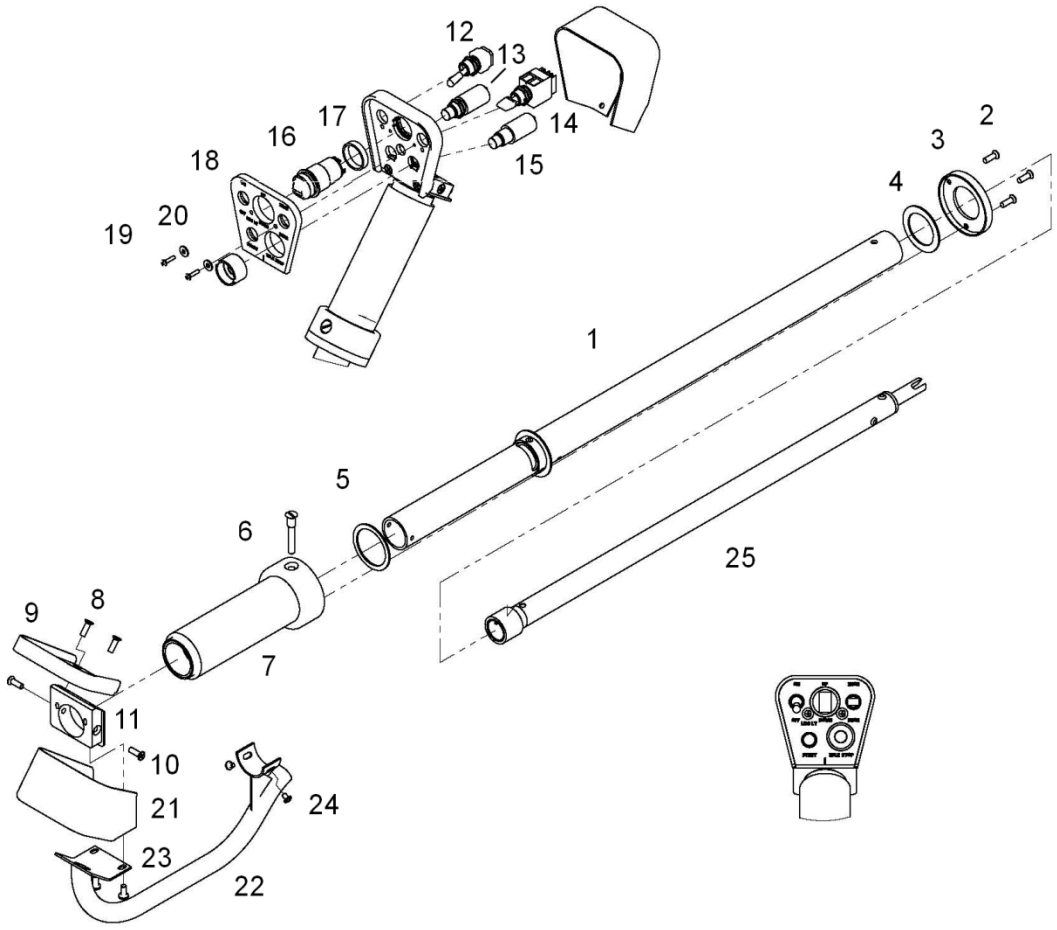


480/B Serial Numbers: 5135 and Earlier
Sheet 1 of 2

1. Collective Stick
2. Screw
3. End Cap
4. Teflon Washer
5. Teflon Washer
6. Torque Pin
7. Twist Grip
8. Screw
9. Forward End Fitting
10. Idle Release
11. Screw
12. Switch Box Cover
13. Switch Plate
14. Switch Box
15. Hand Guard
16. Screw
17. Throttle Control Tube

Figure 12-5. Collective Stick Assembly

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480B Serial Numbers: 5136 and Subsequent
Sheet 2 of 2

1. Collective Stick
2. Screw
3. End Cap
4. Thrust Washer
5. Thrust Washer
6. Torque Pin
7. Grip
8. Screw
9. Switch Plate
10. Screw
11. Housing
12. Switch
13. Switch
14. Switch
15. Switch
16. Switch
17. Spacer
18. Illuminated Panel
19. Screw
20. Washer
21. Switch Plate Cover
22. Handle Assembly
23. Screw
24. Screw
25. Throttle Control Tube

Figure 12-5. Collective Stick Assembly

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D. Remove the screws securing the forward end fitting to the stick. Remove the forward end fitting.

E. Remove the three screws securing the end cap to the throttle twist grip. Remove the end cap and aft teflon washer.

F. Remove the torque pin securing the twist grip to the throttle control tube.

G. Remove the twist grip and the forward teflon washer from the collective stick.

H. Remove the throttle control tube from the collective stick.

12-20. Inspection – Collective Sticks

A. Inspect all parts of the collective stick for nicks, scratches, corrosion, dents, and broken or damaged tubes. Replace parts that are worn, damaged, broken, bent, or corroded.

B. Inspect the switches and wiring of the electrical harness. Replace the switches or wiring as required.

12-21. Assembly – Collective Sticks (Figure 12-5)

NOTE

An "*" will signify a step that only pertains to the pilot's collective stick.

A. Install the throttle control tube into the collective stick.

B. Install the teflon washer in the forward end of the collective stick. Install the twist grip onto the collective stick.

NOTE

For aircraft S/N 5135 and earlier: When installing the pin/screw in the pilot's collective stick, ensure that the slot for the idle release in the throttle control tube is visible through the hole at the forward end of the collective stick.

C. Align the hole on the aft end of the twist grip with the slot in the collective stick and the hole in the throttle control tube. Install the torque pin into the twist grip. When installed, pull on the throttle control tube to ensure the pin/screw has secured the tube and operate the twist grip and check for proper operation.

D. Install the teflon washer and the end cap in the aft end of the twist grip.

E. Install the forward fitting on the collective stick.

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NOTE

Step F pertains only to aircraft S/N 5135 and earlier.

* F. Install the engine idle release (para. 13-102).

G. Install the switch box, hand guard, and electrical harness onto the collective stick.

* H. Install the collective friction stop assembly onto the collective stick. Do not tighten at this time.

12-22. Installation – Collective Sticks

NOTE

An "*" will signify a step that only pertains to the pilot's collective stick.

A. Install the collective stick into the collective stick socket. Shim the collective stick if required to remove play from the stick. Install the pin/bolt and lockwire (.032).

* B. Connect the collective friction stop bracket to the stop assembly (para. 12-31), place the stop assembly at the dimension taken before the stop assembly was removed from the collective stick and tighten the bolt. Ensure the stop assembly is perpendicular to the stop bracket.

C. Install the bellcrank on the throttle control tube.

D. Connect the electrical harness to the connector on the cabin floor.

E. (Copilot 480/480B Only) Install the collective stick into the stick fitting and install the quick release pin. Ensure the throttle push-pull rod is properly engaging the bellcrank.

F. (Copilot 480/480B Only) Connect the electrical harness to the connector on the cabin floor.

G. Check the operation of the electrical switches.

H. Reconnect the collective trim spring capsule to the collective control system (para. 12-38).

I. Check the rigging of the engine power controls (para. 13-93 through 13-93.1).

J. Install the pilot seat.

K. Check the rigging of the collective system (para. 12-15) if the collective friction stop assembly was removed or replaced or if the rigging is in question after the collective sticks are reinstalled.

L. Perform a limited maintenance test flight (para. 4-61).

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12-23. Collective Torque Tube Assembly

12-24. Removal – Collective Torque Tube Assembly

A. Remove the pilot's and copilot/passenger's seats.

B. Remove the collective control stick (para. 12-18).

C. Disconnect the throttle cable from the throttle arm.

D. Remove the throttle cable from the mounting bracket on the torque tube.

E. Disconnect the push-pull rod from the torque tube arm.

F. Remove the hardware securing the bearing mounts to the mounting brackets. Remove the torque tube.

12-25. Inspection – Collective Torque Tube Assembly

A. Inspect the torque tube and fittings for dents, cracks, corrosion, nicks, and scratches. Remove nicks, scratches, corrosion not exceeding .010 inch/.25 mm deep. Replace if cracked or dented.

NOTE

CherryMAX® rivets are used during assembly of the flight control torque tubes starting with TH-28 S/N 3007 and 480 S/N 5003. Reassemble/Repair all torque tube assemblies using standard or oversize CherryMAX® rivets as required. Bolt assemblies are used to install the collective stick fittings on later serial number aircraft.

B. Inspect the roll pin holes for elongation and cracks. Replace the torque tube if damage exceeds the limits for oversize CherryMAX® rivets.

C. Inspect the bearings for excessive wear and roughness. Replace bearings if any found.

12-26. Repair – Collective Torque Tube Assembly

NOTE

The collective torque tube on a 480/480B only has two bearings.

A. Replace bearings using the following procedures:

(1) If the bearings installed on the left end of the torque tube have to be replaced, index mark the collective stick fitting and the bearing sleeve. On the right end, index mark the bearing sleeve. Remove the left side collective stick fitting if replacing the left bearing.

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NOTE

CherryMAX® rivets are used during assembly of the flight control torque tubes starting with TH-28 S/N 3007 and 480 S/N 5003. Reassemble/Repair all torque tube assemblies using standard or oversize CherryMAX® rivets as required.

(2) Remove the roll pins or rivets and remove the bearing assembly from the collective torque tube.

WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

(3) Remove the retaining ring from the bearing housing. Heat the bearing housing to approximately 250°F/121°C. Remove the bearing from the housing.

(4) Press the bearing sleeve from the bearing. Remove residual retaining compound from the surface of the sleeve if present.

CAUTION

Use caution to prevent retaining compound from contaminating the bearing.

(5) Apply retaining compound (Loctite 680) onto the outside circumference of the bearing sleeve. Press the bearing sleeve into the replacement bearing until the end of the sleeve is flush with the bearing inner race.

NOTE

The open side of the bearing housing faces the bearing sleeve.

(6) Heat the bearing housing to approximately 250°F/121°C. Install the bearing into the housing and install the retaining ring.

(7) Install the bearing assembly onto the torque tube and align the index marks. Install standard or oversize CherryMAX® rivets as required. Refer to the procedure in subparagraph “B” if replacing roll pins with CherryMAX® rivets.

(8) If required, reinstall the collective stick fitting. Refer to the procedure in subparagraph “C” if replacing roll pins or CherryMAX® rivets with bolt assemblies.

B. Repair elongated roll pin holes in the bearing assemblies using the following procedures:

(1) Remove the roll pin.

(2) Using a #5 drill bit, line drill the fitting and the torque tube.

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NOTE

If the roll pin hole is still elongated/damaged after drilling, replace the torque tube assembly.

(3) Install oversize CherryMAX® rivets, P/N CR3243-06-02.

NOTE

Only one repair authorized per roll pin hole.

C. Replace roll pins or rivets used to install the collective stick fittings using the following procedures:

(1) Remove the roll pins or rivets.

(2) Using a #11 drill bit, line drill the stick fitting and torque tube.

(3) Install the bolt assemblies.

12-27. Installation – Collective Torque Tube Assembly

A. Place the torque tube assembly into position. Install the securing hardware and tighten.

B. Connect the push-pull rod to the torque tube arm.

NOTE

Ensure the throttle cable is routed over the torque tube.

C. Install the throttle cable into the mounting bracket.

E. Connect the throttle cable to the throttle arm.

F. Install the collective stick (para. 12-22).

G. Rig the engine power controls (para. 13-93).

H. Check the collective system rigging if the torque tube assembly was replace or the rigging is in question.

I. Install the pilot's and copilot/passenger's seats.

J. Perform a limited maintenance test flight (para. 4-61).

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12-28. Collective Friction Assembly

12-29. Removal – Collective Friction Assembly (Figure 12-6)

NOTE

The pilot's controls are on the right side of the aircraft in a TH-28 and on the left side for a 480/480B.

WARNING

Failure to disconnect the collective trim spring capsule from the collective control system or not having a second person restrain the collective stick while the collective friction assembly is disassembled may result in damage to the aircraft or injury to the maintenance personnel working on the aircraft.

A. Disconnect the collective trim spring capsule from the collective control system (para. 12-34) or have a second person restrain the collective stick while the collective friction assembly is disassembled.

B. Remove the hardware securing the stop bracket (4) to the anchor bracket (5) on the cabin floor.

C. Remove the screw (9) and washer(s) (10) in the center of the friction knob/lever assembly (12-14).

D. Turn the friction knob/lever assembly counter-clockwise and remove it from the stop assembly (18). Remove and retain the shims (15) installed between the friction knob/lever assembly and the threaded portion of the stop assembly.

E. Remove the DU washers (16), spring washers (17), and the stop bracket (4) from the stop assembly.

F. Remove the anchor bracket (5) from the cabin floor.

NOTE

Do not remove the collective friction stop assembly from the collective stick unless required.

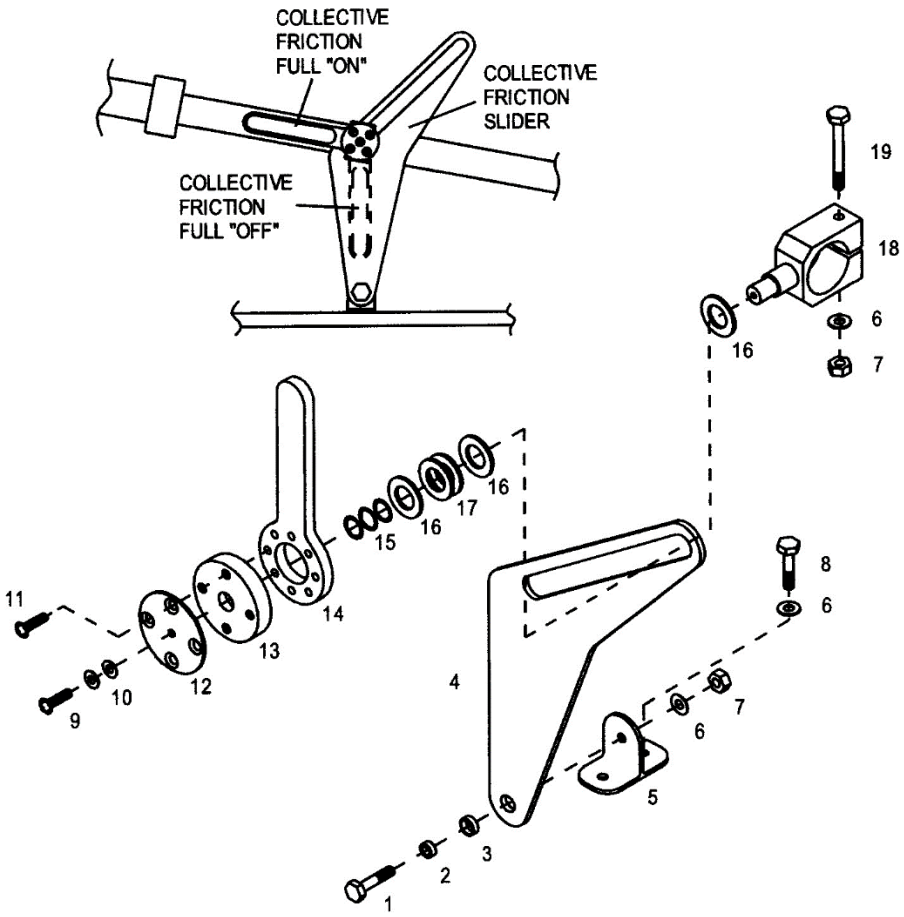
G. Mark the position of the stop assembly (18) on the collective stick.

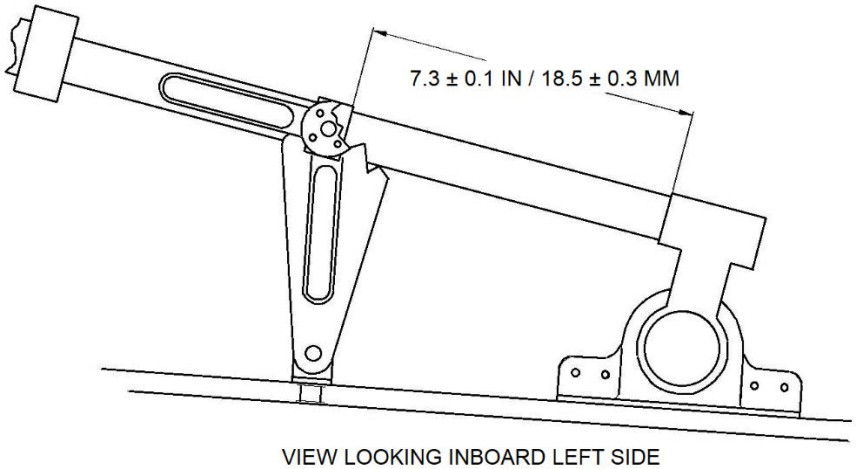
H. Remove the collective stick (para. 12-18).

I. Remove the stop assembly from the collective stick.

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VIEW LOOKING INBOARD LEFT SIDE

1.	Bolt	8.	Bolt	15.	Shims
2.	Bushing	9.	Screw	16.	DU Washer
3.	Bushing	10.	Washer	17.	Spring Washer
4.	Stop Bracket	11.	Screw	18.	Stop Assembly
5.	Anchor	12.	Plate	19.	Bolt
6.	Washer	13.	Knob		
7.	Nut	14.	Lever		

Figure 12-6. Collective Friction Assembly

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12-30. Inspection – Collective Friction Assembly

A. Inspect all of the collective friction assembly parts for corrosion, damage, and wear. Replace damaged or worn parts that affect the proper operation of the collective friction assembly.

12-31. Installation – Collective Friction Assembly (Figure 12-6)

A. Install the stop assembly (18) on the collective stick. Do not tighten at this time.

B. Install the collective stick (para. 12-22).

C. Install the anchor bracket (5) onto the cabin floor.

NOTE

Install the spring washers (17) with the cupped surfaces facing each other.

D. Install the DU washers (16), spring washers (17), and stop bracket(4).

E. Install the shims (15) on the stop assembly and install the friction knob/lever assembly (12-14).

F. Install the screw (9) and washer(s) (10) in the center of the friction knob.

G. Connect the stop bracket to the anchor bracket on the cabin floor.

NOTE

The following dimension listed for the stop assembly location is an initial assembly location and is adjusted during the main rotor control rigging.

H. Position the stop assembly 7.3 inches/18.5 cm from the stick socket or according to the index mark on the collective stick (measured between the aft edge of the collective friction assembly clamp and the forward edge of the collective stick socket as shown in Figure 12-6). Ensure the stop assembly is perpendicular to the stop bracket. Tighten the clamping bolt. Check the friction assembly for any misalignment.

I. Check the operation of the friction assembly. Adjust as required (para. 12-32).

J. If disconnected, connect the collective trim spring capsule to the collective control system (para. 12-38).

K. Perform a limited maintenance test flight (para. 4-61).

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12-32. Adjustment – Collective Friction Assembly (Figure 12-6)

WARNING

Failure to disconnect the collective trim spring capsule from the collective control system or not having a second person restrain the collective stick while the collective friction assembly is disassembled may result in damage to the aircraft or injury to the maintenance personnel working on the aircraft.

A. Check the operation of the collective friction assembly using the following procedures:

NOTE

Due to shimming and the location of the holes in the lever, it may not be possible to get the lever exactly in line with the collective stick or the six o'clock position. The lever should be adjusted so it is as close as possible.

(1) Rotate the friction knob/lever assembly clockwise (lever forward) until it stops. Do not force the lever. The lever should be approximately in line with the collective stick.

(2) Attempt to raise and then lower the collective stick. The collective should be able to move.

(3) Rotate the friction knob/lever assembly counter-clockwise until it stops. Do not force the lever. The lever should be at the six o'clock position and no friction should be applied to the collective stick.

B. Adjust the collective friction assembly using the following procedures:

(1) If the knob/lever assembly rotates approximately 100° but does not stop at the correct positions and the collective can be moved when the friction is full on, adjust the position of the lever by removing the four screws (11) in the outboard side of the knob/lever assembly and relocating the lever and installing the screws (11).

(2) If the collective cannot be moved when the friction is full on, remove the knob/lever assembly (para. 12-29) and add shims (15) between the knob/lever assembly and the threaded portion of the stop assembly. Reassemble the friction assembly and check for proper operation.

(3) If not enough friction is applied at the full on position, remove the knob/lever assembly as above and remove shims (15). Reassemble the friction assembly and check for proper operation.

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(4) If the knob/lever assembly moves excessively more or less than approximately 100° and the proper amount of friction is present at the full on position, remove the center screw (9) from the knob/lever assembly and add washers (10) to the screw to decrease rotation or remove washers to increase rotation. Adjust the position of the lever using step "(1)" once the proper rotation and friction is achieved.

12-33. Collective Trim System (Figure 12-7)

12-34. Removal – Collective Trim System

A. Remove the right side engine access panel.

WARNING

When the spring capsule is in the compressed position, the springs exert approximately 180 pounds/82 kg of force. Use extreme caution when handling a compressed spring capsule.

B. With the collective full down, install special tool T-0022 around the spring capsule and secure with lockwire (.032).

C. Remove the nuts securing the link straps to the capsule pivot points.

D. Remove the hardware securing the straps and spacers to the adjusting link.

E. Remove the straps from the pivot points.

F. Remove the hardware and spacer from the pivot retaining straps.

G. Slide the retainer straps away from the collective bellcrank and the ends off of the capsule pivot.

H. Reposition the collective and remove the hardware connecting the spring capsule to the collective bellcrank.

I. Remove the spring capsule.

J. Disconnect the push-pull rods and the droop compensator push-pull rod from the collective bellcrank.

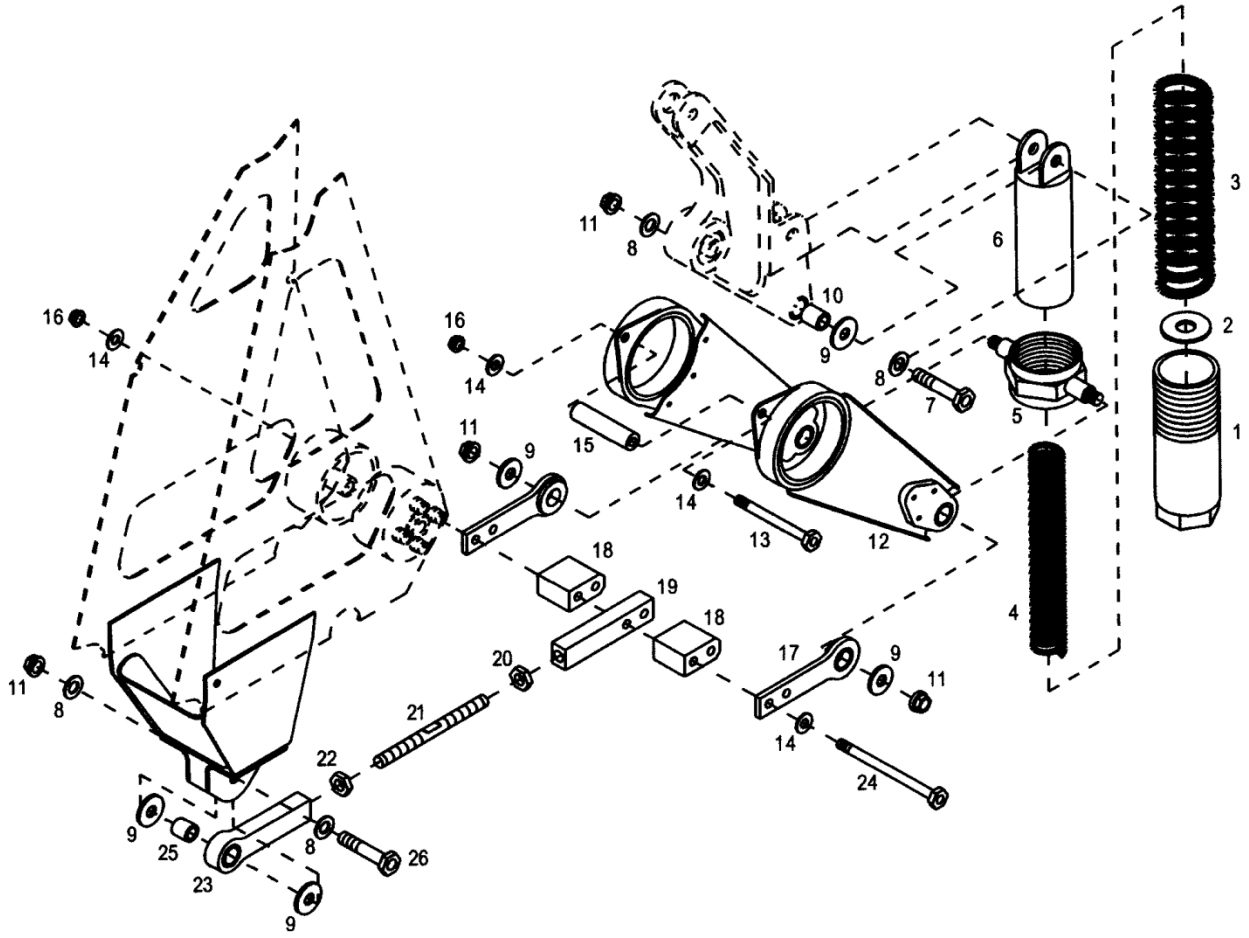
K. Remove the pivot bolt and remove the collective bellcrank.

L. Remove the pivot retainer straps from the bellcrank mounting bracket.

M. Remove the adjusting link from the mounting bracket below the collective bellcrank bracket.

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1.	Spring Retainer	14.	Washer
2.	3/8 Harper Washer	15.	Spacer
3.	Spring	16.	Nut
4.	Spring	17.	Link Strap
5.	Pivot	18.	Spacer
6.	Spring Housing	19.	Link
7.	Bolt	20.	Nut
8.	Washer	21.	Tie Rod
9.	1/4 Harper Washer	22.	Nut
10.	Bushing	23.	Link
11.	Nut	24.	Bolt
12.	Retainer Straps	25.	Bushing
13.	Bolt	26.	Bolt

Figure 12-7. Collective Trim System

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12-35. Disassembly – Collective Trim System

WARNING

When the spring capsule is in the compressed position, the springs exert approximately 180 pounds/82 kg of force. Use extreme caution when handling a compressed spring capsule.

A. Carefully place the spring capsule horizontally between the jaws of a bench vise.

B. Cut the lockwire from the special tool T-0022.

C. Slowly rotate the vise handle to release the spring pressure until all the tension is relieved, remove the capsule from the vise.

D. Remove the spring housing, springs, and washer from the spring retainer.

E. Remove the spring capsule pivot from the spring retainer.

F. Break the torque on the adjusting link jam nuts and turn the link ends from the threaded rod.

12-36. Inspection – Collective Trim System

A. Inspect all the collective trim system parts for bends, corrosion, cracks, nicks, scratches, and wear. Remove corrosion, nicks, and scratches not exceeding .010 inch/.25 mm deep. Replace worn bushings in the pivot retaining and link straps. Replace parts that fail to meet any other inspection requirement.

12-37. Assembly – Collective Trim System

A. Apply grease (Lubriplate 630-AA or MIL-PRF-81322) to the springs and washer.

B. Install the spring capsule pivot on the spring retainer with 3 - 4 threads extended above the spring capsule pivot.

C. Install the washer and springs into the spring retainer.

D. Install the spring housing onto the springs.

WARNING

When the spring capsule is in the compressed position, the springs exert approximately 180 pounds/82 kg of force. Use extreme caution when handling a compressed spring capsule.

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E. Install the special tool T-0022 on the spring capsule and carefully compress the capsule in a vise until the lip of the tool locks between the ears of the spring housing. Secure the tool in place with lockwire (.032).

F. Install the jam nuts and link ends onto the threaded rod. Do not tighten the jam nuts at this time.

12-38. Installation – Collective Trim System

WARNING

When the spring capsule is in the compressed position, the springs exert approximately 180 pounds/82 kg of force. Use extreme caution when handling a compressed spring capsule.

A. Connect the adjusting link to the mount bracket below the collective bellcrank bracket.

B. Install the pivot retaining straps onto the collective bellcrank bracket.

C. Install the collective bellcrank.

D. Connect the collective push-pull rods and the droop compensator rod.

E. Connect the spring capsule to the collective bellcrank.

F. Slide the pivot retaining straps in toward the collective bellcrank. Install the ends of the retaining straps onto the capsule pivot.

G. Install the spacer and hardware in the upper end of the pivot retaining straps.

NOTE

The spacer must be able to be turned by hand after tightening to prevent binding in the system.

H. Install the link straps onto the pivot. Install the washers and nuts and tighten.

I. Install the spacers between the adjusting link and the link straps. Install the hardware and tighten.

WARNING

Ensure that the collective friction is on. Failure to do so may result in damage to the aircraft or injury to the maintenance personnel.

J. Remove the lockwire from around the special tool and remove the special tool.

K. Rig the collective trim system (para. 12-16).

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L. Install the right side engine access panel.

M. Perform a limited maintenance test flight (para. 4-61).

12-39. Collective Walking Beam

12-40. Removal – Collective Walking Beam (Figure 12-20)

A. Remove the hardware (1) connecting the push-pull rod (2) from the walking beam.

B. Remove the hardware (3) from the walking beam pivot straps (4). Remove the pivot straps.

C. Remove the bolts (6) securing the walking beam to the bearing housing in the upper swashplate. Remove the collective walking beam.

12-41. Inspection – Collective Walking Beam

A. Inspect the walking beam for bends, corrosion, cracks, nicks, and scratches. Repair corrosion, nicks, and scratches less than .010 inch/.25 mm deep. Replace the walking beam if it fails the other inspection requirements.

B. Inspect the bearings for security and excessive play. Replace bearings that have more than .005 inch/.13 mm radial play.

C. Inspect the condition of the bushings in the pivot straps. Replace the bushings if worn.

12-42. Installation – Collective Walking Beam (Figure 12-20)

NOTE

Bearing housing P/N 28-16108-11 requires P/N 28-16109-13 bushings (6) and P/N 28-16109-11 bolts (5); bearing housing P/N 28-16108-2 requires P/N 28-16109-1 bolts (5).

A. Install the collective walking beam into the bearing housing in the upper swashplate. Install the bushings (6) (if required), bolts (5), torque 30-40 in-lb/3.4-4.5 Nm, and lockwire (.032).

B. Install the pivot straps (4) between the walking beam and the mount on the bottom of the main rotor transmission. Install washers, shims, bolt (3), torque nut, and install cotter pin. Liberally apply a coating of Vibra-Tite® VC-3 onto the nut and cotter pin installations.

C. Connect the push-pull rod (1) to the walking beam (2).

D. Check the rigging of the collective control system (para. 12-15) if in question.

E. Perform a limited maintenance test flight (para. 4-61).

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12-43 Cyclic Control System

12-44. Description – Cyclic Control System (Figure 12-8)

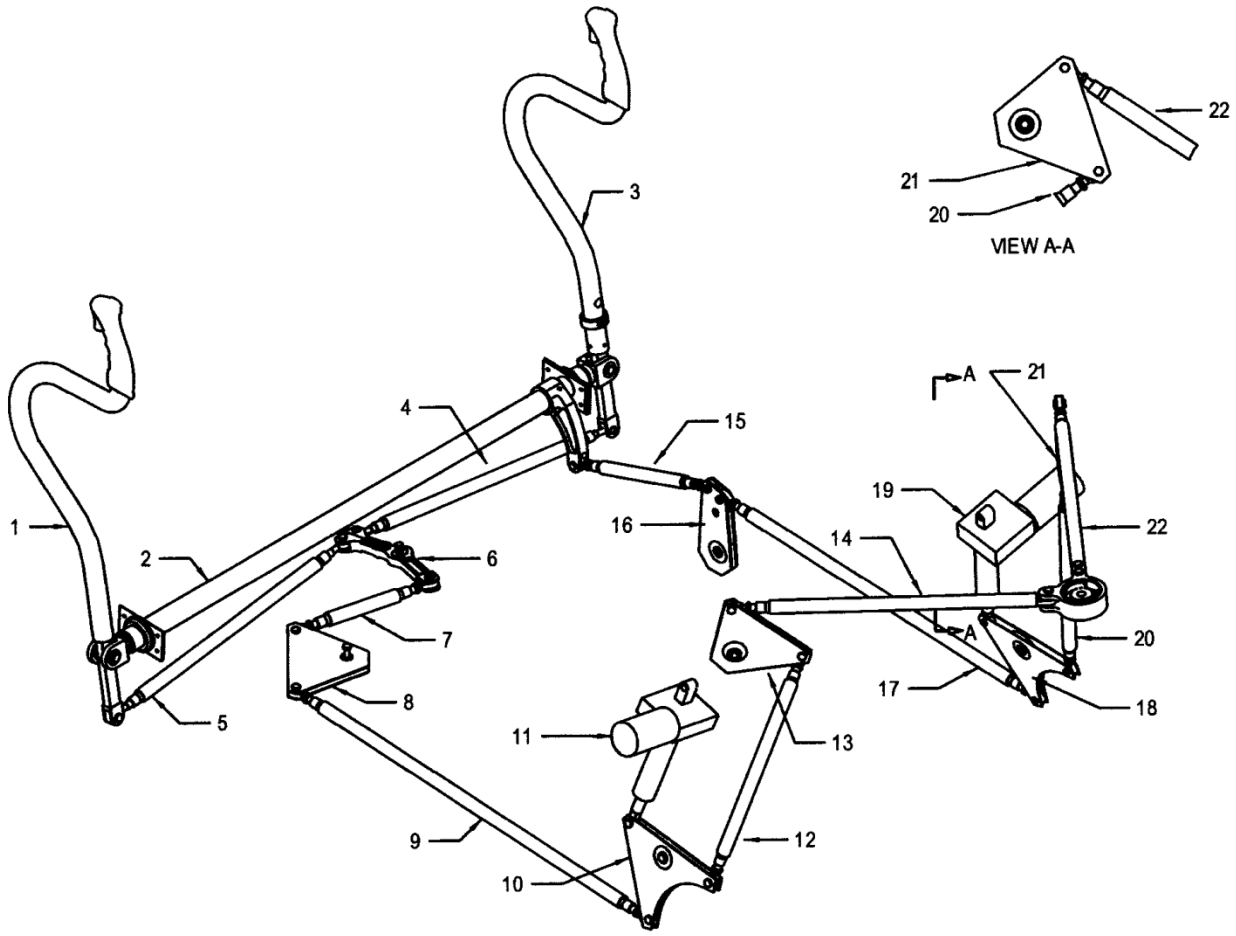
NOTE

The pilot's controls are on the right side of the aircraft in a TH-28 and on the left side for a 480/480B.

The cyclic control system is a fully mechanical control system which is linked to the swashplate through a series of interconnected push-pull tubes, a torque tube, and bellcranks. Both longitudinal and lateral control systems are totally independent with no intermixing before the individual inputs reach the swashplate. Non-rotating control inputs are transmitted to the rotating controls via a universal joint type swashplate at the base of the transmission. Inputs are mixed at the swashplate and transmitted through a set of three push-pull tubes though the center of the mast to pitch change bellcranks at the top of the hub. The motion is then transmitted through pitch change links to the blade pitch horns located on the leading edge of each blade. The aircraft is equipped with a cyclic stick, located directly in front of the pilot seats. The switches mounted on the cyclic grip assembly are all non-functional (before the installation of optional equipment) except the "coolie hat" four way toggle switch at the top center of the grip, used to control the four way cyclic trim system. The cyclic trim system maintains the position of the cyclic control stick and reduces rotor feedback to zero. The system consists of a cyclic trim switch located at the top of each cyclic grip, a pair of electrically operated jack screw actuators that vary spring tension produced by the longitudinal and lateral trim units, and a pair of trim switch units which reverse the direction of the current operating the actuators. The cyclic trim switches each have five positions which are: normally OFF in the center, and momentary FORWARD, AFT, LEFT, AND RIGHT. Both trim mechanisms include an electrically operated reversible motor and a cylindrical spring assembly connected to the cyclic control linkage and both are mounted on the cabin bulkhead in the upper engine compartment. When a trim switch is moved off of center to any one of the four trim directions, power applied through the TRIM circuit breaker energizes one of the trim motors to apply trim spring force in the desired direction. By momentarily moving the switch, very small trim increments may be obtained. Trim force cannot be applied in two directions simultaneously; when both longitudinal and lateral trim corrections are desired, it is necessary to apply first one and then the other. The cyclic trim system does not limit travel of the cyclic control; the pilot may override the trim forces at any time. The 480B has vibration absorber beams installed on the upper lateral and longitudinal bellcranks located in the engine compartment. These beams reduce the mechanical feedback vibration felt in the cyclic controls caused by the main rotor blades. The vibration absorbers can be installed on the TH-28 and 480. If the aircraft is equipped with elastormeric dampers, a surface effect damper is installed in the longitudinal and lateral cyclic controls to dampen the cyclic system feedback produced by the elastomeric dampers.

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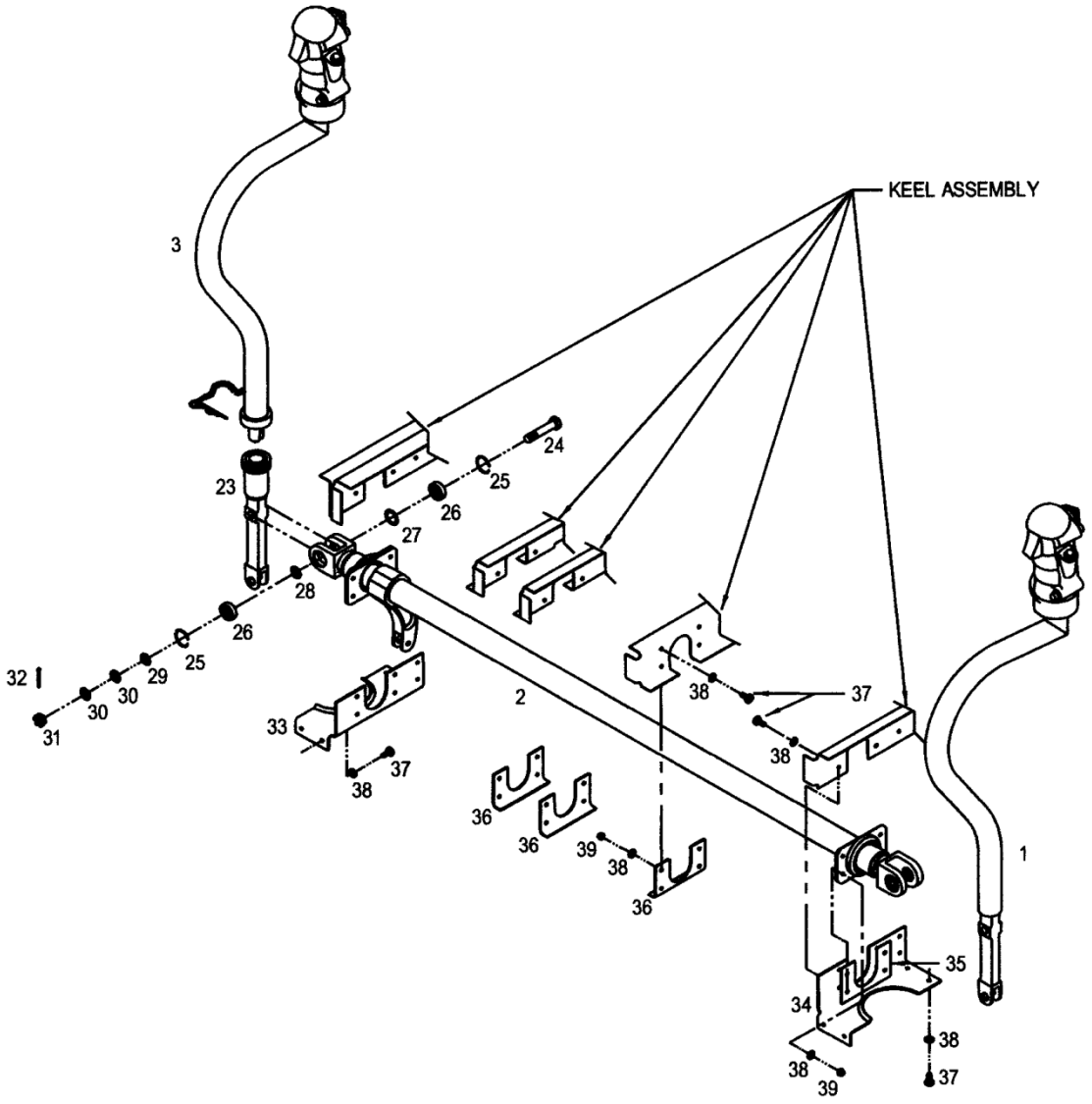


1.	Pilot's Cyclic Stick	12.	Lateral Push-Pull Rod
2.	Cyclic Torque Tube	13.	Lateral Bell Crank
3.	Copilot's Cyclic Stick	14.	Lateral Push-Pull Rod
4.	Lateral Push-Pull Rod	15.	Longitudinal Push-Pull Rod
5.	Lateral Push-Pull Rod	16.	Longitudinal Bell Crank
6.	Lateral Bell Crank	17.	Longitudinal Push-Pull Rod
7.	Lateral Push-Pull Rod	18.	Longitudinal Bell Crank
8.	Lateral Bell Crank	19.	Longitudinal Trim Motor Assy.
9.	Lateral Push-Pull Rod	20.	Longitudinal Push-Pull Rod
10.	Lateral Bell Crank	21.	Longitudinal Bell Crank
11.	Lateral Trim Motor Assy.	22.	Longitudinal Push-Pull Rod

Figure 12-8. Cyclic Control System

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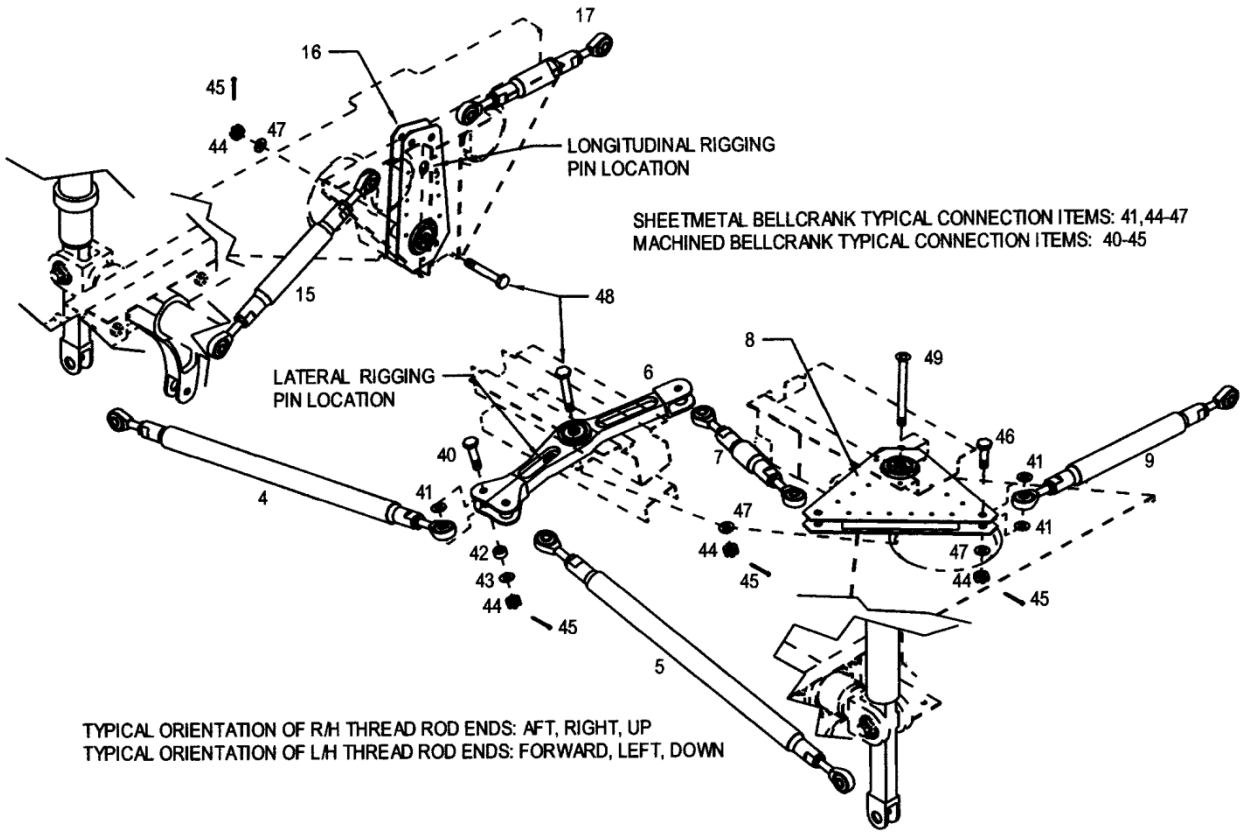


23.	Stick Fitting	32.	Cotter Pin
24.	Bolt	33.	Support Bracket
25.	Retaining Ring	34.	Support Bracket
26.	Bearing	35.	Shim
27.	Shim	36.	Support Bracket
28.	Shim	37.	Bolt
29.	Washer	38.	Washer
30.	Washer	39.	Nut
31.	Nut		

Figure 12-8. Cyclic Control System

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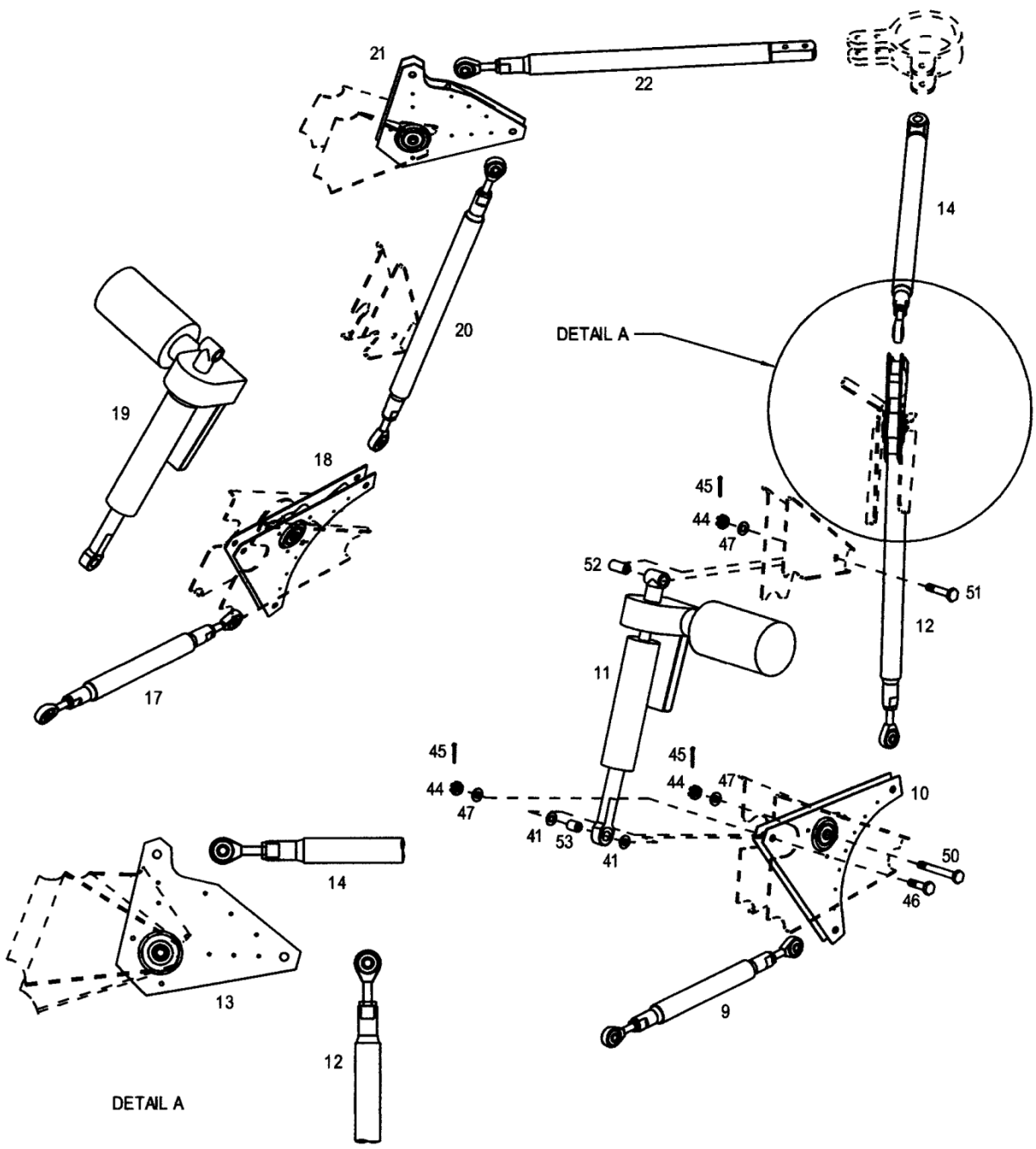


40.	Bolt	45.	Cotter Pin
41.	Washer	46.	Bolt
42.	Bushing	47.	Washer
43.	Washer	48	Bolt
44.	Nut	49.	Bolt

Figure 12-8. Cyclic Control System

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50. Bolt
51. Bolt
52. Bushing
53. Bushing

Sheet 4 of 4

Figure 12-8. Cyclic Control System

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12-45. Cyclic System Rigging – Cyclic Control System (Figure 12-8)

NOTE

Ensure the push-pull rods are set to the lengths in accordance with Table 12-1 or when removed from the aircraft.

NOTE

The collective control system must be rigged before the cyclic control system may be rigged.

NOTE

Procedures referencing the L/H and R/H cyclic sticks will be opposite for the TH-28.

A. Remove the right side keel access panel and the left and right side engine access panels.

B. If installed, remove the bolts connecting the push-pull rods (14 & 22) to the longitudinal and lateral bellcranks (13 & 21) in the engine compartment.

C. Ensure that the longitudinal bellcrank (16) is correctly installed with “FWD” stamp toward the front of the aircraft.

NOTE

The trim motors are in the neutral position when the rigging pins slide freely into position.

D. If the trim motors are connected, position the lateral and longitudinal trim motors in the neutral position.

E. Install the rigging pins in the longitudinal and lateral rigging locks in the control system.

F. Adjust the length of push-pull rod (15) as required to longitudinally center the L/H cyclic stick in the stop ring.

G. Adjust the length of push-pull rod (5) as required to laterally center the L/H cyclic stick in the stop ring.

H. Remove the lateral rigging pin.

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NOTE

Due to manufacturing tolerances, exact rigging of the R/H cyclic stick may not be possible. Splitting the difference in the stop ring contact for the R/H cyclic stick is acceptable.

CAUTION

All ways ensure full lateral travel (stop to stop) on the L/H cyclic stick.

I. Move the L/H cyclic stick from full left to full right travel against the stop ring and adjust push-pull rod (4) as required to center the R/H cyclic stick in the stop ring.

J. Install the lateral rigging pin.

K. Install the swashplate centering tool (T-1575) to hold the swashplate perpendicular to the main rotor mast (Figure 12-9).

L. Loosen the jam nuts on the push-pull rods disconnected from the cyclic bellcranks. Adjust the length of the push-pull rod until the bolt connecting the rod to the bellcrank can freely be installed in the bellcrank.

M. Tighten the jam nuts on the push-pull rods. Install the nuts on the bolts connecting the rods to the bellcrank. Torque the nuts and cotter pin.

N. Remove the rigging pins and the swashplate centering tool.

O. Check that full forward trim positions the L/H cyclic stick against the forward stop (stop ring). Return the longitudinal trim to the neutral position and check that full right trim positions the L/H cyclic stick against the right stop (stop ring). Return the lateral trim to the neutral position.

12-46. Main Rotor Control Rigging – Cyclic Control System

NOTE

The collective and cyclic controls must be rigged before the main rotor controls may be rigged.

NOTE

The lateral and longitudinal trim motors must be in the neutral position when checking the main rotor control rigging.

A. Remove the right side keel access panel and the left and right side engine access panels.

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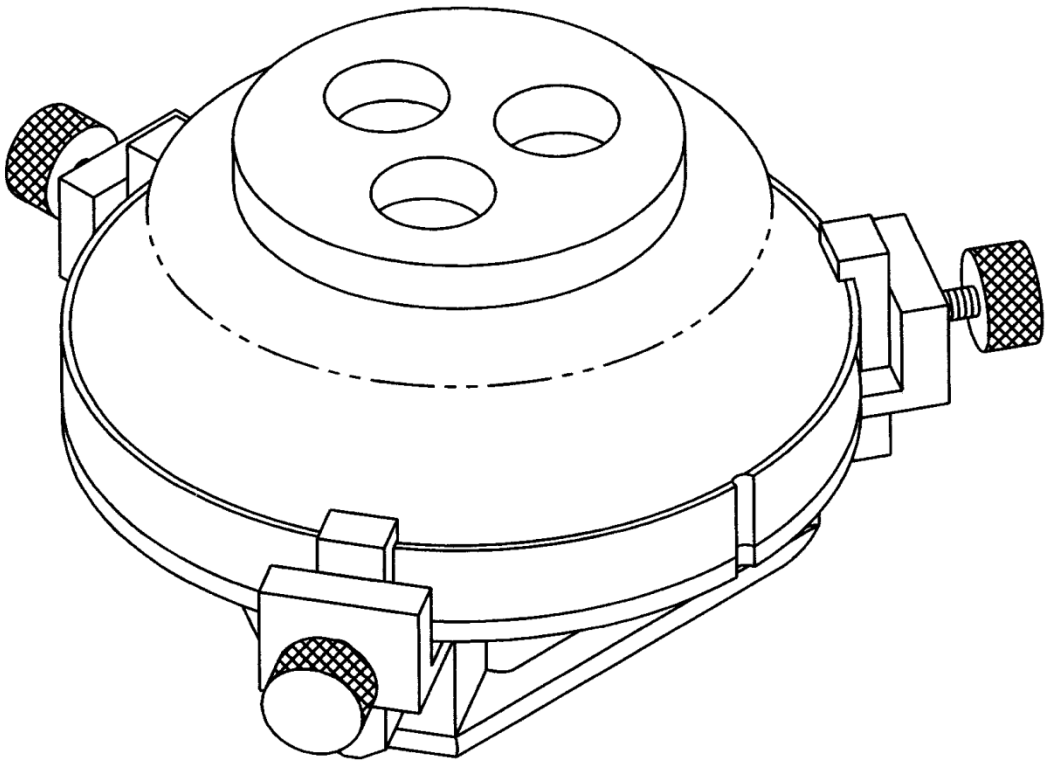


Figure 12-9. Swashplate Centering Tool Installation

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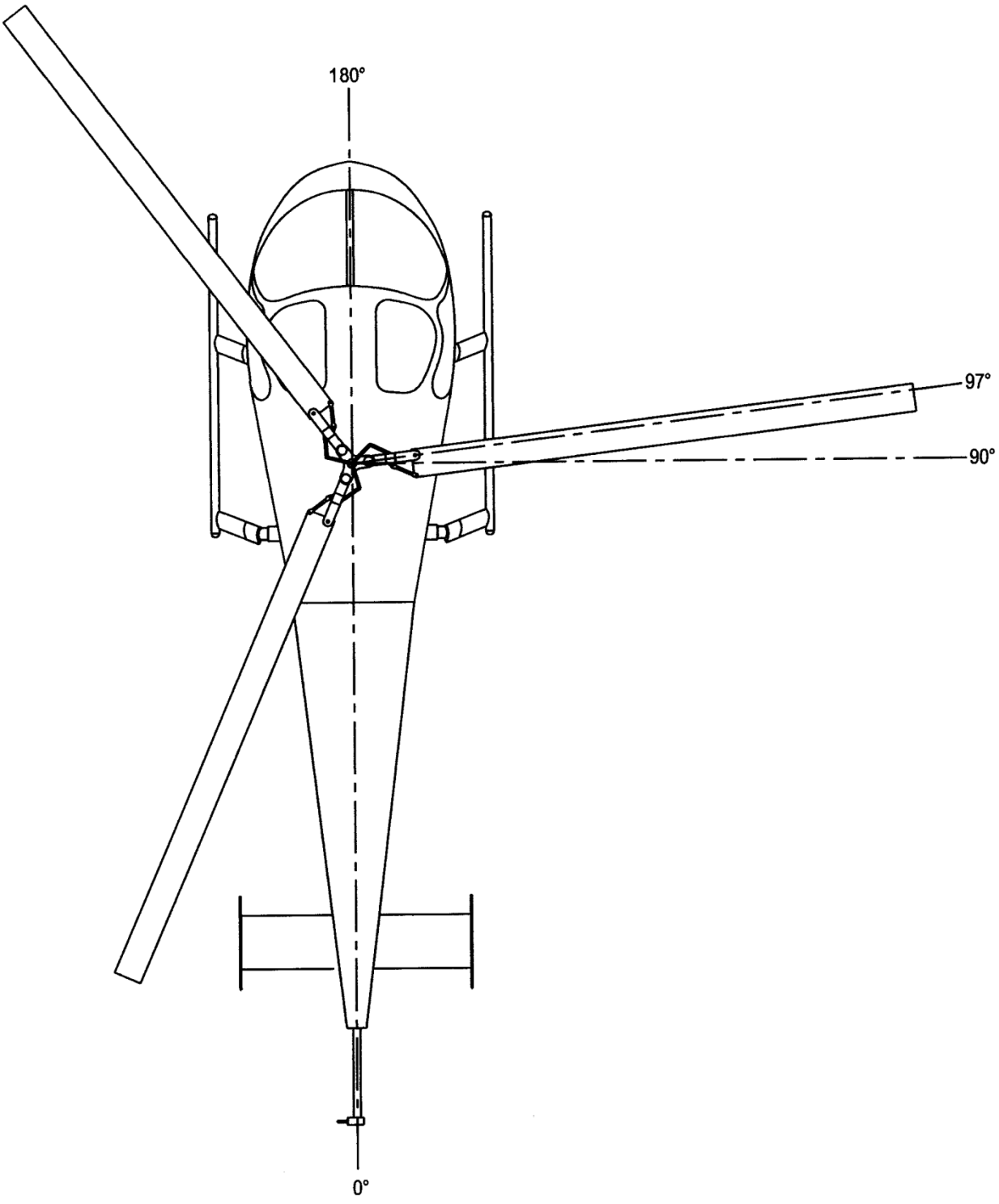


Figure 12-10. Main Rotor Azimuth Positions

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B. Level the aircraft (para. 4-67).

C. Install the lateral and longitudinal cyclic rigging pins.

D. Place the collective full down and apply collective friction.

E. Phase the main rotor blades 120° apart by moving each blade grip until one inch of the damper piston shaft is exposed on each damper.

F. Rotate the main rotor hub until the #1 grip is at the 97° azimuth. The 97° azimuth is located when the dogleg rod end controlling the #1 blade is over and in line with the longitudinal push-pull rod connected to the uni-ball assembly. (Figure 12-10)

G. Place a prop protractor perpendicular to the blade leading edge on the flat area on the top side of the #1 blade grip.

H. Adjust the pitch change link to obtain 3.5° ±.75°. Center the rod end bearings and secure the jam nuts.

I. Repeat the sequence for blades #2 and #3.

J. Rotate the #1 blade to the 97° azimuth position.

K. Release the collective friction and move the collective to the full up position.

NOTE

Completely recheck the collective and cyclic system rigging if the collective friction stop assembly has to be repositioned in the following step.

L. Measure the blade angle with the prop protractor. The measurement should be 20.1° ±.75°. If the blade angle is too high, reposition the collective friction stop assembly farther from the stick socket. If the blade angle is not enough, reposition the collective friction stop assembly closer to the stick socket.

M. Place the collective full down and apply collective friction. Remove the longitudinal rigging pin.

N. Move the cyclic stick full aft and measure the blade angle. The measurement should be 11.6° ± 1.0° Move the cyclic full forward and measure the blade angle. The measurement should be -5.2° ± 1.0°.

O. Install the longitudinal rigging pin and remove the lateral rigging pin.

P. Move the #1 blade to the 187° azimuth position. The 187° azimuth is located when the dogleg rod end controlling the #1 blade is over and in line with the lateral push-pull rod connected to the uni-ball assembly (Figure 12-10).

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Q. Move the cyclic to the full right position and measure the blade angle. The measurement should be 11.5° ± 1.0°. Move the cyclic full left and measure the blade angle. The measurement should be -5.3° ± 1.0°.

R. Remove the longitudinal rigging pin. Rotate the cyclic stick 360° around the stop ring to check for binding. Repeat with the collective full up.

CAUTION

Remove the longitudinal rigging pin. Rotate the cyclic stick 360° around the stop ring to check for binding. Repeat with the collective full up.

12-47. Cyclic Stick

12-48. Removal – Cyclic Stick

A. (Copilot 480/480B Only) Disconnect the electrical harness from the connector on the floor.

B. (Copilot 480/480B Only) Unfasten the retaining ring from the base of the cyclic stick and remove the stick.

C. Remove the keel access panels.

D. Disconnect the electrical harness from the fitting on the cabin floor.

E. Disconnect the push-pull rod from the cyclic stick socket.

F. Remove the bolt securing the cyclic stick socket to the torque tube clevis. Remove the cyclic stick assembly.

12-49. Inspection – Cyclic Stick

A. Inspect the cyclic stick assembly and stick socket for bends, corrosion, cracks, nicks, and scratches. Inspect for play between the cyclic stick and the socket.

B. Inspect the cyclic grip for proper operation of the switches. Replace defective switches.

C. Inspect the wiring harness for frayed or broken wires. Replace defective wires.

D. (TH-28, S/N 3006 & 480, S/N 5001 Only) Inspect the weights below the cyclic grips for security of installation, condition of the protective coating, and cracks at the mounting holes. Replace the weights if cracked at the mounting holes. Repair the protective coating by re-dipping the weights or brushing on Plasti Dip # 11603 or repainting the weights.

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12-50. Repair – Cyclic Stick

A. Remove corrosion, nicks, and scratches that are less than .010 inch/.25 mm in depth. Replace the cyclic stick if cracked, bent, or damage exceeds .010 inch/.25 mm in depth.

B. Repair a cyclic stick with a loose stick socket using the following procedure:

(1) Index mark the orientation of the cyclic stick socket.

(2) Remove the rivets securing the stick socket and remove the stick socket.

WARNING

Acetone and Methylethylketon (MEK) are toxic and must be used with extreme caution. Make sure adequate ventilation is provided. Repeated or prolonged contact with the skin should be avoided. Low-volatile substitutes, such as Extreme Simple Green or Citra-Safe, are preferred solvents.

(3) Clean the stick socket and cyclic stick mating surfaces with Extreme Simple Green, or equivalent.

(4) Insert the stick socket into the cyclic stick in the proper orientation and cleco in place.

(5) Using the proper size drill bit, drill the rivet holes one at a time for either CR3243-5-4 Oversize Rivets (#16 Drill Bit) or CR3213-6-4 Standard Rivets (#10 Drill Bit) as required.

(6) Remove the stick socket and remove the drill chips.

NOTE

Do not break the sharp edge on the blind side (internal) of the holes in the cyclic stick socket.

(7) Deburr the rivet holes.

(8) Clean/Prime the cyclic stick socket and cyclic stick assembly mating surfaces with Locquic® Primer T or equivalent. Follow the instructions provided with the primer.

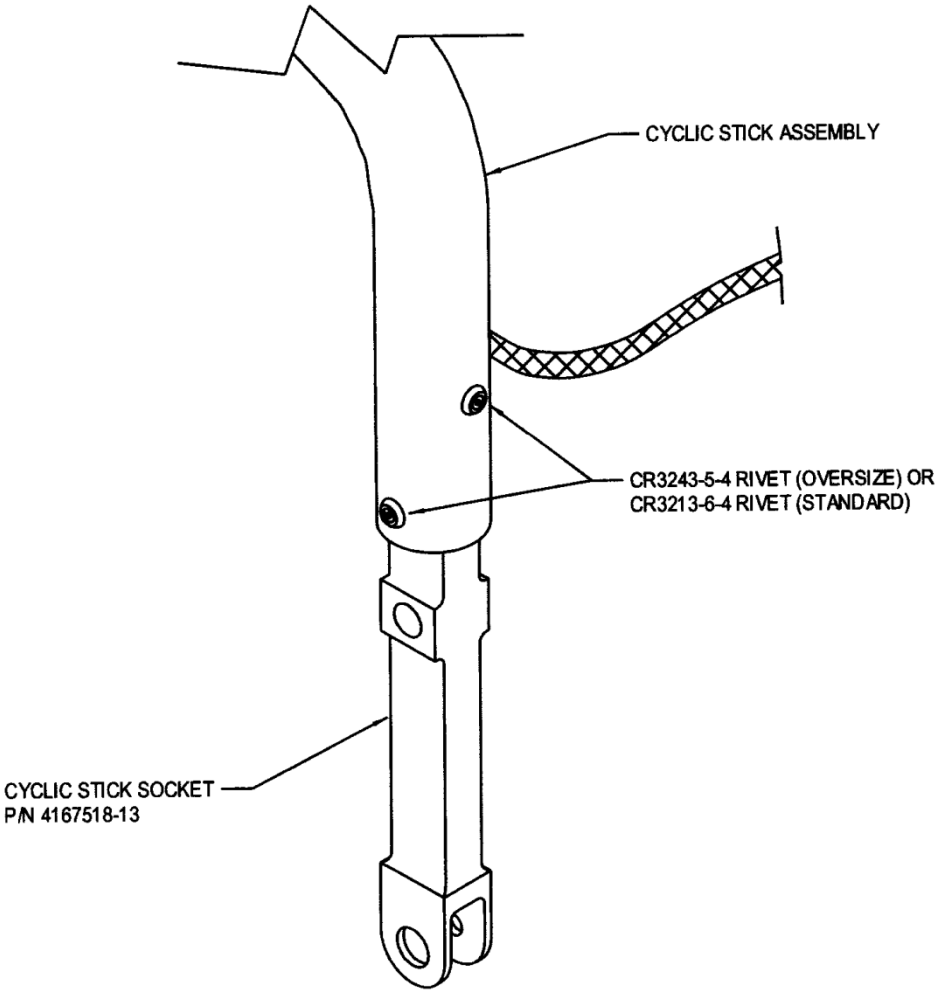
(9) Apply a light coat of Loctite® RC/635 (Green) or equivalent to the stick socket mating surface and install the socket into the cyclic stick assembly in the correct orientation.

(10) Install either the CR3243-5-4 Rivets or the CR 3213-6-4 Rivets according to the holes drilled in step (5) above.

(11) Allow the Loctite® R/C 635 to cure for 24 hours.

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NOTE

Stick socket, P/N 4167517-3, is used in the 480/480B removable cyclic stick assembly and is not shown. The repair procedure is the same for either cyclic stick assembly.

Figure 12-11. Cyclic Stick Socket

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C. Replace defective cyclic grip switches or replace the cyclic grip.

D. Replace/Repair the electrical harness as required.

E. Replace the weights if cracked at the mounting holes. Repair the protective coating by re-dipping the weights or brushing on Plasti Dip # 11603 or repainting the weights.

12-51. Installation – Cyclic Stick (Figure 12-12)

A. (Copilot 480/480B Only) Install the cyclic stick into the fitting and secure with the retaining ring.

B. (Copilot 480/480B Only) Connect the electrical harness to the electrical connector on the cockpit floor.

C. Install the cyclic stick into the torque tube clevis using the following procedure:

NOTE

The shim installation procedure is not required for cyclic torque tube assemblies with a floating bearing. If installing P/N 4166009-9 cyclic torque tube assembly, omit steps 1 through 4. If installing a cyclic torque tube assembly that requires shims, follow steps 1 through 5. Refer to paragraph Figure 12-13 to determine the installed cyclic torque tube configuration.

(1) Measure the distance between the inner races of the cyclic pivot bearings.

(2) Measure the thickness of the bearing mating surface on the cyclic stick socket.

(3) Compare the measurements and assemble a shim package to allow for a .000/+.001in. (.00/+.003 mm) pinch fit of the cyclic stick assembly between the pivot bearing inner races.

(4) Install the cyclic stick and install the shim package on the forward side of the cyclic stick assembly.

(5) Install the retaining hardware, torque the nut and install the cotter pin.

NOTE

After torquing the hardware, if the “floating” bearing (Figure 12-13, Item 6) has movement, remove and re-install bearing with a thread sealant (Loctite 277 or equivalent).

E. Connect the push-pull rod to the cyclic stick fitting.

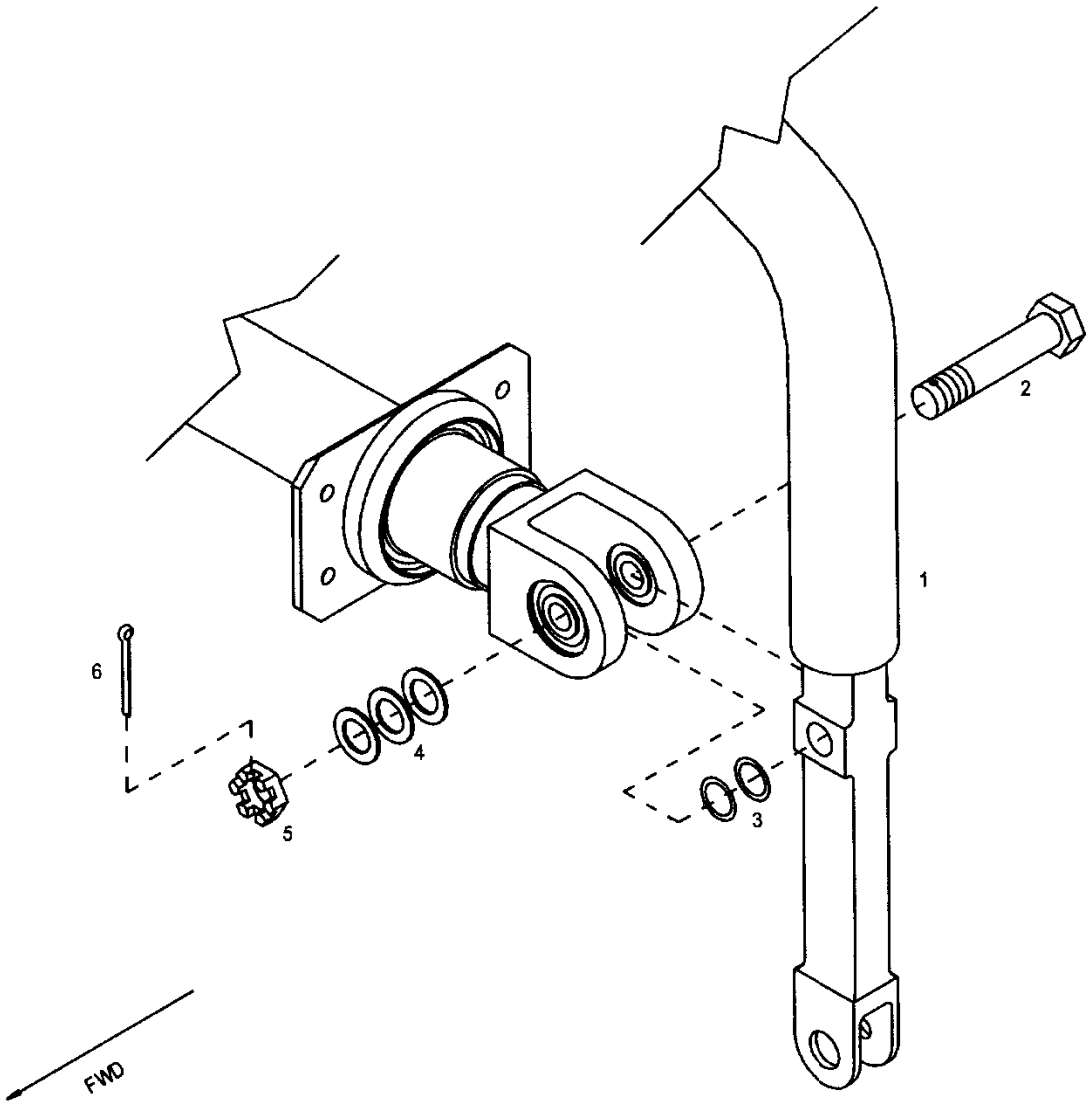
F. Connect the electrical harness to the fitting on the cabin floor.

G. Install the keel access panels.

H. Perform a limited maintenance test flight (para. 4-61).

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1.	Cyclic Stick Assembly	4.	Washers (As required)
2.	Bolt	5.	Nut
3.	Shims (As required)	6.	Cotter Pin

Figure 12-12. Cyclic Stick Installation

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12-52. Cyclic Torque Tube Assembly

12-53. Removal – Cyclic Torque Tube Assembly

A. Remove the left and right side keel access panels.

B. Remove the cyclic sticks (para. 12-48).

C. Disconnect the push-pull rod from the torque tube arm.

D. Remove the hardware securing the torque tube bearing housing brackets to the keel structure and the hardware securing the gussets to the keel structure.

E. Remove the cyclic torque tube.

12-54. Inspection – Cyclic Torque Tube Assembly

A. Inspect the torque tube and fittings for dents, cracks, corrosion, nicks, and scratches. Remove nicks, scratches, or corrosion not exceeding .010 inch/.25 mm depth. Replace if cracked or dented.

NOTE

CherryMAX® rivets are used during assembly of the cyclic control torque tube starting with 480 S/N 5003. Reassemble/Repair all roll pin and CherryMAX® torque tube assemblies using standard or oversize CherryMAX® rivets as required. Starting with TH-28 S/N 3007 & subsequent and 480B S/N 5046 & subsequent, bolt assemblies are used.

B. Inspect the roll pin holes for elongation and cracks. Replace the torque tube if damage exceeds the limits of oversize roll pins.

C. Inspect the bearings for excessive wear and roughness. Replace the bearings as required.

12-55. Repair – Cyclic Torque Tube Assembly (Figures 12-8, 12-13, & 12-14)

A. Replace the bearings in the torque tube clevises using the following procedures:

NOTE

If repairing P/N 4166009-101 (-101) cyclic torque tube assembly, follow steps 1 through 4. If installing P/N 4166009-9 (-9) cyclic torque tube assembly, omit steps as directed. (For other earlier P/N 4166009-(X) configurations, which use shims, follow the steps for P/N 4166009-101. See also Figure 12-13.)

WARNING

Use protective gloves when handling heated parts.

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(1) Heat the bearing housing to approximately 250°F/121°C. Remove the bearing from the clevis fittings.

a. (-101 only) Remove the retaining rings from the clevis fittings and remove the pivot bearings and shims if installed.

WARNING

Acetone and Methylethylketone (MEK) are toxic and must be used with extreme caution. Make sure adequate ventilation is provided. Repeated or prolonged contact with the skin should be avoided. Low-volatile substitutes, such as Extreme Simple Green or Citra-Safe, are preferred solvents.

NOTE

Do not soak the pivot bearings in solvent. The pivot bearings are permanently lubricated bearings.

(2) Clean the pivot bearing outer race and clevis fitting bearing surfaces with Extreme Simple Green, or equivalent.

(3) Install the "fixed" cyclic pivot bearing using the following procedure:

a. (-101 Only) Temporarily install the bearing into the clevis and determine the amount of shims required to provide a .000/+.001 in. (.00/+.003 mm) pinch fit with the retaining ring installed.

b. (-101 Only) Remove the retaining ring, shims, and bearing.

c. Clean/Prime the pivot bearing outer race and clevis fitting bearing surface the Loctite® Primer T or equivalent. Follow the instructions provided with the primer.

d. (-101 Only) Install the shims into the clevis fitting.

e. Apply a light coat of retaining compound (Loctite 635 or equivalent) to the pivot bearing outer race and install the bearing into the clevis fitting.

f. Remove any excess retaining compound.

g. (-101 Only) Install the retaining ring.

(4) Install the "floating" cyclic pivot bearing using the following procedure:

a. (-101 Only) Install the retaining ring into the clevis fitting.

b. Clean/Prime the pivot bearing outer race and clevis fitting bearing surface the Loctite® Primer T or equivalent. Follow the instructions provided with the primer.

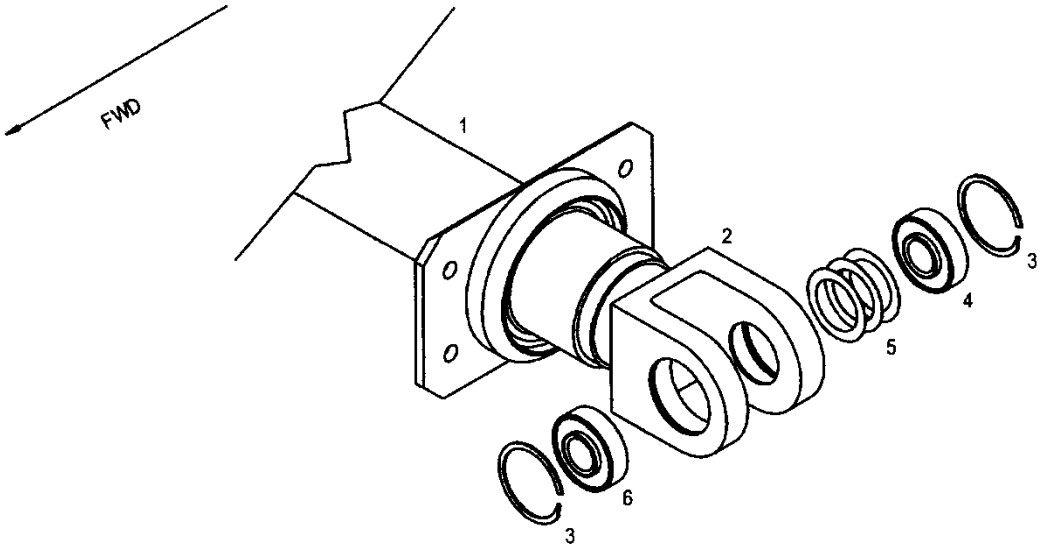
c. Apply a light coat of thread sealant (Loctite 277 or equivalent) to the pivot bearing outer race and install the bearing into the clevis fitting.

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d. (-101 Only) Seat the bearing against the retaining ring.

e. Remove any excess thread sealant.



NOTE

S/N 5059 and subsequent are equipped with P/N 4166009-9 cyclic torque tube assembly. S/N 5058 and prior are originally equipped with cyclic torque tube assembly which includes items (3) and (5). (Refer to the TH-28/480 Series Illustrated Parts Catalog for S/N effectivity.)

1.	Torque Tube Assembly	4.	“Fixed” Bearing
2.	Clevis Fitting	5.	Shims (As Required) *
3.	Retaining Ring *	6.	“Floating” Bearing

(* Items are not used in P/N 4166009-9 assembly.)

Figure 12-13. Clevis Bearing Installation

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B. Replace the torque tube bearings using the following procedures:

(1) Index mark the torque tube clevis and the bearing sleeve on the end of the tube that has the defective bearing.

NOTE

CherryMAX® rivets are used during assembly of the cyclic control torque tube starting with 480 S/N 5003. Reassemble/Repair all roll pin and CherryMAX® torque tube assemblies using standard or oversize CherryMAX® rivets as required. For 480B S/N 5046 through 5052, bolt assemblies were used.

(2) Remove the roll pins, rivets, or bolts from the clevis and the bearing sleeve. Remove the clevis and the bearing assembly from the torque tube.

(3) Remove the sleeve from the bearing.

(4) Remove the retaining ring and shim (if installed) from the bearing housing.

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

(5) Heat the bearing housing to approximately 250°F/121°C. Remove the bearing from the housing.

(6) Heat the bearing housing to approximately 250°F/121°C. Install the new bearing into the housing. Install the retaining ring and shim (if required).

(7) Install the sleeve into the bearing.

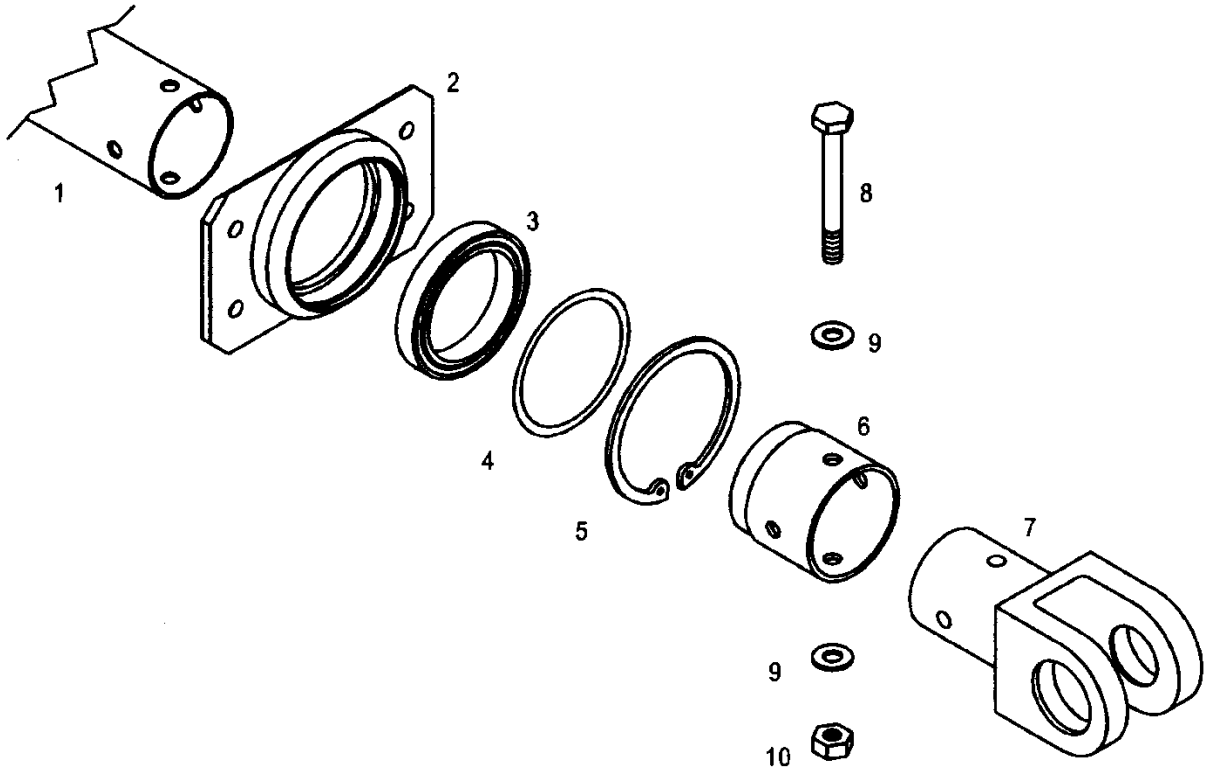
NOTE

The open side of the bearing housing faces the sleeve.

(8) Apply a light coat of corrosion preventive compound such as PAR-AL-KETONE (Black Bear) or equivalent (MIL-C-52, Type 1) on the mating surfaces of the bearing assembly and clevis. Install the bearing assembly and clevis on the torque tube. Align the index marks. Install the CherryMAX® rivets or bolts. If installing CherryMAX® rivets instead of roll pins, use the repair procedure in subparagraph “C” below.

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1.	Torque Tube	6.	Sleeve
2.	Retainer	7.	Clevis
3.	Bearing	8.	Bolt or Rivet
4.	Shim (If Required)	9.	Washer
5.	Retaining Ring	10.	Nut

Figure 12-14. Cyclic Torque Tube Bearing Installation

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NOTE

CherryMAX® rivets are used during assembly of the cyclic control torque tube starting with 480 S/N 5003. Reassemble/Repair all roll pin and CherryMAX® torque tube assemblies using standard or oversize CherryMAX® rivets as required. Starting with TH-28 S/N 3007 & subsequent and 480B S/N 5046 & subsequent, bolt assemblies are used.

C. Repair elongated roll pin holes using the following procedures:

(1) Remove the roll pin.

(2) Using a #5 drill, line drill the fitting and the torque tube.

NOTE

If the roll pin hole is still elongated/damaged after drilling, replace the torque tube assembly.

(3) Install oversize “-06" CherryMAX® rivets.

NOTE

Only one repair authorized per roll pin/rivet hole.

D. Remove minor surface corrosion from the torque tube assembly and apply a light coat of corrosion preventive compound such as PAR-AL-KETONE (Black Bear) or equivalent (MIL-C-52, Type 1).

12-56. Installation – Cyclic Torque Tube Assembly

A. Install the torque tube assembly. Install the hardware securing the bearing housing brackets to the keel structure and the hardware securing the gussets to the keel structure.

(1) Assemble the right and then the left side brackets; do not tighten the hardware.

(2) Torque the hardware securing the right side bracket.

(3) Measure the gap between the left side bracket and the bulkhead.

(4) Install the corresponding P/N 4166053 shim(s) and torque remaining hardware.

B. Connect the push-pull rod to the torque tube arm.

C. Install the cyclic stick (para. 12-51).

D. If the torque tube was replaced, check the cyclic control rigging (para. 12-45).

E. Install the left and right side keel access panel.

F. Perform a limited maintenance test flight (para. 4-61).

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12-57. Cyclic Stop Ring

12-58. Removal – Cyclic Stop Ring

A. Remove the cyclic stick (para. 12-48).

B. Remove the hardware securing the stop ring to the cabin floor. Remove the stop ring.

12-59. Inspection – Cyclic Stop Ring

A. Inspect the stop ring for excessive wear, or damage to the Teflon insert. Replace if excessively worn or damaged.

12-60. Installation – Cyclic Stop Ring

A. Install the stop ring and the securing hardware.

B. Install the cyclic stick (para. 12-51).

C. Perform a limited maintenance test flight (para. 4-61).

12-61. Cyclic Vibration Absorber (Figure 12-15)

12-62. Removal – Cyclic Vibration Absorber

NOTE

The procedure to remove either the longitudinal or lateral vibration absorber is the same; however, the vibration absorbers are not interchangeable.

A. Open either engine access panel.

B. Disconnect the lanyard from the pylon.

C. Disconnect the push-pull rods from the vibration absorber assembly.

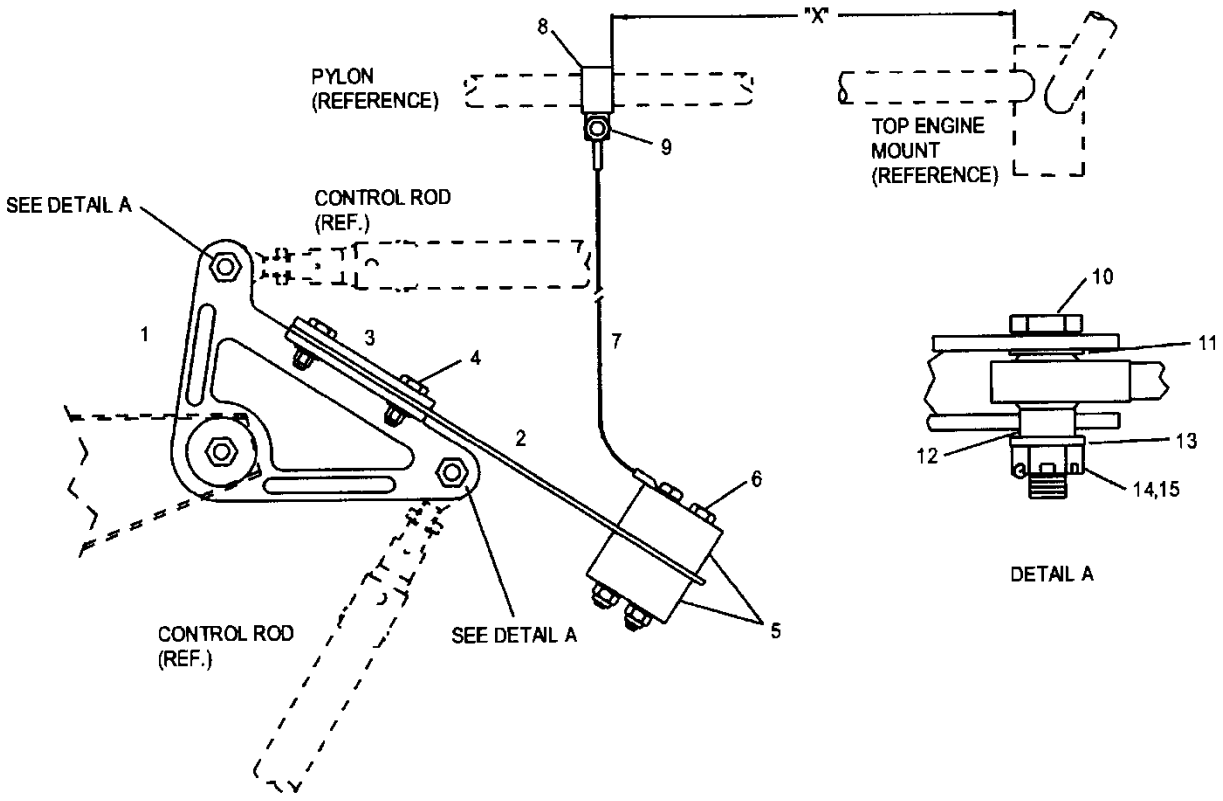
D. Remove the vibration absorber assembly mounting hardware and remove the vibration absorber assembly.

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DIMENSION "X"

17.25"-17.5"/43.8 cm - 44.5 cm LATERAL (LEFT SIDE)
20.5"-20.75"/52.1 cm - 52.7 cm LONGITUDINAL (RIGHT SIDE)



1.	Bellcrank	9.	Bolt Assembly
2.	Beam	10.	Bolt
3.	Plate	11.	Washer
4.	Bolt Assembly	12.	Bushing
5.	Weight	13.	Washer
6.	Bolt Assembly	14.	Nut
7.	Lanyard	15.	Cotter Pin
8.	Clamp		

Figure 12-15. Cyclic Vibration Absorber

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12-63. Disassembly – Cyclic Vibration Absorber

NOTE

The vibration absorber assemblies are “tuned” at the factory. Note which beam is installed on which bellcrank before removing the beam assembly from the bellcrank.

A. Remove the hardware securing the beam to the bellcrank and remove the beam.

12-64. Inspection – Cyclic Vibration Absorber

A. Inspect the bellcrank in accordance with paragraph 12-11.

B. Inspect the beam and weights for security of installation, corrosion, cracks, nicks, and/or scratches.

C. Inspect the lanyard for condition and security of installation.

12-65. Repair – Cyclic Vibration Absorber

A. Replace the beam assembly if the beam or weights are cracked, damage or corrosion on the beam exceeds .010 inch/.25 mm in depth, or damage or corrosion on the weights exceeds .050 inch/1.3 mm. Polish out damage or corrosion not exceeding the damage limits.

B. Replace the lanyard if damaged.

C. Replace the hardware as required.

12-66. Assembly – Cyclic Vibration Absorber

NOTE

Ensure that the beam assembly is installed on the bellcrank noted before disassembly.

A. Install the beam assembly and plate onto the bellcrank. Install the hardware. Torque the nuts (25 in-lb/2.8 Nm) and install slippage marks.

12-67. Installation – Cyclic Vibration Absorber

A. Install the vibration absorber assembly into the pylon mount and install the hardware. Torque (30-40 in-lb/3.4-4.5 Nm) the nut and install the cotter pin.

B. Connect the push-pull rods to the vibration absorber assembly. Torque (30-40 in-lb/3.4-4.5 Nm) the nuts and install the cotter pins.

C. Connect the lanyard to the pylon.

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12-68. Trim Actuator Assembly

12-69. Removal – Trim Actuator Assembly

NOTE

Maintenance procedures are the same for the longitudinal and the lateral trim actuators.

NOTE

Prior to removal, if a trim actuator assembly contain shims (Figure 12-17.1), the distance from the motor housing to the bottom of the spring capsule should be measured to assist the spring housing travel check (step N). The distance is measured with the motor fully extended. Record the measurement. Then, set the trim actuator assembly to a neutral position (mid-travel) and proceed with removal.

A. Open the left or right side engine access panel.

B. Disconnect the trim actuator from the electrical harness.

C. Disconnect the trim actuator from the longitudinal or lateral bellcrank.

D. Disconnect the trim actuator from the mounting bracket on the cabin bulkhead. Remove the trim actuator.

E. Remove the spacers from the trim actuator pivot points.

12-70. Disassembly – Trim Actuator Assembly (Figure 12-16)

A. Remove the hardware attaching the switch assembly to the trim actuator. Remove the switch assembly. Retain the shims installed under the switch assembly, if installed.

B. Rotate the spring capsule assembly to remove it from the acme shaft assembly.

C. Remove the hardware securing the motor to the gear housing. Remove the motor.

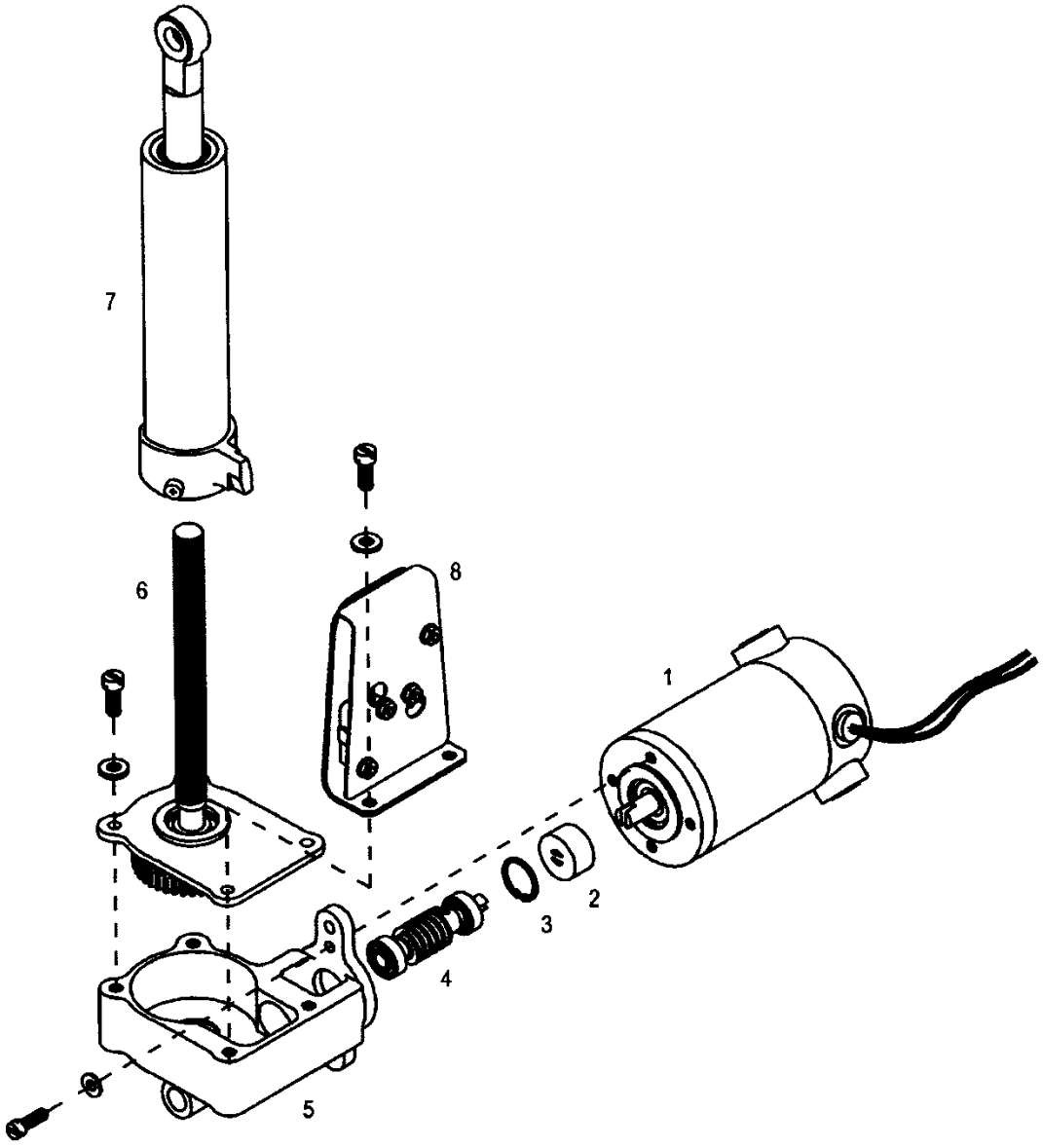
D. Remove the coupling and retaining ring from the end of the worm assembly in the gear housing.

E. Remove the remaining hardware from the acme shaft assembly. Tap the cover to one side and pull on the acme shaft to remove the acme shaft assembly.

F. Gently tap the gear housing against the work bench to remove the worm assembly.

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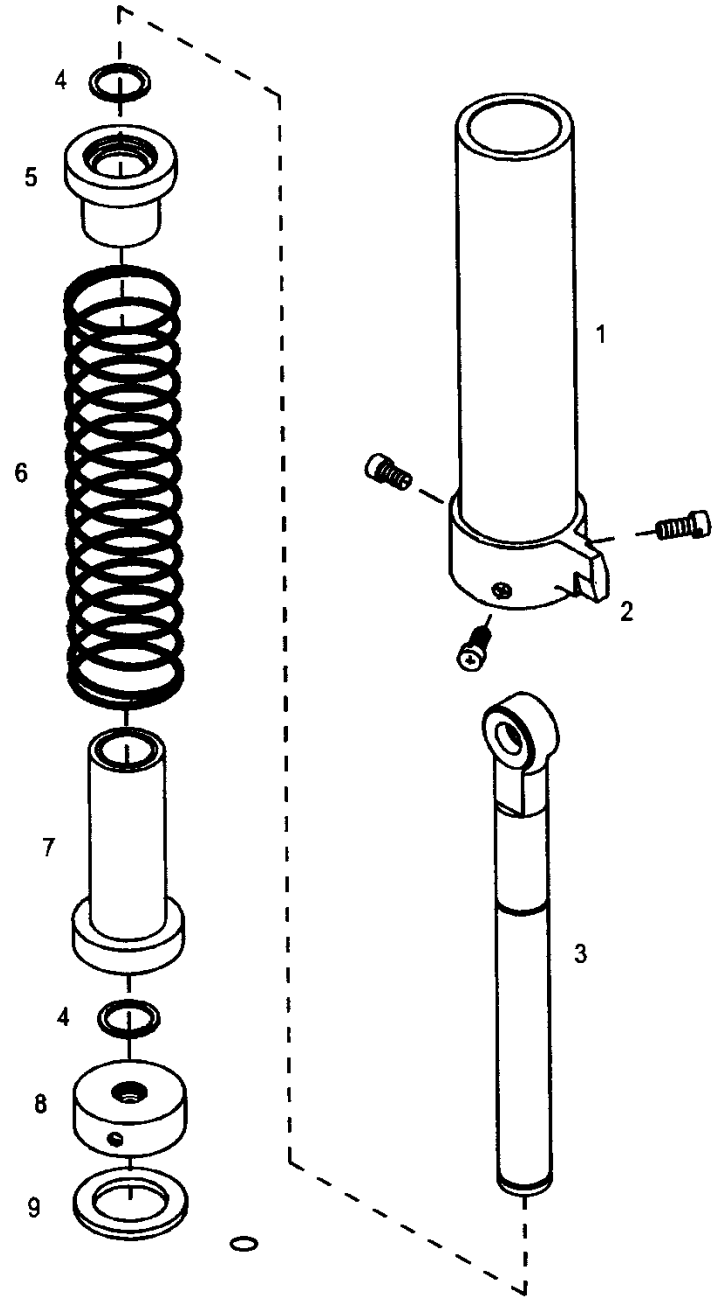


1.	Motor	5.	Gear Housing
2.	Coupling	6.	Acme Shaft Assembly
3.	Retaining Ring	7.	Spring Capsule Assembly
4.	Worm Assembly	8.	Switch Assembly

Figure 12-16. Trim Actuator Assembly

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1. Housing
2. Actuator
3. Shaft Assembly
4. Retaining Ring
5. Spring Retainer
6. Spring
7. Spring Retainer
8. Acme Nut
   (recess orientated toward the shaft)
9. Bumper

Figure 12-17. Spring Capsule Assembly

G. Disassemble the spring capsule assembly using the following procedure (Figure 12-17):

(1) Remove the three screws securing the actuator to the housing and the acme nut in the bottom of the spring capsule. Remove the acme nut.

(2) Remove the spring and shaft assembly from the housing.

(3) Place a rod that will fit into the spring and shaft assembly vertically in a vise.

(4) Place the spring and shaft assembly onto the rod in the vertical position.

(5) Push down on the spring retainer closest to the rod-end. Remove the retaining ring from the groove in the shaft and move it up to the rod-end.

(6) Remove the spring and shaft assembly from the rod. Turn the assembly over and remove the other retaining ring.

(7) Remove spring retainers and spring from the shaft.

(8) Remove the retaining ring from the shaft.

12-71. Inspection – Trim Actuator Assembly

A. Inspect the components of the actuator assembly for corrosion, cracks, nicks, scratches, and excessive wear.

B. Inspect the micro switches for proper operation.

C. Inspect the electrical wiring for fraying or broken wires or connectors.

12-72. Repair – Trim Actuator Assembly

A. Replace defective micro switches or damaged wiring.

B. Replace the acme nut in the spring capsule if excessively worn as follows:

(1) Remove the nut from the spring capsule assembly (para. 12-70).

(2) Bond a new bumper onto the replacement nut using adhesive ("Hot Stuff" HS-3 or equivalent).

(3) Install the replacement nut with the bumper facing away from the capsule.

C. Replace the acme shaft assembly, the worm assembly, and the motor as complete units if they require replacement.

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12-73. Assembly – Trim Actuator Assembly

A. Install the worm assembly into the gear housing until the aft bearing is aligned with the bearing seat in the housing. Do not install the bearing into the seat at this time.

B. Pack the outer walls of the gear housing and the worm with grease (MIL-PRF-81322).

C. Install the acme shaft assembly onto the gear housing with the cover turned to one side exposing the worm.

D. With the cover seated against the gear housing, push the worm assembly seating the bearings in place. Install the retaining ring.

E. Rotate the cover into position and install the two screws and washers in the cover holes located opposite the worm assembly.

F. Rotate the worm assembly with a screwdriver to check for binding in the gears.

NOTE

Install the coupling with the proper size opening matched with the worm assembly shaft and the motor shaft.

G. Install the coupling onto the slotted end of the worm assembly.

H. Align the slots in the motor with the coupling and install the motor onto the gear housing. Install the hardware and lockwire (.032”).

I. Assembly the spring capsule assembly using the following procedure:

(1) Install one of the retaining rings onto the shaft and position it against the rod-end.

NOTE

The shorter spring retainer is installed toward the rod-end.

(2) Install the spring retainers and spring onto the shaft.

(3) Position the spring retainers and spring against the rod-end. Install the retaining ring on the opposite end of the shaft. Ensure the retaining ring is positioned correctly in the ring groove in the shaft.

(4) Place a rod that will fit into the spring and shaft assembly vertically in a vise. Place the spring and shaft assembly onto the rod in the vertical position.

(5) Push down on the spring retainer closest to the rod-end. Install the retaining ring into the groove in the shaft. Ensure the retaining ring is positioned correctly in the ring groove in the shaft.

(6) Lubricate the spring and shaft assembly with grease (Lubriplate 630-AA or MIL-PRF-81322).

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(7) Install the spring and shaft assembly into the housing.

(8) Install the acme nut (recess orientated toward the shaft) with bumper facing away from the rod-end.

(9) Firmly grasp the gear housing, and pull the shaft assembly to check for looseness. If a click is felt and the retaining ring moves slightly, remove the acme nut and install 4166032 shims, as required, to occupy any gap between the spring housing and the acme nut. Reinstall the nut and check the shim effectiveness.

(10) Install the actuator on the housing so the actuator is flush with the bottom of the housing. Install the retaining screws and lockwire (.025").

J. Lubricate (Lubriplate 630-AA or MIL-PRF-81322) the threads of the acme shaft assembly. Turn the spring capsule assembly onto the shaft until the rubber bumper is approximately one inch from the cover.

K. Turn the actuator on the spring capsule so it will align with the slot in the switch assembly. Install the switch assembly and securing hardware and lockwire (.025).

L. Install shim(s), if required, switch assembly, secure hardware and lockwire (.025"), and install the electrical connectors.

NOTE

Set the trim actuator assembly on a portable table near the aircraft to electrically test the actuator.

N. Check the spring housing travel and adjust the switch positions to ensure that the retracted and extended spring housing travel are within the limits specified as noted below. An additional person is required to assist with cyclic operation.

(1) Install and connect the battery, if required.

(2) If no shims are installed:

a. The retracted travel (minimum stroke) limit is 0.125" +0.05"/-0.00".

b. The extended travel (maximum stroke) limit is 1.95" +0.00"/-0.05".

(3) If a shim is installed (Figure 12-17.1):

a. The retracted travel (minimum stroke) limit 'Min' is the difference between this dimension and 1.825" +0.05"/-0.00"

b. The extended travel (maximum stroke) limit is the 'Max' dimension measured in paragraph 12-69 (+0.00"/-0.05").

CAUTION

To prevent damage to the switch assembly, immediately stop applying trim to the cyclic if the actuator will run out beyond the length allowed by the bracket slot.

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(3) To adjust the spring housing travel, loosen the switch mounting hardware to set the switch position(s) as necessary to bring the spring housing travel within limits. For example, to shorten the spring housing extension, loosen the switch mounting hardware for the extending switch and adjust the switch position inward (Figure 12-17.2).

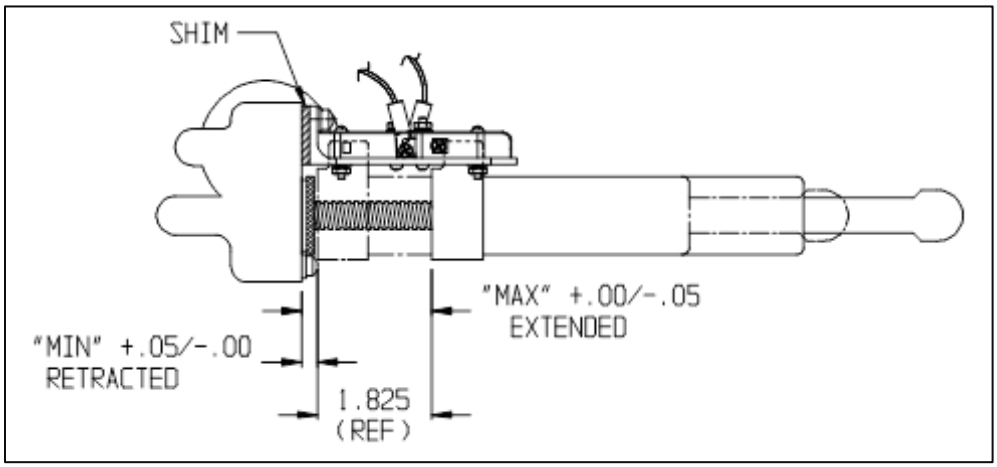


Figure 12-17.1. Trim Actuator Limits with Shim(s) Installed

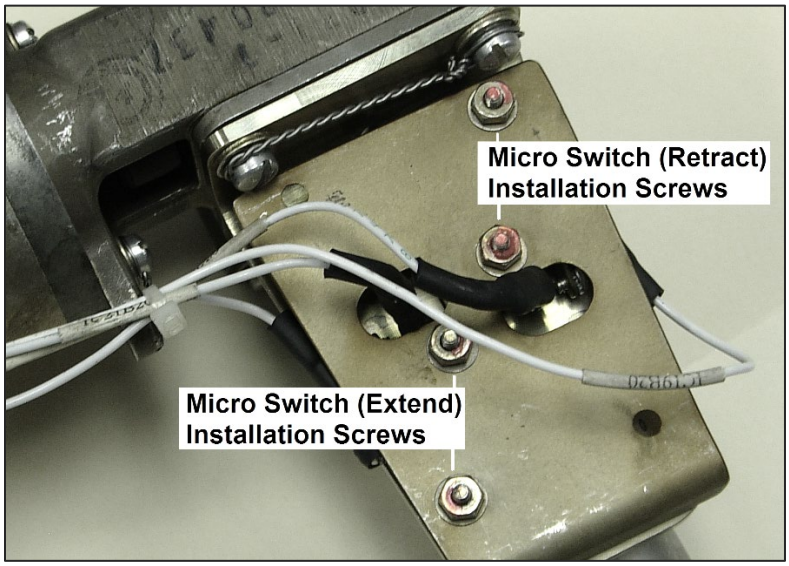


Figure 12-17.2. Switch Plate Assembly Micro Switch Screws
(trim actuator assembly removed for clarity)

NOTE

If is not possible to achieve the limits after adjusting the switch positions, either the bracket slot or the switch screw slots may be filed to achieve the travel limits. The maximum amount that the bracket slot may be filed is 0.040".

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(4) Check the spring housing travel to verify that proper adjustment was made.

(5) When the switch adjustments are complete, apply VC-3 Vibra-Tite to the exposed screw threads and nut face.

(6) Disconnect and remove the battery, as required.

12-74. Installation – Trim Actuator Assembly

A. Install the spacers in the trim actuator assembly pivot points.

B. Install the trim actuator assembly in the mount bracket on the cabin back wall. Install the hardware, torque and cotter pin.

C. Attach the trim actuator assembly to the longitudinal or lateral bellcrank, torque and cotter pin.

D. Connect the trim actuator assembly to the electrical harness.

E. Install the battery and apply power.

F. Check for clearance between the spring housing and the cyclic bellcrank.

(1) Extend the actuator to full travel (trim full forward or full left) and move the cyclic full aft/right. Verify clearance.

(2) If there is contact, remove the shims between the switch assembly and the actuator. Install the switch assembly and re-safety.

(3) Repeat step (1) and step (2), as required.

(4) If the spring housing contacts the bellcrank, and there are no shims, check the travel in accordance with preceding step N.

(5) If the travel is correct and the spring housing contacts the bellcrank, contact Enstrom Product Support.

G. Close the left or right side engine access panel.

12-75. Lower Swashplate Assembly

12-76. Removal – Lower Swashplate Assembly (Figure 12-18)

A. Open the left and right side engine access panels.

B. Remove the longitudinal and lateral push-pull tubes from between the uni-ball assembly and the longitudinal and lateral bellcranks in the engine compartment.

C. Disconnect the three rod-ends (doglegs)from the lower swashplate.

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D. Remove the hardware securing the lower swashplate to the upper swashplate.

E. Remove the lower swashplate by pulling down on the uni-ball bearing housing.

12-77. Disassembly – Lower Swashplate Assembly

A. Install tool T-0016 in the end of the tie rod (19). Place a wrench on the tool T-0016 to prevent the tie rod from rotating and remove the cotter pin (10), nut (11), washer (12), DU washer (13), and shims (14) from the tie rod.

B. Tap the tie rod out of the bushings (15) using an aluminum drift. Separate the lower universal housing (7) from the upper universal housing (18). Remove the spacers (20) from inside the bushings (15) in the housing.

C. Remove the shims (14) and the DU washer (13) from the tie rod.

D. Temporarily install the tie rod in the universal shaft (17) to prevent it from rotating and remove the cotter pins, nuts, spacers, DU washers, and shims from both ends of the shaft (17).

E. Tap the end of the shaft with an aluminum drift to remove the shaft and sleeve (16) from the lower universal housing.

F. Tap the opposite sleeve to remove it from the lower universal housing.

G. Tap the sleeves from the upper universal housing using an aluminum drift.

H. Hold the uni-ball shaft (1) with a wrench and remove the cotter pin, nut, and washer. Separate the uni-ball assembly (4) from the lower universal housing.

I. Remove the spacer (5) from the uni-ball shaft.

J. Remove the shaft from the uni-ball assembly.

K. Rotate the uni-ball until it is aligned with the recesses in the bearing outer race and remove the uni-ball.

L. Remove the retaining ring (2) from the uni-ball.

WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

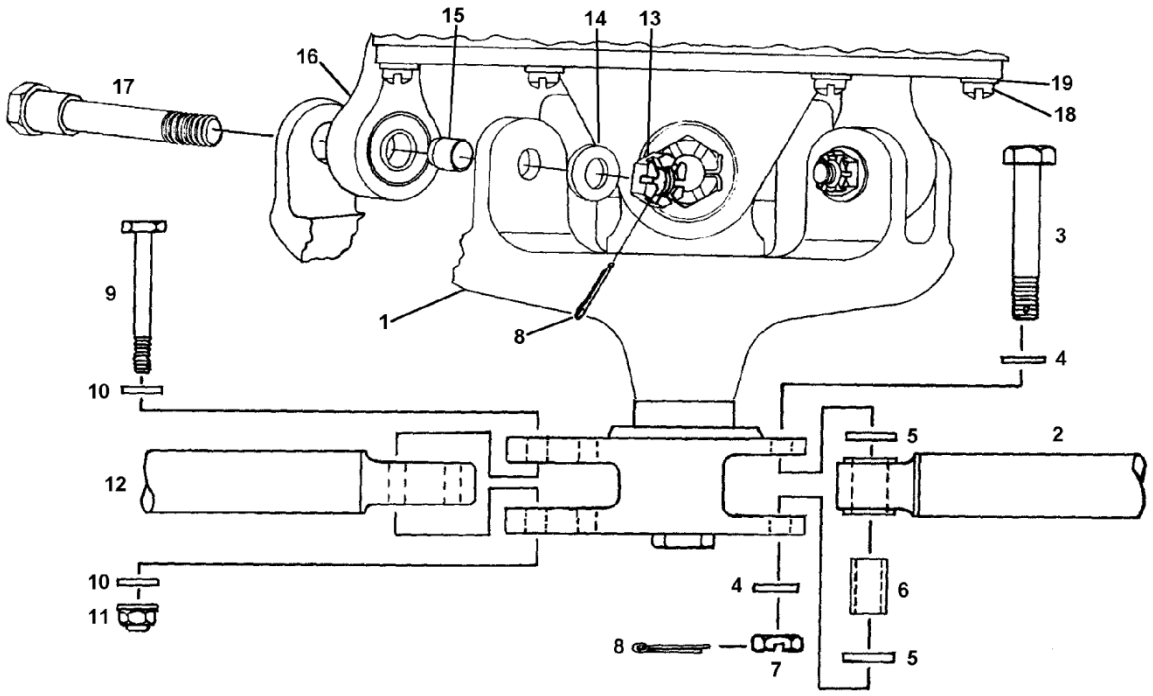
WARNING

Use protective gloves when handling heated parts.

M. Heat the uni-ball to approximately 250°F/121°C. and remove the bearing (3) from the uni-ball.

N. Press the DU bushings (15) from the sleeves (16).

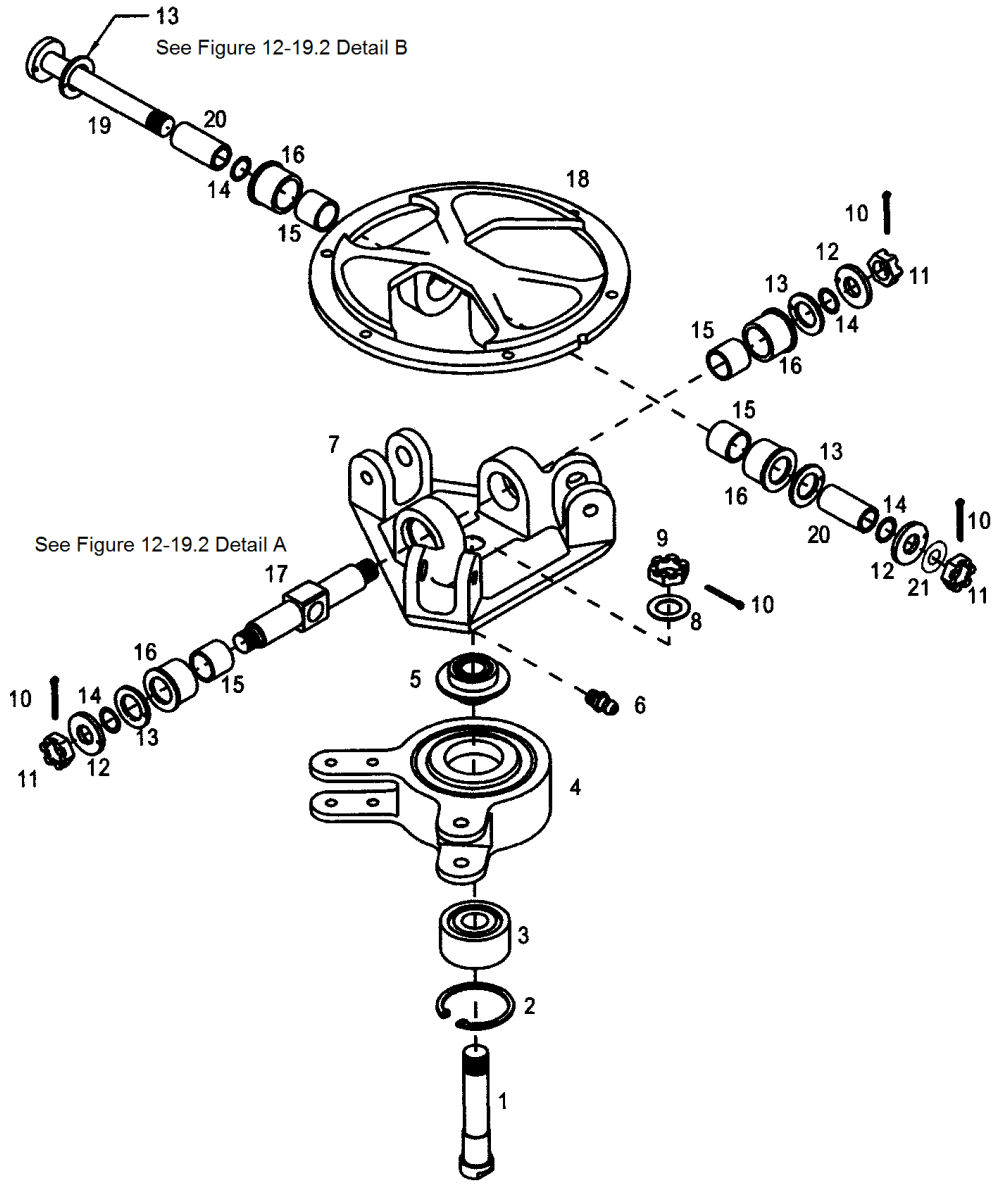
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1. Lower Swashplate Assy.
2. Lateral Push-Pull Rod
3. Bolt
4. Washer
5. 1/4 Harper Washer
6. Spacer
7. Nut
8. Cotter Pin
9. Bolt
10. Washer
11. Nut
12. Longitudinal Push-Pull Rod
13. Nut (P/N AN320-4)
14. Washer
15. Spacer
16. Rod End (Dog Leg)
17. Bolt
18. Screw
19. Washer

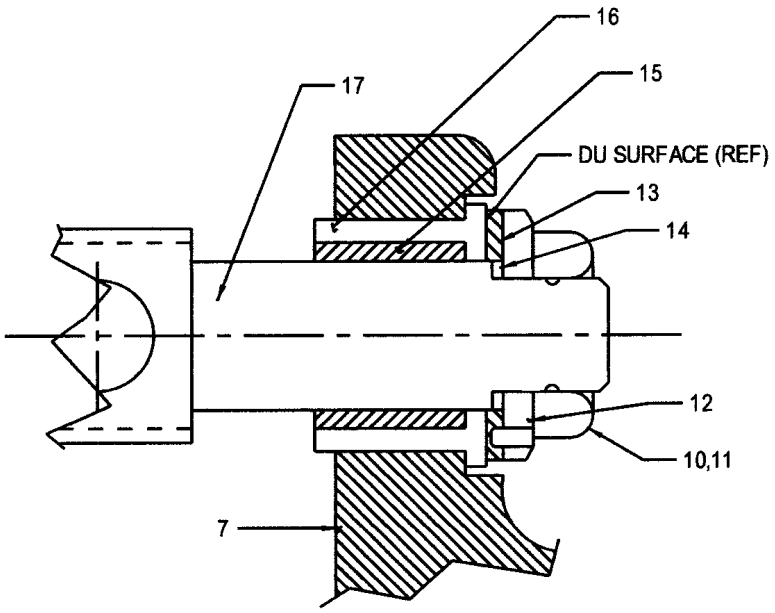
Figure 12-18. Lower Swashplate Installation

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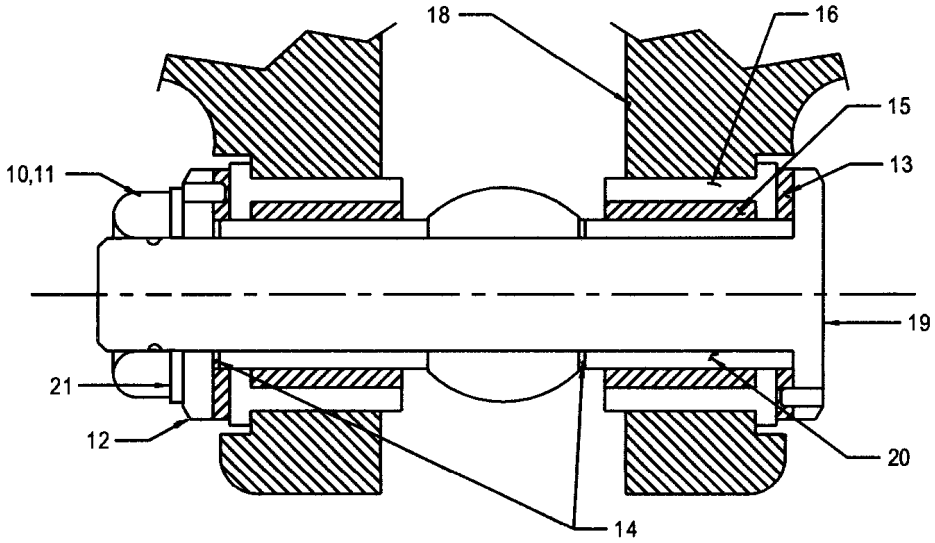
1.	Bolt	12.	Washer
2.	Retaining Ring	13.	DU Washer
3.	Bearing	14.	Shim
4.	Bearing Housing Assembly	15.	DU Bushing
5.	Spacer	16.	Sleeve
6.	Lube Fitting	17.	Universal Shaft
7.	Lower Housing	18.	Upper Housing
8.	Washer	19.	Tie Rod Assembly
9.	Nut	20.	Spacer
10.	Cotter Pin	21.	Light Washer
11.	Nut		

Figure 12-19.1. Lower Swashplate Assembly



DETAIL A

UNIVERSAL SHAFT TO LOWER HOUSING
(TYPICAL BOTH ENDS)



DETAIL B

TIE ROD TO UPPER HOUSING

Figure 12-19.2. Lower Swashplate Installation

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12-78. Inspection – Lower Swashplate Assembly

A. Use the following procedure to inspect the lower swashplate assembly during periodic inspections (100 Hour/Annual):

(1) Remove both side panel cowls.

(2) Disconnect the pitch change bellcranks located on the main rotor hub from the main rotor push-pull rods located in the mast and from the pivot brackets.

(3) With the aid of an assistant, remove the collective friction and move the collective up and down throughout the range and wiggle the cyclic stick (movement of the collective and cyclic stick does not have to occur simultaneously). Observe and ***carefully*** feel the lower swashplate assembly for any looseness (e.g. vertical play at the universal joint or end play along the universal shaft and tie rod axes). Any looseness is most noticeable with a collective control reversal and/or reversal of the cyclic controls. NOTE: Vertical looseness may also be evident at the collective stick as a sudden change in stick force or may exhibit itself as a clinking sound. Using a 9/16 inch crows foot and torque wrench set to 60 in-lb/6.8 Nm, check that the torque required to rotate the tie rod assembly at the nut on the end of the tie rod assembly is more than 60 in-lb/6.8 Nm. Do not remove the cotter pin from the nut during the check and stop the torque check if 60 in-lb/6.8 Nm is reached without the tie rod assembly rotating. Any rotation of the tie rod with less than 60 in-lb/6.8 Nm of torque is unacceptable.

(4) If neither looseness nor loss of torque is evident, reconnect the pitch change bellcranks and return the aircraft to service.

(5) If any looseness or loss of torque is found, remove the lower swashplate assembly from the aircraft and perform the following additional inspections:

a. Inspect the universal joint for looseness/play by twisting and pushing and pulling the upper and lower housings of the lower swashplate against each other.

b. Inspect the tie rod and universal shaft axis for end play by attempting to move the upper and lower housings against each other along the tie rod and universal shaft axes.

c. Check the pre-load of the tie rod and universal shaft axis. The pre-load should be between 0.5 and 2.0 pounds (.23 and .91 kg) using a spring scale, with no noticeable end play.

(6) Disassemble the lower swashplate assembly and inspect the detail parts in accordance with Table 12-2.

NOTE

Contact Enstrom Product Support to procure an overhauled lower swashplate assembly.

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(7) Replace unserviceable parts as required and reassemble the lower swashplate in accordance with paragraph 12-79.

(8) Reinstall the lower swashplate assembly and reconnect the pitch change bellcranks.

B. See Table 12-2 for the detailed inspection requirements for the lower swashplate assembly.

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Table 12-2. Lower Swashplate Assembly

			Inspection Requirements*			
P/N	Fig. 12-19 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
4140531-13	1	Bolt	Bearing surface Dia. .4723 to .4726	-.0002	Not Repairable	Replace Shaft
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Shaft
ECD009-11	3	Bearing	O.D. 1.2595 to 1.2598	No Tolerance Allowed	Not Repairable	Replace Bearing
			I.D. .4722 to .4724	No Tolerance Allowed	Not Repairable	Replace Bearing
			Ratcheting or roughness	None Allowed	Not Repairable	Replace Bearing
4140526-3, -7	4	Bearing Assembly	Bolt holes in pivot ears for elongation	None Allowed	Not Repairable	Replace Housing
			Surface nicks or scratches	None Allowed	≤ .010 deep	Blend and polish out smooth
			Security of the uni-ball race in the housing	No Movement Allowed	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
			Uni-ball race for scoring or scratches	None Allowed	≤ .002 deep	Polish out smooth

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Table 12-2. Lower Swashplate Assembly

			Inspection Requirements*			
P/N	Fig. 12-19 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
4140526-3, -7	4	(Cont'd) (Uni-ball Bearing)	Bearing bore Dia. 1.2598	+.0006 -.0000	Not Repairable	Replace Uni-ball
			Surface scoring or scratches	None Allowed	≤ .002 deep	Polish out smooth
4140534-11	5	Spacer	Nicks or galling on the I.D.	None Allowed	≤ .003 deep	Polish out smooth
4140535-11,-13 28-16119-3, -5	7	Housing	Bushing bores Dia. .7500 to .7505 (-11,-13,-3) .7495 to .7500 (-5)	+.0005	Not Repairable	Replace Housing
			Center bolt bore Dia. .4375 (-11,-13) .4370 to .4380 (-3, -5) (no galling allowed in this bore)	+.0005	Not Repairable	Replace Housing
			Large bolt bore Dia. in the pivot ears .375 to .376	+.0005	Not Repairable	Replace Housing
			Small bolt bore Dia. in the pivot ears .250 to .251	+.0005	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
28-16227-3	12	Washer	Nicks and gouges	None Allowed	Not Repairable	Replace Spacer

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Table 12-2. Lower Swashplate Assembly

P/N	Fig. 12-19 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-16263-5	13	DU Washer	Thickness .0585 to .0605	-.008	Not Repairable	Replace washer
08GDU08	15	DU Bushing	**I.D. .4992 to .5019	+.0025	Not Repairable	Replace bushing
28-16226-5	16	Sleeve	O.D. .7503 to .7508	-.0003	Not Repairable	Replace Sleeve
			I.D. .5937 to .5941	+.0002	Not Repairable	Replace Sleeve
28-16223-19	17	Universal Shaft	O.D. .4991 to .4995	-.0003	Not Repairable	Replace Shaft
			Tie Rod Bore .3750 to .3752	+.0005	Not Repairable	Replace Shaft
			Concentricity	.0015 FIM	Not Repairable	Replace Shaft
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Shaft
28-16116-1, -11	18	Housing	Bushing bores Dia. .7500 to .7505	+.0005	Not Repairable	Replace Housing
			Cracks	None Allowed	Not Repairable	Replace Housing
28-16224-5	19	Tie Rod Assembly	O.D. .3748 to .3750	-.0005	Not Repairable	Replace Tie Rod
			Concentricity	.002 FIM	Not Repairable	Replace Tie Rod
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Tie Rod

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Table 12-2. Lower Swashplate Assembly

			Inspection Requirements*			
P/N	Fig. 12-19 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-16225-19	20	Spacer	O.D. .4991 to .4995	-.0003	Not Repairable	Replace Spacer
			†Length 1.037 to 1.036	-.001	Not Repairable	Replace Spacer

* All dimensions are in inches.

** Inspect DU Bushing I.D. with the bushing installed in the sleeve, P/N 28-16226-5.

† Measure length at several locations to check for uneven wear.

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12-79. Assembly – Lower Swashplate Assembly (Figure 12-19.1, Figure 12-19.2)

WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

NOTE

Install the uni-ball bearing into the housing with the loading grooves in the bearing race face down.

A. Heat the uni-ball housing to approximately 250°F/121°C.

B. Apply adhesive (Loctite #277) to the outer race of the bearing (3) and install the bearing (3) into the uni-ball housing (4). Install the retaining ring (2). Allow the uni-ball housing assembly to cool.

NOTE

Install the uni-ball housing assembly onto the lower swashplate assembly with the retaining ring away from the swashplate.

NOTE

Install the shaft with the head on the same side as the retaining ring.

C. Support the inner race of the bearing and press the shaft (1) into the bearing.

D. Install the spacer (5) onto the shaft.

E. Lubricate (MIL-PRF-81322) the shaft and install into the lower universal housing (7). Install the washer and nut. Torque the nut and install a cotter pin.

F. Install the DU bushings (15) into the sleeves (16).

G. Check the fit of the universal shaft (17) and the tie rod (19) in the bushings. The universal shaft and tie rod should move freely in the bushings. If required, use an expandable reamer and lightly ream the bushings so that the shaft and tie rod move freely in the bushings. Do not ream the bushings so they have free play (loose fit).

NOTE

The lower universal housing may be heated with a heat gun to allow easier installation of the sleeves. Do not exceed 250°F/121°C. Allow the parts to cool before shimming.

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WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

H. Lubricate (MIL-PRF-81322) the O.D. of two of the sleeves and the bores of the ears on the lower universal housing (7).

I. Install one of the sleeves into the lower universal housing using tool T-0100-1.

CAUTION

Ensure that the correct Universal Shaft, P/N 28-16223-19, is used when assembling the lower swashplate assembly (The length of the bushing surface is 1.289" ± .001"/32.74 mm ± .03 mm). Failure to install the correct universal shaft can result in premature wear of the tie rod and universal shaft.

J. Install the universal shaft into the lower universal housing though the ear without the sleeve and then install a sleeve into the lower universal housing using T-0100-1. The shaft should rotate freely in the bushings.

K. Shim the universal shaft using the following procedure:

(1) Using a felt tip marker, place a mark on one of the ears on the lower universal housing and install a .020"/.5 mm shim (14) on the end of the universal shaft. The mark indicates a .020"/.5 mm shim is installed.

(2) Install a DU washer (13) on the shaft with the Teflon (grey) side of the washer against the sleeve.

(3) Install a washer (12) on the shaft with the pin towards the DU washer.

(4) Install the tie rod into the universal shaft to prevent the shaft from rotating and install a nut (11). Ensure the DU washer is properly seated on the retention pin on the washer. Torque the nut to 110-150 in-lbs/12.5-17.0 Nm and check that the cotter pin hole is aligned. This may require installing different nuts until the proper torque and cotter pin hole alignment is achieved. Do not back the nut off for cotter pin alignment.

(5) Install a .020"/.5 mm shim, DU washer, washer, and nut on the opposite end of the universal shaft. Ensure the DU washer is properly seated on the retention pin on the washer. Torque the nut to 110-150 in-lbs/12.5-17.0 Nm and check that the cotter pin hole is aligned. This may require installing different nuts until the proper torque and cotter pin hole alignment is achieved.

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(6) Tap each end of the universal shaft with an aluminum drift and hammer to seat the stack up.

(7) Insert the tie rod or an appropriate size bolt in the tie rod bore of the universal shaft and check the preload with a spring scale at a 3 inch/7.5 cm arm. The preload should be 1.5-2. pounds/.68-.91kg. If too loose, fewer shims are required. If too tight, more shims are required. Ideal shimming of the assembly is to have equal amounts of shims on each end of the universal shaft; however, a .005"/.13 mm maximum difference in shims is allowed from end to end to obtain proper preload.

NOTE

The upper universal housing may be heated with a heat gun to allow easier installation of the sleeves. Do not exceed 250°F/121°C. Allow the parts to cool before shimming.

WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

L. Lubricate (MIL-PRF-81322) the O.D. of the two remaining sleeves and the bores of the ears on the upper universal housing (18). Using tool T-0100-1, install the sleeves into the upper universal housing.

CAUTION

Ensure that the spacers used on the tie rod are the correct length (Refer to Table 12-2). Failure to install the correct length spacers can result in premature wear of the tie rod and universal shaft.

M. Install a DU washer onto the tie rod. Ensure the Teflon (grey) surface is facing inboard and the DU washer is properly seated on the retention pin. Install a spacer (20) and then a .020"/.5 mm shim onto the tie rod.

N. Place the upper universal housing over the lower universal housing and align the proper openings.

O. Insert the tie rod through the sleeve in the upper housing that is in line with the dog leg ears of the lower housing, the universal shaft, and the opposite sleeve in the upper housing.

CAUTION

Ensure that the spacers used on the tie rod are the correct length (Refer to Table 12-2). Failure to install the correct length spacers can result in premature wear of the tie rod and universal shaft.

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P. Install the remaining spacer onto the tie rod.

Q. Install a .020"/.5 mm shim, DU washer, washer, and nut on the tie rod. Ensure the DU washer is properly seated on the retention pin on the washer. Using tool T-0016 to secure the tie rod, torque the nut to 110-150 in-lbs/12.5-17.0 Nm and check that the cotter pin hole is aligned. This may require installing different nuts until the proper torque and cotter pin hole alignment is achieved.

R. Tap each end of the tie rod with an aluminum drift and hammer to seat the stack up.

S. Install the lower swashplate assembly on tool, T-0134 (Plate Assembly), a spare bell housing, P/N 28-16112-1, clamped in a vise, or on the upper swashplate assembly.

T. Insert a bolt though one of the ears on the cyclic bearing housing and check the preload of the tie rod axis. The preload on the tie rod axis should be the same as the universal shaft preload ± .25 pounds/.11 kg. If too loose, fewer shims are required. If too tight, more shims are required. Ideal shimming of the assembly is to have equal amounts of shims on each end of the tie rod; however, a .005"/.13 mm maximum difference in shims is allowed from end to end to obtain proper preload.

U. Install the cotter pins when the preload is set.

12-80. Installation – Lower Swashplate Assembly (Figure 12-18)

A. Install the lower swashplate assembly with the attachment ears aligned with the rod ends (doglegs) in the upper swashplate assembly.

B. Secure the swashplate in place with washers and screws. Torque the screws and lockwire (.032) in pairs.

C. Clean/Degrease the threads on the three bolts, P/N 28-16129-2, using a suitable cleaner (contact cleaner, brake cleaner, etc.. procured from local source).

D. Connect the main rotor control rods to the lower swashplate assembly using the bolts and spacers. Ensure the bevel on the spacer is towards the rod end bearing.

E. Install the washers and nuts, P/N AN320-4, onto the bolts. Torque the nuts to 40-60 in-lbs/4.5-6.8 Nm and install the cotter pins. Liberally apply a coating of Vibra-Tite® VC-3 onto the nut and cotter pin installations.

NOTE

Replace the nut, washer, spacer, and/or bolt as required if the cotter pin hole will not line up at the 40-60 in-lbs/4.5-6.8 Nm torque application.

F. Install the longitudinal and lateral push-pull rods.

G. Close the left and right side engine access panels.

H. Perform a limited maintenance test flight (para. 4-61).

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12-81. Upper Swashplate Assembly

12-82. Removal – Upper Swashplate Assembly (Figure 12-20)

A. Open the left and right side engine access panels.

B. Remove the lower swashplate assembly (para. 12-76).

C. Remove the collective walking beam (para. 12-40).

D. Remove the main rotor push-pull rods (para. 12-86.2).

E. Remove the hardware securing the upper swashplate assembly to the lower end of the mast. Slide the bell of the upper swashplate up and down to tap the swashplate from the lower end of the mast.

12-83. Disassembly – Upper Swashplate Assembly

A. Install blocks (T-1758) on each side of the control housing (13) and clamp the blocks in a vise with the nuts (1) facing up for removal.

B. Bend the lock plate (2) back to a flat position and remove the nuts using special socket (T-0086). Remove the locking tab.

C. Place the swashplate assembly in an arbor press using blocks (T-1758) for support and with the bell housing (3) up.

D. Position three plug tools (T-0102-1) in the threaded end of the guide tube assembly (15) and press the swashplate assembly apart.

E. If the DU bearings (12) are worn, press them from the control housing (13).

F. Press the spacer (11) from the bearing housing assembly and remove the rain slinger (10).

G. Remove the hardware securing the bearing retainer (4) to the bearing housing. Remove the bearing retainer, and shims (6) from the bearing housing.

WARNING

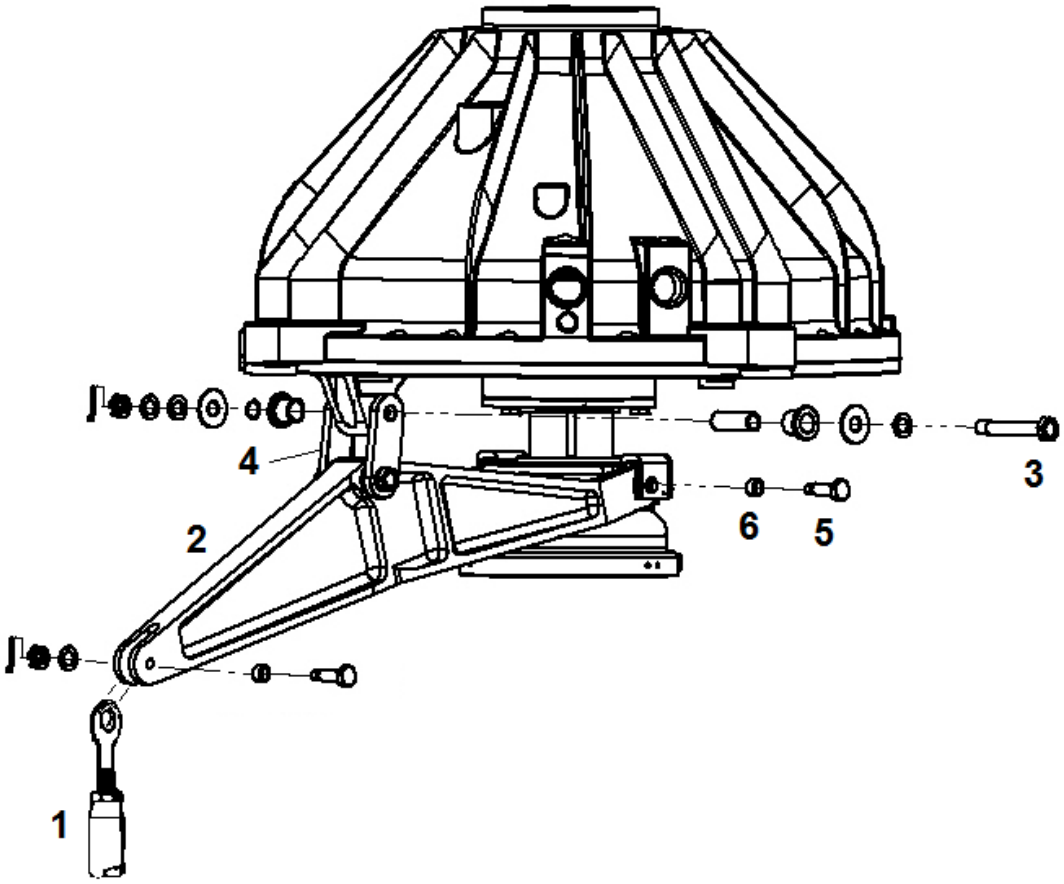
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WARNING

Use protective gloves when handling heated parts.

H. Heat the bearing housing to approximately 250°F/121°C. Press the bearing (7) from the housing.

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NOTE

Bearing housing P/N 28-16108-11 requires P/N 28-16109-13 bushings (6) and P/N 28-16109-11 bolts (5); bearing housing P/N 28-16108-2 requires P/N 28-16109-1 bolts (5).

1. Collective Push-Pull Rod
2. Collective Walking Beam
3. Bolt
4. Pivot Straps
5. Bolt
6. Bushing (if required)

Figure 12-20. Upper Swashplate Installation

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12-84. Inspection – Upper Swashplate Assembly

A. See Table 12-3 for the detailed inspection requirements for the upper swashplate assembly.

12-85. Assembly – Upper Swashplate Assembly (Figure 12-21)

NOTE

If installing a new bearing, remove the seal from one side of the bearing.

WARNING

Use extreme caution when removing or installing heated parts and assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

A. Heat the bearing housing (8) to approximately 250°F/121°C.

B. Lubricate (MIL-PRF-81322) the O.D. of the bearing and the I.D. of the housing. Install the bearing (7) with the open side of the bearing against the closed side of the housing. The bearing must be seated against the inboard flange of the housing. Allow the assembly to cool.

C. Calculate the thickness of the shims (6) required to preload the bearing in the housing using the following procedures:

(1) Use a depth micrometer to measure the distance from the face of the bearing to the face of the housing.

(2) Subtract .003 inch/.08 mm from the measurement in step (a) to equal the required amount of shims.

D. Place the shims on the face of the housing.

E. Install the bearing retainer (5) and secure with screws. Torque the screws in an alternating sequence and lockwire (.025) in pairs.

F. Install tool (T-1709) on the inner race on the sealed side of the bearing. Place the slinger (10) on the open side of the bearing and press the spacer (11) into the inner race of the bearing.

G. Clean the guide tube bores of the control housing (13) and the O.D. of the DU bushings (12) with Loctite Primer.

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Table 12-3. Upper Swashplate Assembly

			Inspection Requirements*			
P/N	Fig. 12-21 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-16113-1	1	Nut	Threads (crossed or missing)	None Allowed	Not Repairable	Replace Nut
			Hex corners for rounding or deformation	None Allowed	Not Repairable	Replace Nut
28-16126-1	2	Lock Plate				Replace on re-assembly
28-16112-15, -17	3	Housing	Guide tube bore Dia. .9062 to .9069	+.0003	Not Repairable	Replace Housing
			Nicks and gouges	.005 deep	≤ .025 deep	Blend and polish out smooth
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Housing
28-16043-19	5	Bearing Retainer	Nicks and scratches	.005 deep	≤ .010 deep	Blend and polish out smooth
ECD013-11	7	Bearing	O.D. 3.9370	-0.0004	Not Repairable	Replace Bearing
			I.D. 2.5591	+.0000 -.0004	Not Repairable	Replace Bearing
			Condition of balls and cage after cleaning	No pits or flat spits allowed	Not Repairable	Replace Bearing

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Table 12-3. Upper Swashplate Assembly

			Inspection Requirements*			
P/N	Fig. 12-21 Item #	Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-16108-2, -11	8	Bearing Housing	Bearing bore Dia. 3.9365 to 3.9371	No Tolerance Allowed	Not Repairable	Replace Housing
			Pivot bolt holes for galling or wear	None Allowed	Not Repairable	Replace Housing
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Housing
28-16386-1	10	Rain Slinger	Check for deformation	None Allowed	Not Repairable	Replace Slinger
28-16106-2	11	Spacer	Guide tube holes for galling	None Allowed	Not Repairable	Replace Spacer
16-DU-12	12	Bushing	O.D. 1.125	+.0000 -.0005	Not Repairable	Replace Bushing
			I.D. 1.000	+.0005 -.0000	Not Repairable	Replace Bushing
4140530-11	13	Control Housing	Bushing bore Dia. 1.1250 to 1.1256	+.0004	Not Repairable	Replace Housing
			O.D. 2.6465 to 2.6470	-.0003	Not Repairable	Replace Housing
			O.D. for galling	.001 deep	≤ .005 deep	Polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Housing

Table 12-3. Upper Swashplate Assembly

P/N	Fig. 12-21 Item #	Part Name	Inspection Requirements* Inspection	Serviceable Limits	Repair Limits	Repair or Action
28-16260-1	15	Guide Tube Assembly	Sheared or worn rivets	None Allowed	If rivet is sheared with no other damage to the assembly	Replace Rivet
			Threads (crossed or missing)	None Allowed	Not Repairable	Replace Guide Shaft in the retainer
			Looseness of guide shaft in the retainer	No movement allowed	Not Repairable	Replace Assembly
			Guide shafts for galling	.001 deep	≤ .005 deep and ≤ 1.0" long	Blend and polish out smooth
			Cracks	None Allowed	Not Repairable	Replace Assembly

* All dimensions are in inches.

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H. Apply adhesive (Loctite #277) to the O.D. of the DU bushings and press the bushings into the bearing housing until they are flush with the face of the control housing. Rotate the assembly and repeat the installation on the opposite end.

I. Install the control housing on the guide tube assembly (15) with the large flange of the housing facing toward the threaded end of the guide tubes.

J. Place the guide tube assembly in an arbor press with the threaded end of the guide tubes up.

K. Lubricate (MIL-PRF-81322) the guide tubes and the I.D. of the holes in the spacer installed in the bearing housing assembly. Press the housing assembly onto the guide tubes with the slinger facing the bearing housing on the guide tube assembly.

L. Lubricate the I.D. of the holes in the bell housing (3) and press the housing onto the guide tubes. Ensure the bell housing is seated into the bearing.

M. Slide the bearing housing up and down on the guide tubes. If the housing is excessively tight or binding, mark the positions of the bell housing, spacer, and the bearing housing on the guide tubes. Press the assembly apart, rotate the above items 120˚ on the guide tubes and reassemble the components. Re-check to be sure the bearing housing slides with no interference.

N. Clean the threads of the guide tubes and the nuts (1) with Loctite Primer.

O. Install the aluminum blocks T-1758 on the control housing (13) and clamp in a vise with the bell housing up.

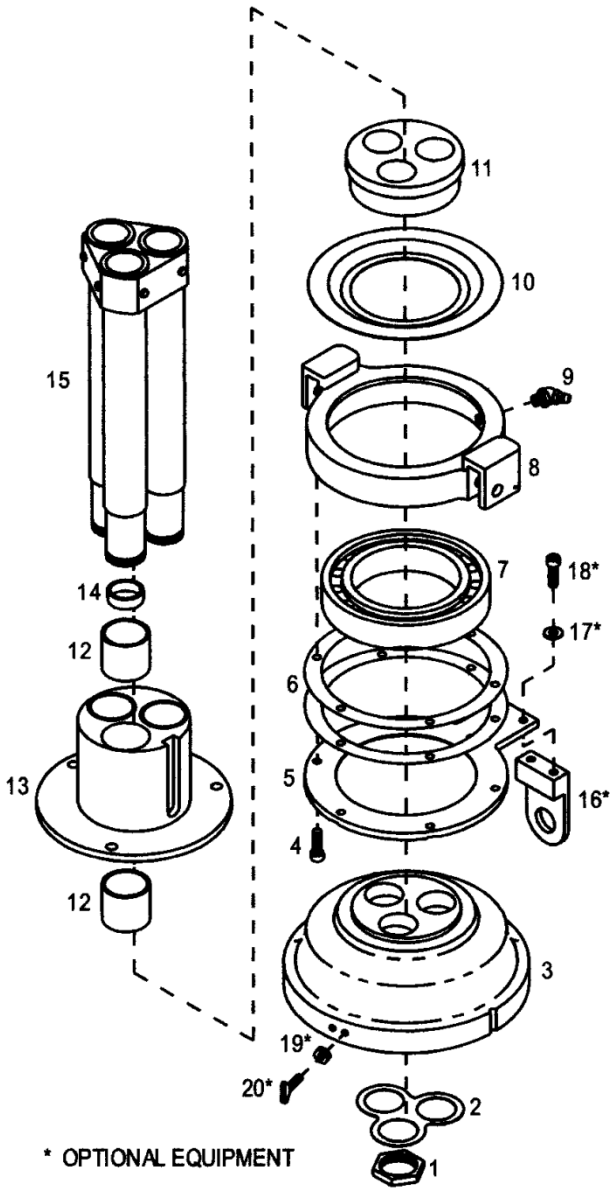
P. Install the lock plate (2) on the guide tubes.

Q. Apply Loctite 277 to the threads of the nuts and install the nuts onto the guide tubes. Torque the nuts to 240 in-lb/27.1 Nm using special socket T-0086.

R. Bend the lock plate against two flats of each nut.

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1.	Nut	11.	Spacer
2.	Lock Plate	12.	Bushing
3.	Bell Housing	13.	Control Housing
4.	Screw	14.	Bushing
5.	Bearing Retainer	15.	Guide Tube Assembly
6.	Shims	16.	Magnetic Pickup Bracket
7.	Bearing	17.	Washer
8.	Bearing Housing	18.	Screw
9.	Lube Fitting	19.	Nut
10.	Slinger	20.	Interrupter

Figure 12-21. Upper Swashplate Assembly

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12-86. Installation – Upper Swashplate Assembly (Figure 12-20)

A. Lubricate (MIL-PRF-81322) the bore of the main rotor mast at the lower end.

B. Align the slot in the control housing with the locking pin in the lower end of the mast. Install the upper swashplate into the mast. Gently tap the swashplate into position by sliding the swashplate assembly up and down on the guide tubes.

C. Install the hardware securing the swashplate. Torque the bolts and lockwire (.025).

NOTE

Rotate the upper collective bearing assembly with the swashplate in the full up position and ensure the lockwire does not interfere with the collective bearing housing.

D. Install the collective walking beam (para. 12-42).

E. Install the main rotor push-pull rods (para. 12-86.4).

F. Install the lower swashplate (para. 12-80).

G. Install the left and right side engine access panels.

H. Perform a limited maintenance test flight (para. 4-61).

12-86.1. Main Rotor Push-Pull Rods

12-86.2. Removal – Main Rotor Push-Pull Rods

A. Open the left and right side engine access panels.

B. Remove the lower swashplate assembly (para. 12-76).

NOTE

The rod ends (doglegs) are match taper reamed to the push-pull rods.

C. Index mark the rod ends (doglegs) to their respective push-pull rod.

D. Remove the cotter pins and the nuts from the push-pull rods.

E. Install the puller tool T-0045 over the dogleg with the center of the tool aligned with the push-pull rod, and remove the doglegs.

F. Disconnect the upper end of the push-pull rods from the pitch change bellcranks on the main rotor hub.

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G. Remove the hardware securing the pitch change bellcranks to their brackets. Lift the pitch change bellcranks from their brackets and separate the push-pull rods from the pitch change bellcranks.

NOTE

Secure the spacers in the push-pull rods and the pitch change bellcranks with a piece of lockwire when disassembled or removed.

H. Remove the push-pull rods through the upper end of the mast.

12-86.3. Inspection – Main Rotor Push-Pull Rods

A. Inspect the main rotor push-pull rods in accordance with Table 12-3.1.

12-86.4. Installation – Main Rotor Push-Pull Rods

A. Install the push-pull rods into the mast from the upper end and through the guide tubes in the upper swashplate.

NOTE

Stuff a shop cloth into the upper end of the mast to prevent anything from being dropped into the mast when connecting the push-pull rods to the pitch change bellcranks. Remember to remove the shop cloth when installation is complete.

WARNING

If anything is dropped into the mast it must be removed prior to moving the flight controls.

B. Install the spacers into the push-pull rods and the pitch change bellcranks (para. 12-91).

C. Connect the push-pull rods to the pitch change bellcranks. Torque the nuts to 40 in-lbs/4.5 Nm and cotter pin (para. 12-91).

D. Connect the pitch change bellcranks to the mounting brackets. Torque the nuts to 40 in-lbs/4.5 Nm and cotter pin (para. 12-91).

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Table 12-3.1. Main Rotor Push-Pull Rod Inspection Requirements

Part Name	Inspection	Serviceable Limits	Repair Limits	Repair or Action
Push-Pull Rod Assembly	Cracks or Dents	No Tolerance Allowed	Not Repairable	Replace Push-Pull Rod Assembly
	Nicks, scratches, or corrosion in Area A (See Figure 12-21.1)	.007”/.18mm (See Repair or Action)	.007”/.18 mm	Blend and polish out smooth
	Nicks, scratches, or corrosion in Area B (See Figure 12-21.1)	.015”/.38mm (See Repair or Action)	.015”/.38mm	Blend and polish out smooth
	Bent push-pull rod assembly (See Figure 12-21.2)	.030”/.76 mm	.030”/.76 mm	Replace Push-Pull Rod Assembly
Lower Fitting	Cracks	None Allowed	Not Repairable	Replace Push-Pull Rod Assembly
	Contact wear from guide tube assembly (See Figure 12-21.3)	.030”/.76 mm (See Repair or Action)	.030”/.76 mm	Blend and polish out smooth
	Threads (rolled or missing)	None Allowed	Not Repairable	Replace Push-Pull Rod Assembly
Upper Fitting	Cracks	None Allowed	Not Repairable	Replace Upper Fitting or Replace Push-Pull Rod Assembly
	Nicks, scratches, or corrosion	.010”/.25 mm (See Repair or Action)	.010”/.25 mm	Blend and polish out smooth
	Bore wear on Bearing, P/N MS21240-08-C-12	.505”/12.83 mm	Not Repairable	Replace Bearing
Vinyl Sleeve	Wear	Worn Through	Not Repairable	Replace Vinyl Sleeve

* Contact wear can be repaired on two sides of the lower fitting. The rod assembly may be rotated 180° and reused when the contact wear reaches the repair limit on one side. Refer to Figure 12-21.3.

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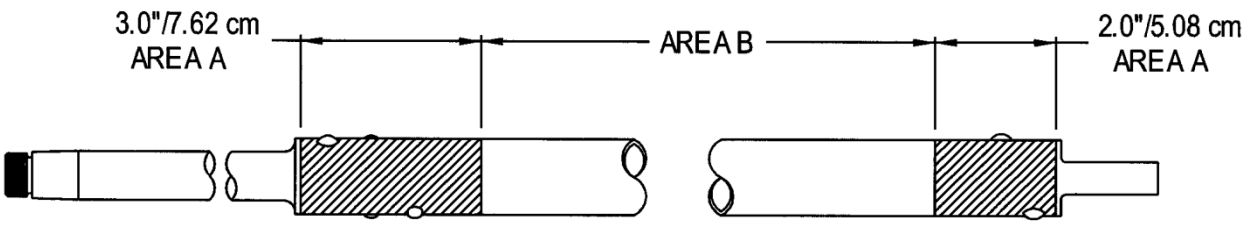


Figure 12-21.1. Inspection Area Identification

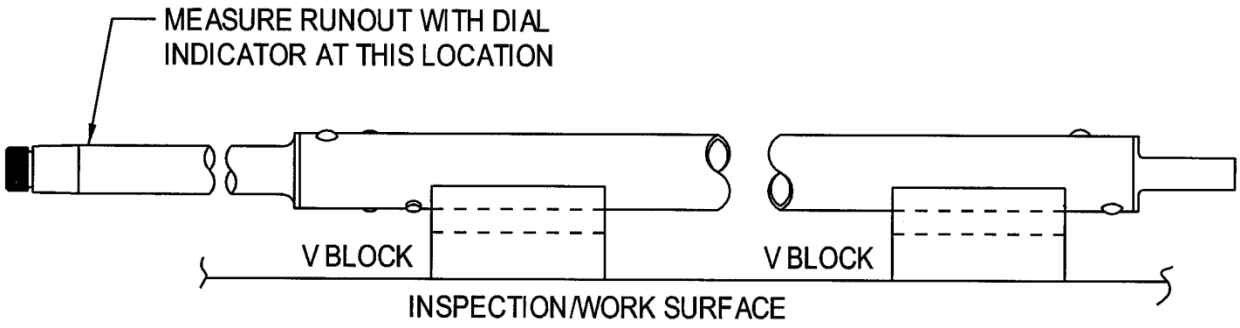


Figure 12-21.2. Push-Pull Rod Runout Inspection

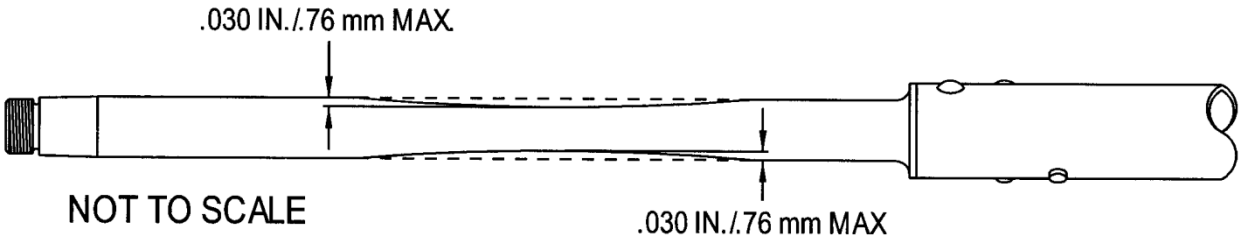


Figure 12-21.3. Lower Fitting Contact Wear Limits

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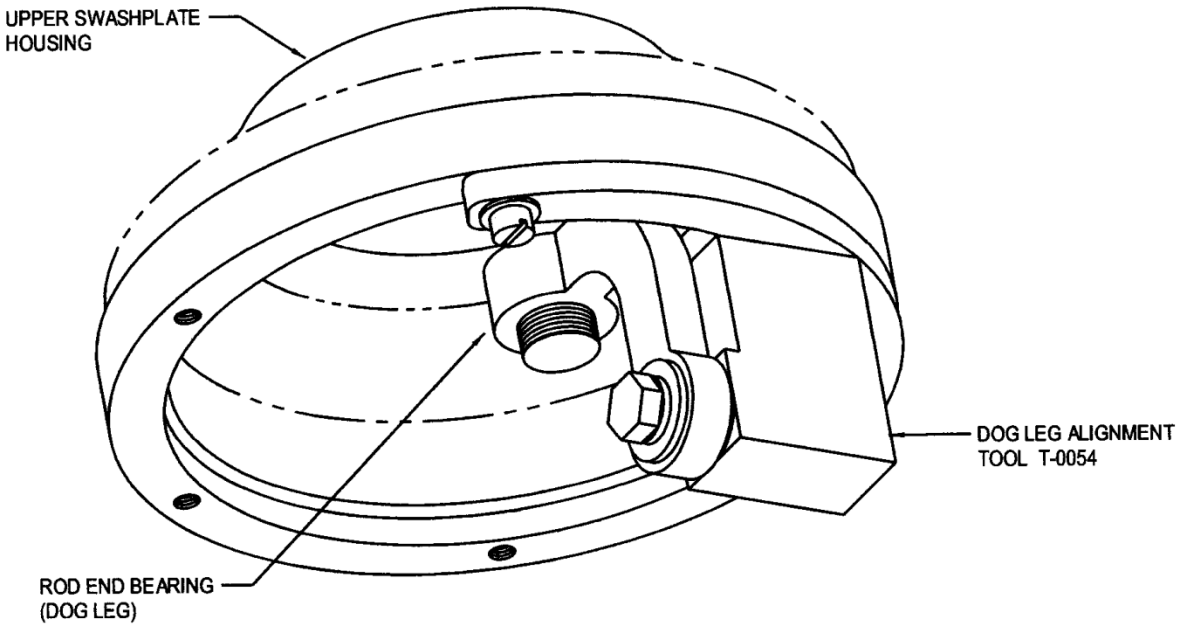


Figure 12-22. Rod End (Dog Leg) Installation

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E. Install the rod ends (doglegs) onto the push-pull rods using the following procedures:

NOTE

The doglegs must be installed on the respective push-pull rod they were removed from.

NOTE

If a new dogleg is installed, it must be reamed with a #5 Brown and Sharpe High Speed Steel Finish Reamer.

(1) Install the doglegs on the push-pull rods and install the nuts finger tight.

(2) Install the special tool T-0054 on the bell housing of the upper swashplate assembly while aligning the dogleg parallel to its respective pitch change bellcrank on the main rotor hub. Install the screws to hold the tool in place. Place a spacer on each side of the bearing in the dogleg and install the bolt to position the dogleg on the tool (Figure 12-22).

NOTE

If the nut is over torqued when aligning with the cotter pin hole, do not loosen the nut to re-align. Instead, back the nut off completely and retorque.

(3) Torque the nut to 140 in-lbs/15.9 Nm and cotter pin.

(4) Repeat steps (2) and (3) for each dogleg.

F. Install the lower swashplate (para. 12-80).

G. Install the left and right side engine access panels.

H. Perform a limited maintenance test flight (para. 4-61).

12-87. Pitch Change Bellcranks

12-88. Removal – Pitch Change Bellcranks

CAUTION

Foreign objects dropped down the mast must be immediately removed to prevent damaging the flight controls.

A. Index mark the pitch change bellcranks for reinstallation.

CAUTION

Do not over rotate the blade grips when the pitch change links are not connected to the pitch change bellcranks or the pitch change bellcranks are not installed in the mounting brackets.

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B. Remove the hardware connecting the pitch change bellcranks to the push-pull rods in the mast.

C. Remove the hardware connecting the pitch change bellcranks to the pitch change links.

D. Remove the center pivot bolts from the pitch change bellcranks. Lift the pitch change bellcranks from the mounting brackets.

NOTE

Install tie wraps to hold the pivot spacers in the pitch change bellcranks and the push-pull rods.

12-89. Inspection – Pitch Change Bellcranks

A. Inspect the pitch change bellcranks for nick, scratches, corrosion, cracks, worn bushings, worn bearings, and security of installation.

12-90. Repair – Pitch Change Bellcranks

A. Blend out nicks, scratches, and corrosion not exceeding .010"/.25 mm deep.

B. Replace the pitch change bellcrank if cracked or the inboard bushings come out of the pitch change bellcrank.

C. Replace the pitch change bellcrank if the bushing bores are elongated.

D. Replace the bearings (5) if ratcheting or roughness is felt or if radial play with the spacer (6) installed exceeds .005"/.13mm.

12-91. Installation – Pitch Change Bellcranks (Figure 12-23)

CAUTION

Foreign objects dropped down the mast must be immediately removed to prevent damaging the flight controls.

CAUTION

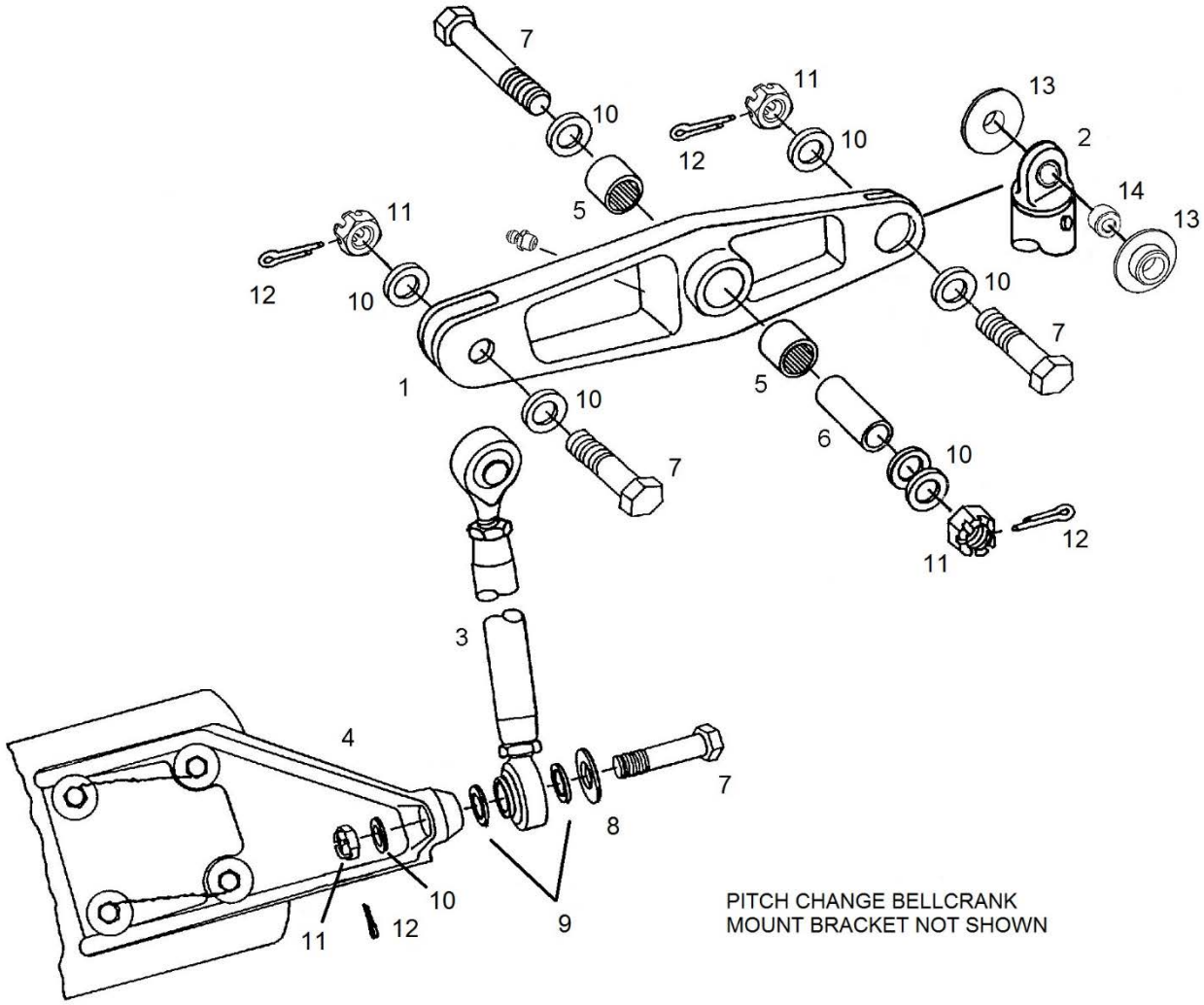
Do not over rotate the blade grips when the pitch change links are not connected to the pitch change bellcranks or the pitch change bellcranks are not installed in the mounting brackets.

A. Connect the pitch change bellcrank to the push-pull rod in the mast. Torque the nut (40 in-lb/4.5 Nm) and cotter pin. Check that the pitch change bellcrank freely pivots at the rod end connection.

B. Install the pitch change bellcrank into the mounting bracket and install the hardware. Torque the nut (40 in-lb/4.5 Nm) and cotter pin.

C. Connect the pitch change link to the pitch change bellcrank and install the hardware. Torque (75 in-lb/8.5 Nm) the nut and cotter pin.

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1.	Pitch Change Bellcrank	8.	Harper Washer
2.	Push-Pull Rod (Note 1)	9.	Spacer
3.	Pitch Change Link	10.	Washer
4.	Pitch Horn	11.	Nut
5.	Bearing	12.	Cotter Pin
6.	Spacer	13.	Bushing
7.	Bolt	14.	Bushing

Note 1. Shown with bearing insert installed in push-pull rod fitting.

Figure 12-23. Pitch Change Bellcrank and Pitch Change Link Installation

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12-92. Pitch Change Links

12-93. Removal – Pitch Change Links (Figure 12-23)

NOTE

Index marking the pitch change links and measuring the overall length will prevent having to perform a rigging check.

CAUTION

Do not over rotate the blade grips when the pitch change links are not connected to the pitch change bellcranks or the pitch change bellcranks are not installed in the mounting brackets.

A. Index mark the links for reinstallation. Disconnect the upper end of the link from the pitch change bellcrank.

B. Disconnect the lower end from the pitch horn and remove the pitch change links. Measure the overall length of the links and record.

12-94. Inspection – Pitch Change Links

A. Inspect the pitch change links for nicks, scratches, corrosion, cracks, and security of installation.

B. Inspect the rod end bearings for excessive wear.

12-95. Repair – Pitch Change Links

A. Blend out scratches, nicks, and corrosion that are not deeper than .010"/.25 mm.

B. Replace parts that are cracked.

C. Replace rod end bearings that have .005"/.13 mm axial play or greater.

12-96. Installation – Pitch Change Links (Figure 12-23)

CAUTION

Do not over rotate the blade grips when the pitch change links are not connected to the pitch change bellcranks or the pitch change bellcranks are not installed in the mounting brackets.

NOTE

Turn the rod ends into the barrel as equally as possible and check the witness hole for proper thread engagement.

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A. Adjust the link to the length measured when it was removed.

NOTE

Install the pitch change link with the wrenching flats in the barrel orientated up.

B. Connect the link to the pitch horn with the hardware in the following order: bolt (7), Harper washer (8), spacer (9), pitch change link (3), spacer (9), pitch horn (4), washer (10), and nut (11). Tighten the nut to 75 in-lbs/8.5 Nm and cotter pin.

C. Connect the upper end of the link to the pitch change bellcrank and install the hardware. Tighten the nut to 75 in-lbs/8.5 Nm and cotter pin.

D. Center the rod ends and verify the links are at the length measured when removed, adjust if required and tighten the jam nuts.

E. Check the track of the main rotor and autorotation rpm if the pitch change links or the rod ends were replaced and adjust as required.

12-97. Tail Rotor Control System

12-98. Description – Tail Rotor Control System (Figure 12-24)

NOTE

The pilot's controls are on the right side of the aircraft in a TH-28 and on the left side for a 480/480B.

The tail rotor control system provides directional control of the aircraft by varying the pitch in the tail rotor blades. The system consists of a set of control pedals, push-pull rods, bellcranks. cables, pulleys, and a pitch control assembly. The tail rotor control pedals are located on the floor directly in front of the pilot's seat. The pedals can be adjusted for proper positioning under the feet by removing the quick release pins in the pedals, repositioning the pedals and reinstalling the pins.

12-98.1. Troubleshooting – Tail Rotor Control System (See Paragraph 9-41)

12-99. Tension Adjustment – Tail Rotor Control System

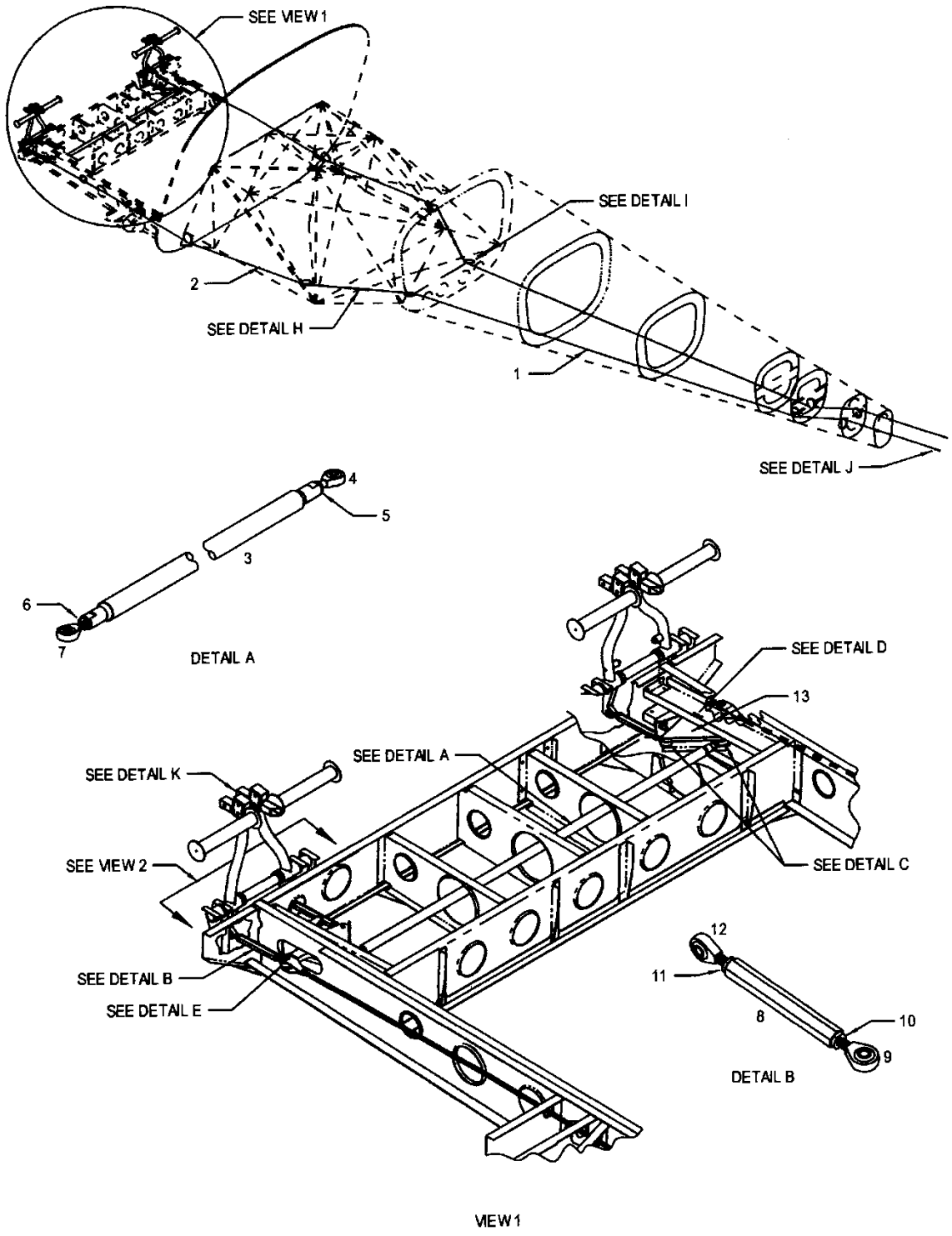
A. Remove the pedals from the pedal arms. Clamp the pedal arms in the neutral position with two pieces of wood and a C-clamp.

B. Install the tail rotor rigging tool (T-2889 or T-0140) between the tail rotor transmission output shaft seal housing and the bronze bearing in the pitch control assembly slider to hold the tail rotor pitch controls in the neutral position. Secure the pitch control assembly in this position by installing wooden wedges between the pitch control assembly and the transmission on the right side of the transmission. (See Figure 12-25 and/or Figure 12-25.1)

C. Open the engine access panels.

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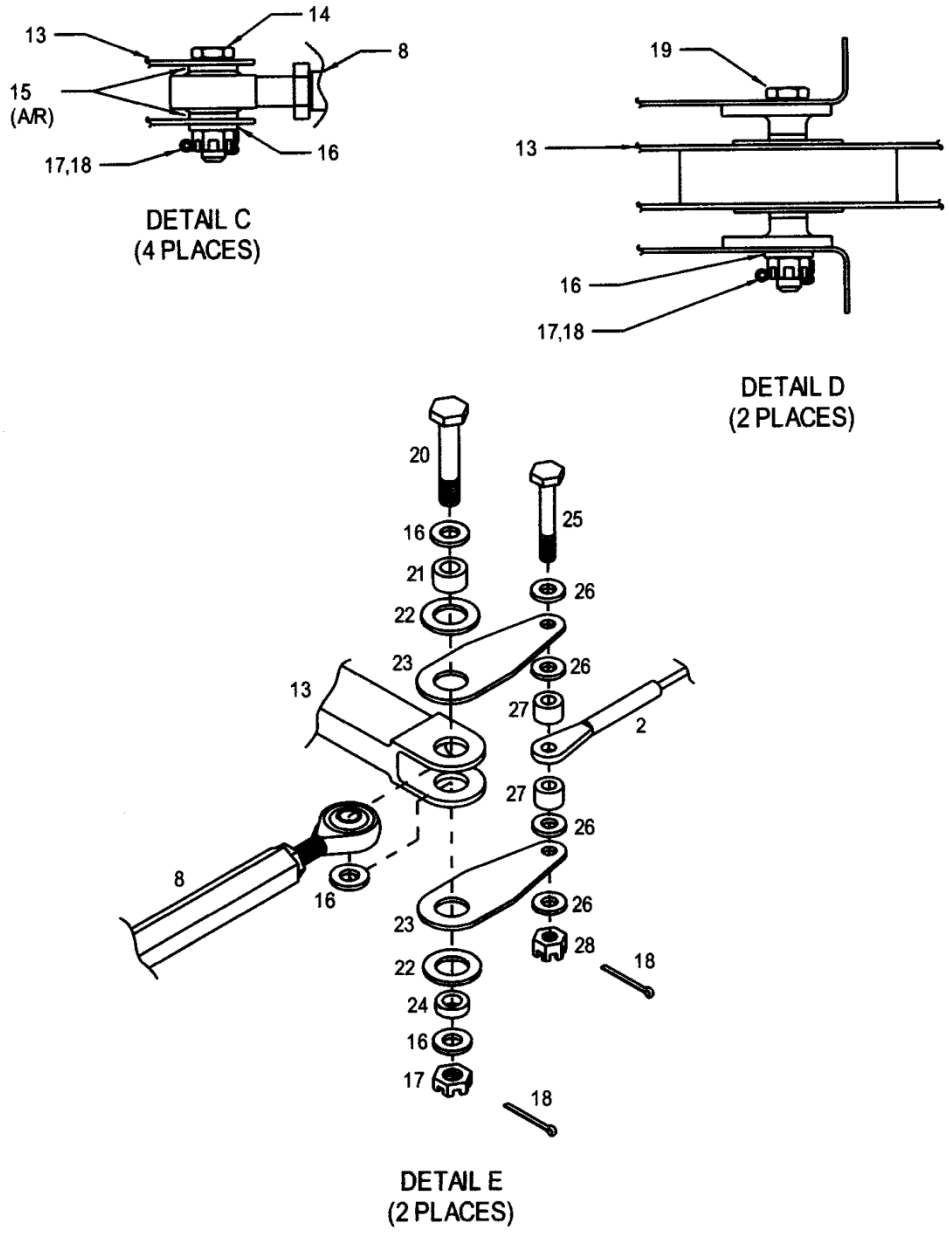


1. Aft Cable Assembly (2 Each)
2. Fwd. Cable Assembly (2 Each)
3. Push-Pull Rod
4. Bellcrank Assembly (2 Each)
5. Push-Pull Rod (4 Each)
6. Pedal Assembly (2 Each)

Figure 12-24. Tail Rotor Control System

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Figure 12-24. Tail Rotor Control System

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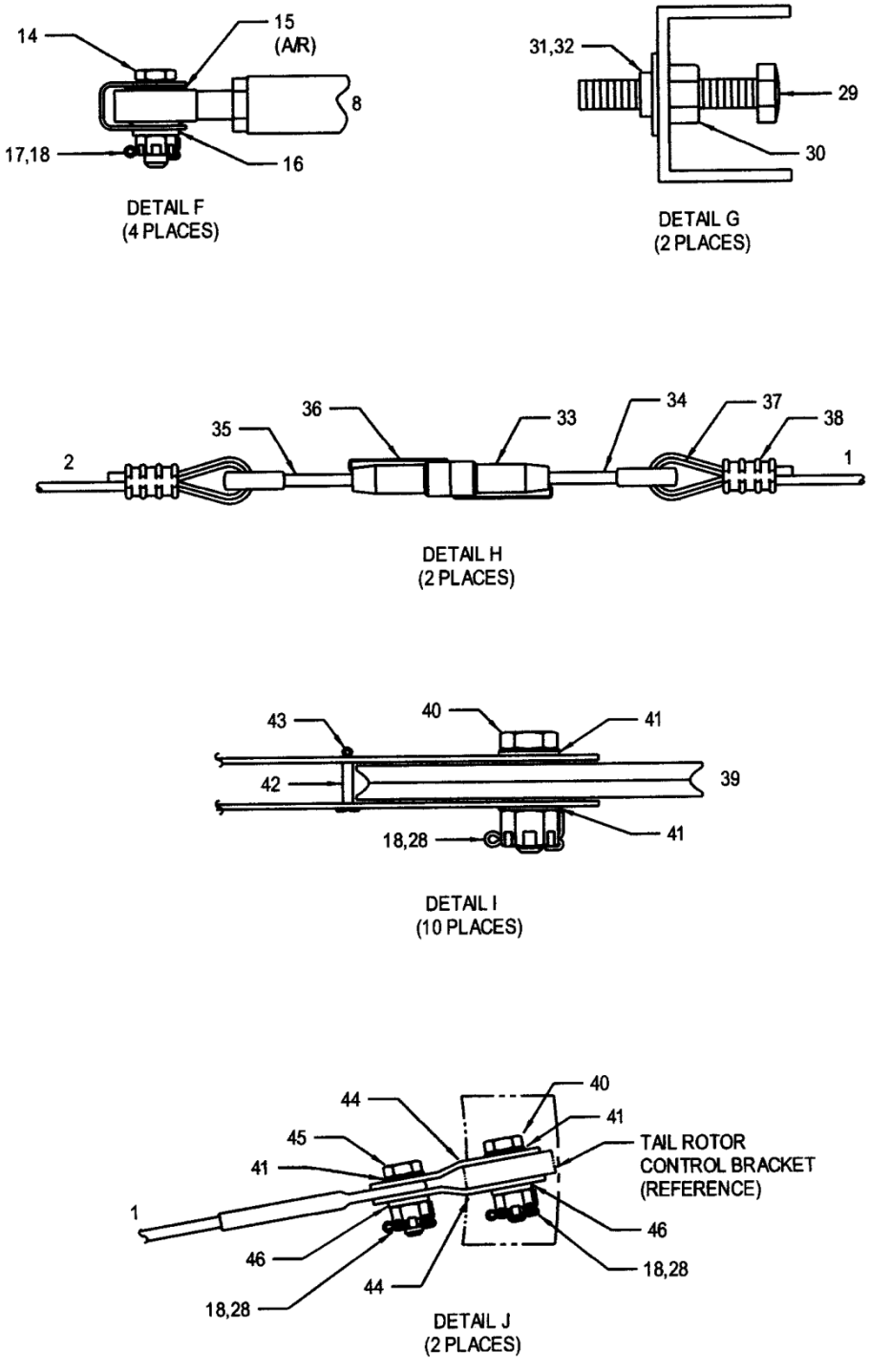
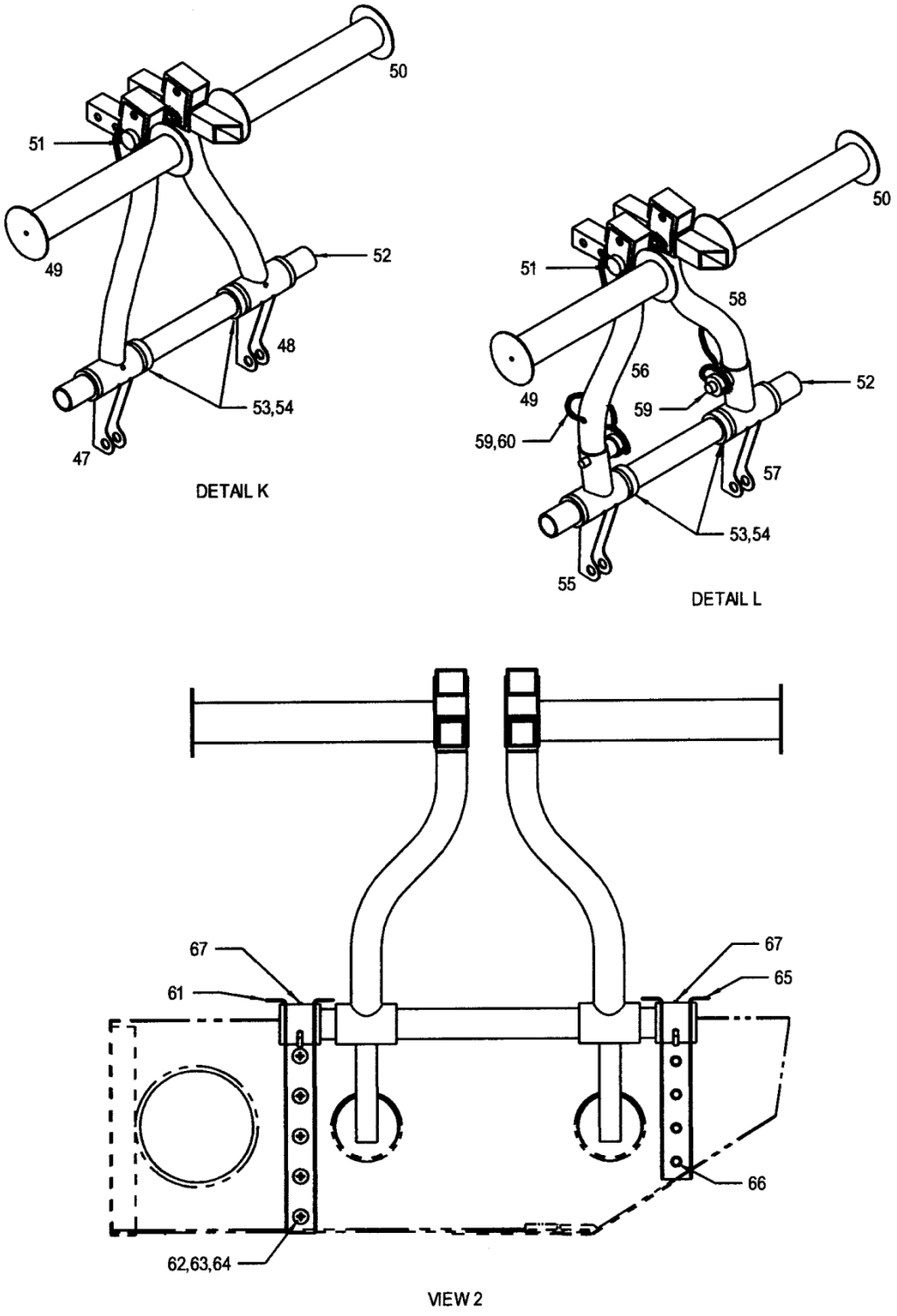


Figure 12-24. Tail Rotor Control System

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Figure 12-24. Tail Rotor Control System

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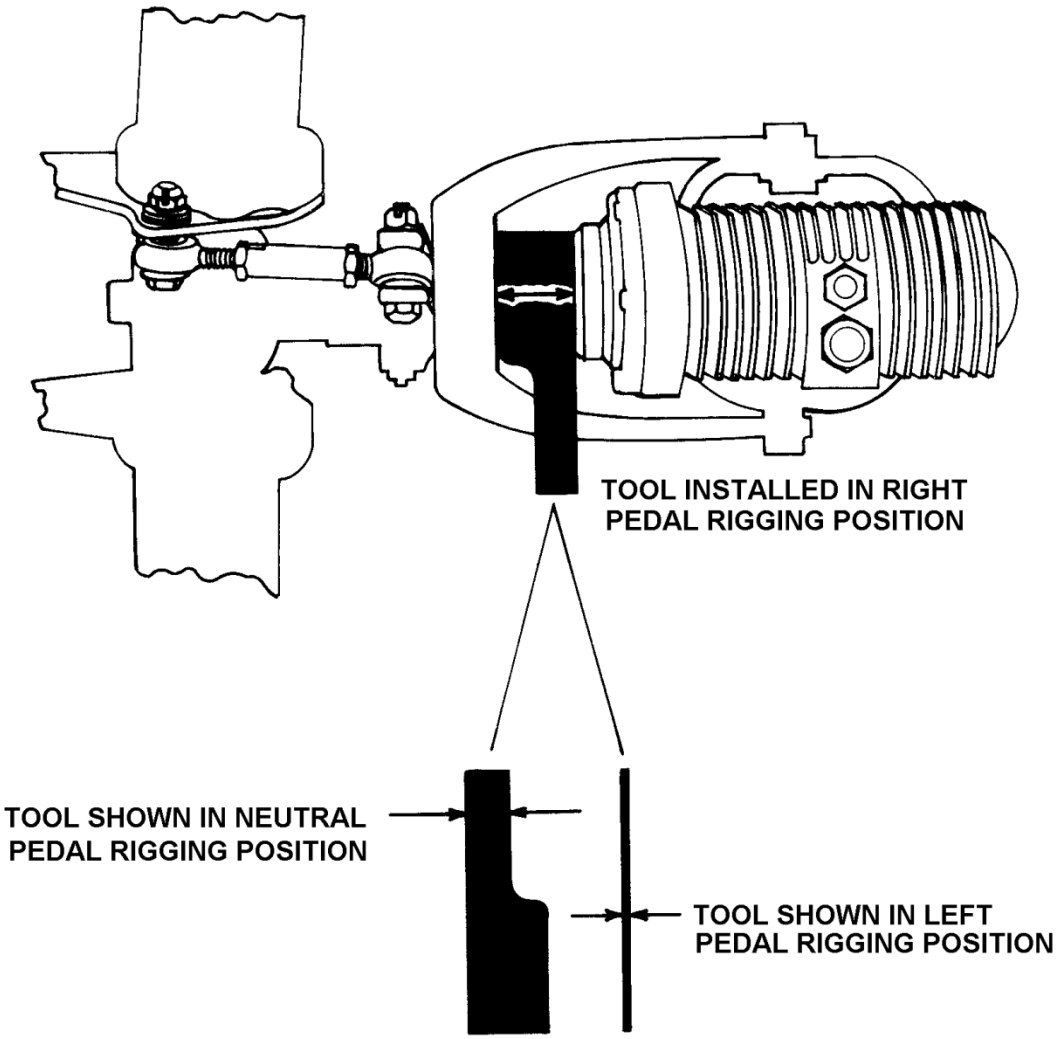
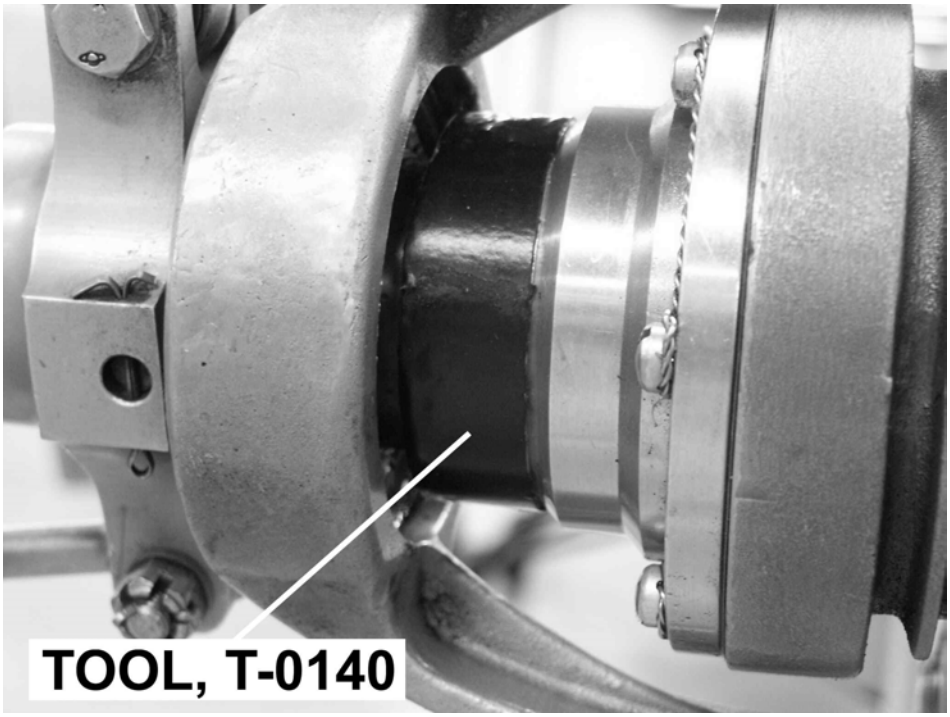


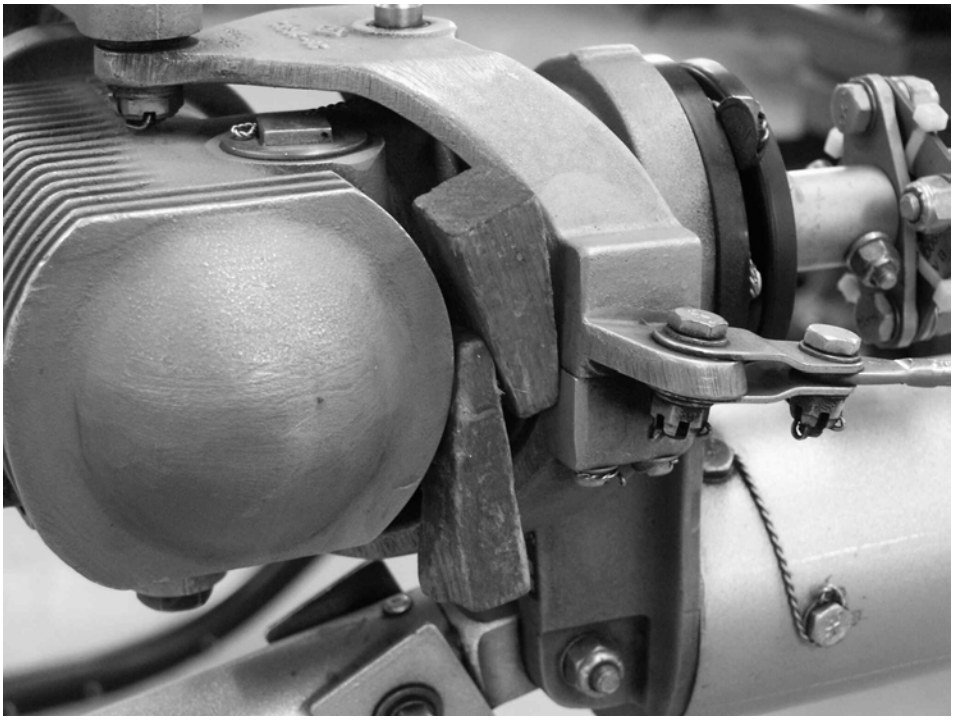
Figure 12-25. Rigging Tool (T-2889)

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TOOL INSTALLED ON OUTPUT SHAFT



WOODEN WEDGES INSTALLED

Figure 12-25.1. Rigging Tool (T-0140)

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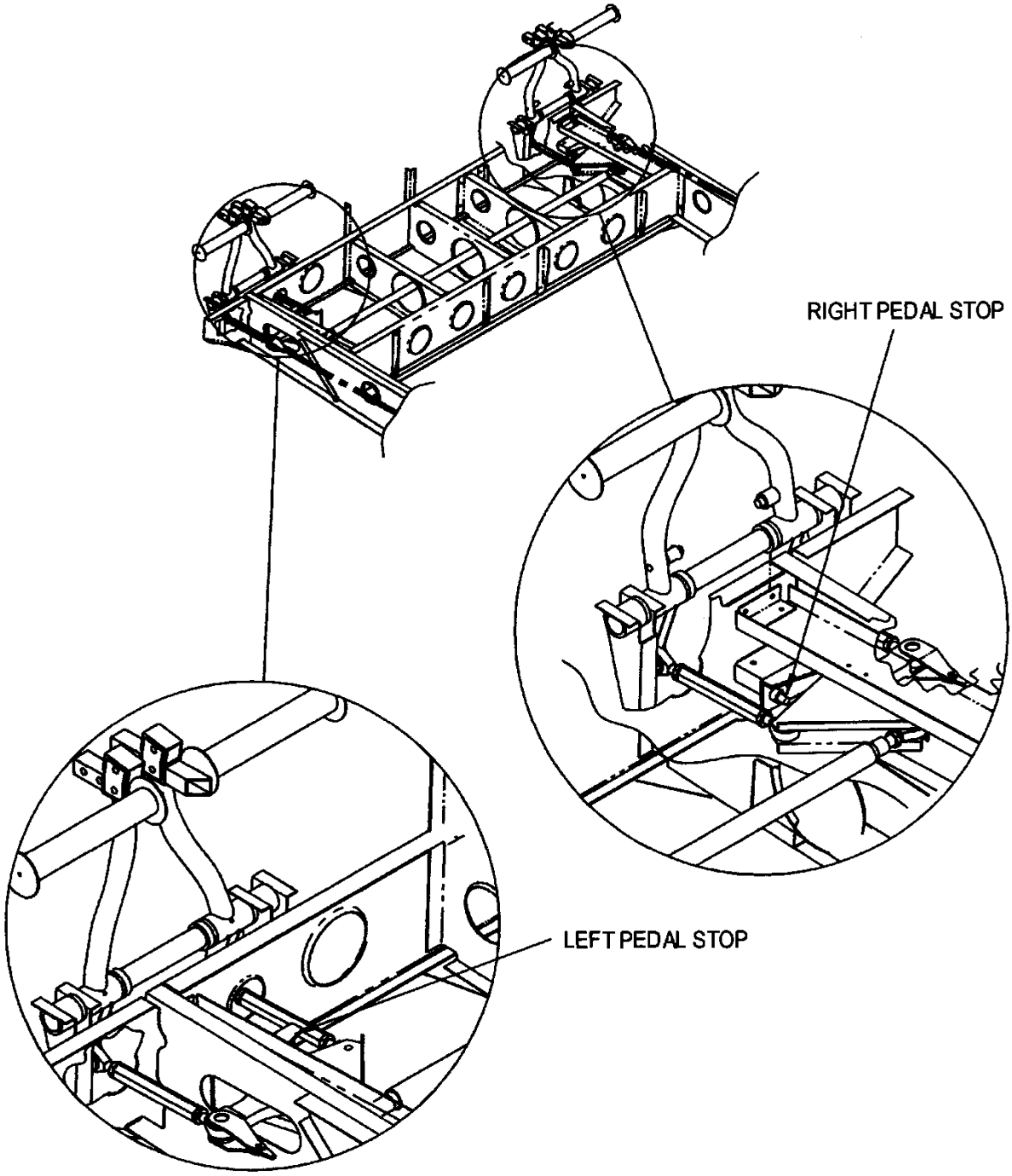


Figure 12-26. Tail Rotor Control Stops

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D. Using a cable tensiometer, adjust the turnbuckles until the cable tension is 40-45 lbs/18.2-20.5 kg. The tension on the cables must be equal to within ± 1 lb/.45 kg.

CAUTION

The turnbuckles may not have more than three threads showing at each end.

E. Install safety clips in the turnbuckles when the cable tension is set.

F. Remove the rigging tool from the tail rotor transmission.

G. Remove the tool from the control pedal arms and install the pedals.

H. Install the engine access panels.

I. Check the rigging of the tail rotor controls (para. 12-100) if adjustments were made.

12-100. Rigging – Tail Rotor Control System

A. Verify the cable tension is set (para. 12-99).

B. Remove the keel access panels.

C. Install the tail rotor control rigging tool (T-2889) in the left pedal position between the output shaft seal housing and the face of the brass bushing in the pitch control assembly. (Figure 12-25)

D. Move the control pedals to the full left position. The control pedals should contact the stop just as the pitch control assembly contacts the rigging tool. Adjust the stop on the left side tail rotor control bellcrank until the pedal and the control assembly make contact at the same time.

E. Move the control pedals to the full right position. Insert the rigging tool between the seal housing and the control assembly. The rigging tool should just fit in when the pedals contact the right stop. Adjust the stop on the right side tail rotor control bellcrank until the tool will just fit when the pedals contact the stop.

F. Cycle the pedals and look for interference between the pitch control assembly pivot brackets and the tail rotor transmission.

G. Install the keel access panels.

NOTE

Refer to para. 12-5 through 12-12 for maintenance procedures for the push-pull rods and bellcranks.

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12-101. Tail Rotor Pedal Assembly

12-102. Removal – Tail Rotor Pedal Assembly

A. (Copilot 480/480B Only) Remove the quick release pins securing the pedal arms in the pedal assembly.

B. Remove the keel access panels.

C. Mark the position of the foot plates on the cabin floor. Remove the foot plates.

D. Remove the pedals from the pedal arms.

E. Disconnect the push-pull rods from the pedal arms.

F. Remove the hardware attaching the inboard pedal assembly mount to the keel.

G. Slide the mount inboard until clear of the pivot rod and remove the mount.

H. Remove the cotter pins securing the pedal arm retainers and remove the pedal arms and the retainers from the pivot rod.

I. Remove the roll pin securing the pivot rod in the outboard mount and remove the pivot rod.

J. Remove the rivets securing the outboard mount and remove the mount.

12-103. Inspection – Tail Rotor Pedal Assembly

A. Inspect the assembly for bends, corrosion, cracks, nicks, and scratches. Repair corrosion, nicks, or scratches if the damage is less than .010 inch/.25 mm deep. Replace parts if any other conditions are found.

B. Inspect the bushings in the pedal arms for excessive wear. Replace the bushings if any found.

12-104. Installation – Tail Rotor Pedal Assembly

A. Install the pivot rod into the outboard mount and install the roll pin.

B. Install the outboard mount into the aircraft and install the mounting rivets.

C. Install the outboard pedal arm onto the pivot rod and position against the outboard mount. Install an arm retainer and cotter pin in place. Install the retainer for the inboard arm and cotter pin in place. Install the inboard pedal arm onto the pivot rod.

D. Install the inboard mount into position and install the hardware securing the inboard mount to the keel.

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E. Connect the push-pull rods to the pedal arms.

F. Install the pedals into the pedal arms.

G. Remove the old double back tape used to attach the foot plates to the cabin floor. Install new tape (4016-1).

H. Position foot plates into place and install the rivets and screw securing the foot plates.

I. Install the keel access panel(s).

J. (Copilot 480/480B Only) Install the pedal arms into the pedal assembly and secure with the quick release pins.

12-105. Tail Rotor Control Cables

12-106. Removal – Tail Rotor Control Cables

A. Remove the cables in the tailcone using the following procedures:

(1) Remove the engine access, and aft access panels.

(2) Remove the left and right side horizontal stabilizers and the left and right side spar attachment access panels.

(3) Remove the two pulleys forward of the spar attachment bulkhead from the mounting brackets.

(4) Remove the guide pins from the pulleys installed in the aircraft aft of the turnbuckles in the engine compartment.

(5) Disconnect the cables from the connecting links attached to the pitch control assembly on the tail rotor transmission.

(6) Attach a string to the cable and pull the cable from the tailcone leaving the string in its place.

(7) Remove the safety clip from the turnbuckle and disconnect the cable from the turnbuckle.

B. Remove the cables installed in forward portion of the aircraft using the following procedures:

(1) Remove the engine access and the keel access panels.

(2) Remove the guide pins installed in the pulleys located in the engine compartment.

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(3) Disconnect the cables from the tail rotor control bellcranks.

(4) Attach a string to the cable and pull the cable from the keel area leaving the string in its place.

(5) Remove the safety clip from the turnbuckle and disconnect the cable from the turnbuckle.

12-107. Inspection – Tail Rotor Control Cables

A. Inspect the cables for corrosion, broken strands, fraying, and worn spots. Replace cable if any found.

B. Inspect the turnbuckle for cracks or damage. Replace if any found.

12-108. Installation – Tail Rotor Control Cables

A. Install the aft cables using the following procedures:

(1) Connect the cable to the turnbuckle and adjust the turnbuckle until there is an equal amount of thread engagement on each end.

(2) Attach the string in the tailcone to the cable. Pull the cable through the tailcone.

CAUTION

The connecting links must pivot freely at the cable connections and at the bellcrank and pitch control assembly connections.

(3) Connect the cable to the connecting links installed on the pitch control assembly installed on the tail rotor transmission.

(4) Install the pulleys that were removed and install all the pulley guide pins.

(5) Install the left and right side spar access panels and the left and right side horizontal stabilizers.

(6) Install the engine access and the aft access panels.

(7) Adjust the cable tension (para. 12-99).

B. Install the forward cables using the following procedures:

(1) Connect the cable to the turnbuckle and adjust the turnbuckle until there is an equal amount of thread engagement on each end.

(2) Attach the string in the keel to the cable. Pull the cable through the keel.

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CAUTION

The connecting links must pivot freely at the cable connections and at the bellcrank and pitch control assembly connections.

(3) Connect the cable to the connecting links installed on the tail rotor control bellcrank.

(4) Install the pulley guide pins.

(5) Install the engine access and keel access panels.

(6) Adjust the cable tension (para. 12-99).

12-109. Replacement – Tail Rotor Control Cable

A. Replace the aft cables using the following procedures:

(1) Remove the cable from the tailcone (para. 12-106).

(2) Install the new cable into the tailcone.

CAUTION

The connecting links must pivot freely at the cable connections and at the bellcrank and pitch control assembly connections.

(3) Connect the new cable to the connecting link on the pitch control assembly.

(4) Install the removed pulleys and the pulley guide pins.

(5) Remove the pedals from the pedal arms on the pilot's side of the aircraft. Clamp the pedal arms in the neutral position with two pieces of wood and a C-clamp.

(6) Install the tail rotor rigging tool (T-2889) in the neutral position between the tail rotor transmission output shaft seal housing and the brass bushing in the pitch control assembly slider. Hold the pitch control assembly in this position by installing a wooden wedge between the pitch control assembly and the transmission on the right side of the transmission.

(7) Adjust the turnbuckle so only one thread of the rod end is showing at each end.

(8) Run the new cable through the Nicopress sleeve and the thimble on the turnbuckle rod end.

(9) Pull the cable taut. Push the Nicopress sleeve against the thimble and swedge the sleeve. Remove the excess cable leaving .25-.50 inches/6.4-12.7 mm extending from the sleeve.

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(10) Adjust the cable tension (para. 12-99).

(11) Rig the tail rotor controls (para. 12-100).

(12) Install the left and right side horizontal stabilizers.

(13) Install the engine access and aft access panels.

B. Replace the forward control cable using the procedures for the aft cables. Modify the procedures to account for the differences between the forward and aft installations.

12-110. Tail Rotor Control Cable Pulleys and Guides

12-111. Removal – Tail Rotor Control Cable Pulleys and Guides

A. If removing the pulleys in the tailcone, remove the left and right side horizontal stabilizers.

B. If removing the pulleys in engine compartment or the aft area of the pylon, remove the engine access or the aft access panels.

C. If removing the pulleys in the keel area, remove the keel access panels.

D. Remove the hardware securing the pulley to the mounting bracket. Remove the pulley from the bracket.

E. Use the following procedures to remove the cable guides in the tailcone:

(1) Remove the control cable (para. 12-106) from the side of the tailcone the guide is to be removed from.

(2) If removing the guides in the #2 bulkhead, reach into the tailcone and remove the guide(s).

(3) If removing the guides in the #3 bulkhead, support the tailcone with a stand under the tail rotor guard bracket on the bottom of the tailcone. Install a plank into the tailcone. Crawl into the tailcone and remove the guide(s).

(4) If removing the guides from the #4 bulkhead, remove the guides via the horizontal spar attachment access holes.

(5) Remove the guides from the aft (#7) bulkhead if required.

F. Remove the guides in the keel structure by removing the keel access panels and removing the guides.

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12-112. Inspection – Tail Rotor Control Cable Pulleys and Guides

A. Inspect the pulleys for flat spots, damage, and tight or worn bearings. Replace the pulley if any found.

B. Inspect the guides for wear. Replace excessively worn guides.

C. Inspect the pulley brackets for condition and security. Replace brackets that are damaged.

12-113. Installation – Tail Rotor Control Cable Pulleys and Guides

A. Install the pulleys by reversing the order of removal.

B. Adjust the cable tension (para. 12-99).

C. Check the rigging of the tail rotor controls (para. 12-100).

D. Install the cable guides by reversing the order of removal.

NOTE

If only the guides in the keel structure were replaced and no other maintenance action was performed on the tail rotor control cables, omit steps E and F.

E. Adjust the cable tension (para. 12-99).

F. Check the rigging of the tail rotor controls (para. 12-100).

12-114. Pitch Control Assembly

12-115. Removal – Pitch Control Assembly (Figure 12-27)

A. Disconnect pitch change links from the pitch change link retainer.

B. Remove the tail rotor assembly (para. 9-44).

C. Remove the hardware connecting the pivot brackets to the bearing housing.

NOTE

Extra force may be required to slide the pitch change mechanism off the tail rotor output shaft because the keys will force the seal retainer from the pitch change bearing.

D. Slide the pitch control assembly off of the chrome sleeve on the tail rotor transmission output shaft.

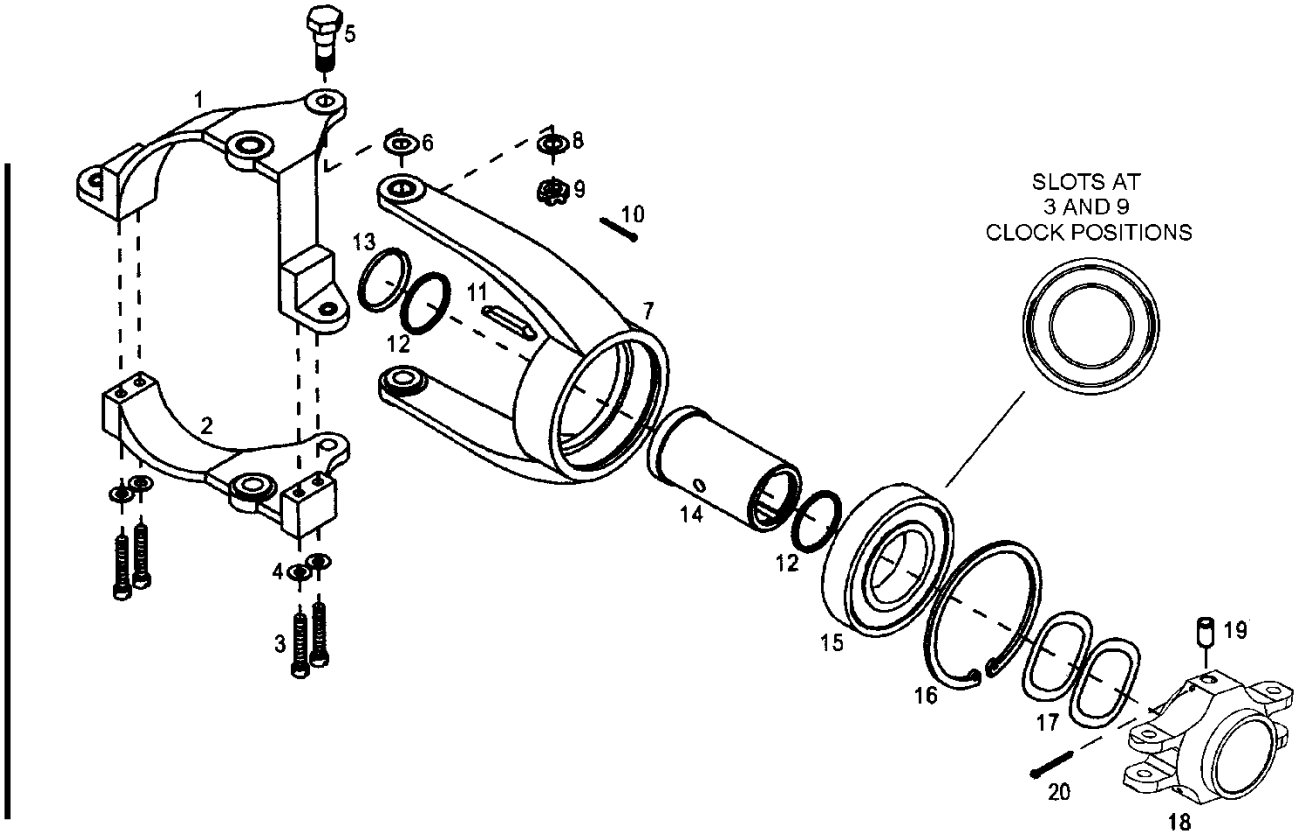
E. Remove the keys, seal, and seal retainer from the chrome sleeve.

F. Disconnect the tail rotor control cables from the pivot brackets.

G. Remove the hardware securing the pivot brackets together. Remove the brackets from the transmission.

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1.	Upper Bracket	11.	Key
2.	Lower Bracket	12.	Seal
3.	Screw	13.	Seal Retainer
4.	Washer	14.	Pitch Control Bearing
5.	Bolt	15.	Bearing
6.	Washer	16.	Retaining Ring
7.	Bearing Housing	17.	Spring Washer
8.	Washer	18.	Pitch Link Retainer
9.	Nut	19.	Pin
10.	Cotter Pin	20.	Cotter Pin

Figure 12-27. Pitch Control Assembly

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12-116. Disassembly – Pitch Control Assembly (Figure 12-27)

A. Remove the cotter pins from the pitch change link retainer.

B. Place the pitch change link retainer in a small arbor press and press the dowel pin through the retainer and the pitch control bearing. Rotate the retainer and remove the opposite dowel pin.

CAUTION

Use a press tool that exactly fits the bronze pitch control bearing or damage will occur to the bearing. Heat the bearing housing (7) and pitch change retainer (12) to 230°F with a heat gun before attempting to press the pitch control bearing from the bearing housing and the pitch change retainer.

C. Gently press the pitch control bearing from the pitch change link retainer, wave spring washers, and the bearing.

D. Remove the seal from the outboard end of the pitch control bearing.

E. Remove the retaining ring from the bearing housing.

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

WARNING

Use protective gloves when handling heated parts.

F. Heat the bearing housing to approximately 250°F/121°C. Gently tap the bearing from the housing.

12-117. Inspection – Pitch Control Assembly

A. See Table 12-4 for the detailed inspection requirements for the pitch change assembly.

12-118. Assembly – Pitch Control Assembly (Figure 12-27)

WARNING

Use extreme caution when removing or installing the blade and grip assemblies to prevent from injuring personnel.

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Table 12-4. Tail Rotor Pitch Control Assembly

			Inspection Requirements			
P/N	Fig.12-27 Item #	Part Name	Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
28-16331-1	7	Bearing Housing	Bearing bore 2.6774 to 2.6779	+.0002	Not Repairable	Replace Housing
			Oilite bushing I.D. .3755 to .3765	+.0005	Not Repairable	Replace Housing
			Surface nicks and scratches	None Allowed	≤ .020 deep	Blend and polish out smooth
TS-023	12	Seal	Inspect for cuts or tears	None Allowed	Not Repairable	Replace Seal
28-16394-2, -11	14	Pitch Control Bearing	Bronze O.D. 1.3777 to 1.3787	-.0005	Not Repairable	Replace Bearing
			Bore Dia. 1.079 to 1.081	+.001	Not Repairable	Replace Bearing
			Keyway width .1875 to .1895	+.0005	Not Repairable	Replace Bearing
			Dowel pin holes .2450 to .2470 (-2)	+.003	Not Repairable	Replace Bearing
			Dowel pin holes .2490 to .2495 (-11)	+.0005	Not Repairable	Replace Bearing
			Distortion of the bore	None Allowed	Not Repairable	Replace Bearing

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Table 12-4. Tail Rotor Pitch Control Assembly

			Inspection Requirements			
P/N	Fig.12-27 Item #	Part Name	Inspection*	Serviceable Limits*	Repair Limits	Repair or Action
ECD016-11	15	Bearing	O.D. 2.6772	+.0000 -.0005	Not Repairable	Replace Bearing
			I.D. 1.3780	+.0005 -.0000	Not Repairable	Replace Bearing
			Axial movement of the inner race to the outer race	.002	Not Repairable	Replace Bearing
			Ratcheting or roughness	None Allowed	Not Repairable	Replace Bearing
5002-268-PP	16	Retaining Ring	Check for flatness	No distortion	Not Repairable	Replace Retaining Ring
W-47	17	Wave Spring Washer	Check for wave contour	No flat spots	Not Repairable	Replace Washer
28-16392-13	18	Pitch Link Retainer	Bore 1.3782 to 1.3787	+.0002	Not Repairable	Replace Retainer
			Dowel pin holes .2490 to .2495	+.0002	Not Repairable	Replace Retainer
			Pitch link retaining bolt holes .250 to .251	+.0005	Not Repairable	Replace Retainer
			Surface nicks and scratches	None Allowed	≤ .010 deep	Blend and polish out smooth
28-16397-11	19	Dowel Pin	O.D. .2495 to .2505	-.0005	Not Repairable	Replace Pin

* All dimensions are in inches

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WARNING

Use protective gloves when handling heated parts.

A. Heat the bearing housing (7) to approximately 250°F/121°C. Install the bearing (15) into the housing with the slots for removing the inner bearing section facing outboard towards the pitch change link retainer and orientated 90° to the pivot arms of the bearing housing (3 and 9 clock positions) (Figure 12-27).

B. Install the retaining ring (16) with the opening in line with one of the bearing housing pivot arms.

C. Press the pitch control bearing (14) into the bearing in the outboard direction.

D. Install the two wave spring washers (17) onto the pitch control bearing.

NOTE

Assembly of the pitch link retainer and bearing can be facilitated by using alignment pins (0.75 in/1.9 cm max. length) fabricated from 1/4 inch bolts (1.5 in long bolt; head and threads removed).

E. Heat the pitch link retainer (18) to approximately 230°F/110°C and slide it over the bearing (14). Insert the two pins to align the bearing (14) with the pitch link retainer (18). When the retainer has cooled, push the alignment pins into the inside of the bushing to remove.

F. Press the dowel pins into the retainer.

NOTES

Seat the dowel pins into the pitch change link retainer far enough that the cotter pins can be installed. The pins must not extend through the pitch control bearing.

Installation of the dowel pins may distort the bottom surface of the pitch control bearing. Check that the inside bearing surface is free of distortion after installing the pins.

G. Install the cotter pins into the pitch link retainer.

H. Install the pitch change assembly onto the tail rotor gearbox output shaft to ensure that it will slide on the chrome shaft without binding. It is common for the bronze pitch control bearing (5) to be slightly distorted on the inside in the area of the pins. If this is the case, use a fine tooth (1/2) round file to dress the bearing so it will slide freely.

I. Install the seal into the outboard end of the pitch control bearing.

12-119. Installation – Pitch Control Assembly (Figure 12-27)

A. Install the pivot brackets onto the tail rotor transmission. Install the hardware, torque, and lockwire (.025).

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CAUTION

The connecting links must pivot freely at the cable connections and at the bellcrank and pitch control assembly connections.

B. Connect the tail rotor control cables to the pivot brackets.

C. Slide the seal retainer and the seal onto the chrome sleeve.

D. Install the keys into the slots in the sleeve.

E. Align the keyways in the pitch control bearing with the keys on the sleeve. Slide the pitch control assembly onto the sleeve.

F. Install the stainless steel washers (6) between the pivot brackets and the arms of the bearing housing.

G. Install the pivot bolts connecting the brackets to the bearing housing. Install the washers and locknuts. Torque the nuts and align the cotter pin holes. Install the cotter pins and cycle the pivot brackets to check for interference.

NOTE

The heads of the pivot bolts must rotate when the control brackets are moved. If they do not move, check for binding in the bushings.

H. Install the seal into the retainer. Install the retainer into the recessed area of the pitch control bearing using tool T-0140. Alternatively, the seal may be installed by tapping it with a small punch.

I. Install the tail rotor assembly (para. 9-51).

J. Connect the pitch change links to the pitch change link retainer (para. 12-126).

NOTE

Omit steps K and L if no major components of the pitch control assembly were replaced.

K. Adjust the tail rotor control cable tension (para. 12-99).

L. Check the tail rotor control rigging (para. 12-100).

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12-120. Tail Rotor Pitch Change Links

12-121. Removal – Tail Rotor Pitch Change Links (Figure 12-28, Figure 12-29)

NOTES

Index mark (color code) the pitch change links.

Pitch change links P/N 28-16345-11 or P/N 28-16391-1 must be installed as same part number pairs (either two P/N 28-16345-11 or two P/N 28-16391-1). Pitch change links P/N 28-16391-3 or P/N 28-16391-5 may be installed in combination with each other but not in combination with P/N 28-16345-11 or P/N 28-16391-1. For the barrel type, the pitch change link length and rod end orientation has been set at the factory. Do not disassemble unless the rod ends need replacement.

Paragraphs 12-122 and 12-125 apply to the barrel type pitch change links only.

A. Disconnect the pitch change links from the tail rotor pitch arms. Keep the bolt and washer stack up together for each pitch change link.

B. Remove the hardware securing the pitch change links to the retainer. Remove the pitch change links and spacers from the retainer.

12-122. Disassembly – Tail Rotor Pitch Change Links

A. Loosen the jam nuts from the barrel and remove the rod ends from the barrel.

12-123. Inspection – Tail Rotor Pitch Change Links

A. Inspect the pitch change links for cracks, corrosion, bends, damage, and proper and secure installation.

B. Inspect the rod ends for excessive play.

12-124. Repair – Tail Rotor Pitch Change Links

A. Corrosion, nicks, or scratches in the solid link, barrel, or rod end outer race not exceeding .010"/.25 mm deep may be burnished out. Replace the solid link, barrel, or rod end if cracked or damage exceeds .010"/.25 mm deep.

B. Replace the rod end (28-16345-X) or the pitch change link (28-16391-X), as applicable, if its axial play exceeds .005"/.13 mm.

C. Correctly install improperly installed pitch change links.

12-125. Assembly – Tail Rotor Pitch Change Links

A. Install the jam nuts onto the rod ends and apply Loctite (VC-3) to the threads of the rod ends.

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B. Install the right hand rod end into the barrel until the threads completely cover the witness hole in the barrel.

C. Install the left hand rod end into the barrel until the overall length of the pitch change link measures 4.260” ± 0.005”/10.82 cm ± 0.13 cm. Orientate the rod ends 30° from each other (Figure 12-29).

12-126. Installation – Tail Rotor Pitch Change Links (Figure 12-28, Figure 12-29)

NOTE

If the pitch change links (barrel type) being installed are from the factory or the length and rod end bearing orientation are known to be satisfactory (removed serviceable), or if the pitch change links being installed are the solid type, omit steps A and D through F.

A. Lock the tail rotor control pedals in the neutral position.

NOTE

For aircraft manufactured or modified with P/N 28-16391-3 or 28-16391-5 pitch link assemblies, the rod end labeled “**T/R ↑ BLADE”**, must be installed in the proper orientation as shown in Figure 12-28.

B. Install the left hand thread rod end of the pitch change link and the spacers (3) into the retainer. Install the bolts (1) so that heads are in the direction of rotation, washers (2 & 5), and nuts (6). Torque the nuts and install the cotter pins.

C. Connect the right hand thread rod ends to the pitch arms with the hardware in the following sequence: bolt (1) (bolt head installed in direction of rotation), Harper washer (8), thin spacer (9), O-ring (11), pitch change link rod end (4) (see Note above), thick spacer (10), washer (13), pitch arm, washer(s) (5, 13) (use stack-up retained from para. 12-121,A), and nut (6). Torque the nuts (55-75 in-lb/6.2-8.5 Nm) and install the cotter pins (7). (See also SDB T-055 and SIL T-027, latest revision, respectively.)

NOTE

Omit Steps D and E for aircraft with P/N 28-16391 pitch link assemblies.

D. Adjust the length of the pitch change link assemblies to 4.26"/10.82 cm and center the rod end bearings referenced to the pitch link retainer and the pitch horn. Tighten the jam nuts against the barrel while holding the barrel with a wrench. Recheck for the correct length (4.26"/10.82 cm) and that the rod ends are still centered, adjust as required.

CAUTION

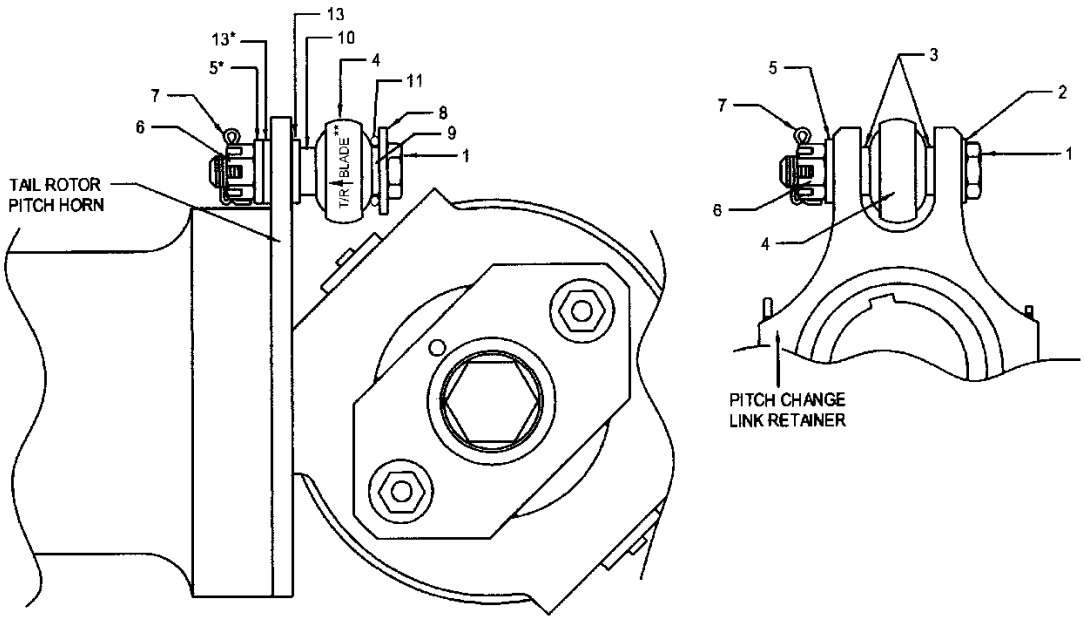
Ensure the right hand thread rod ends are still turned past the witness holes.

E. Using a piece of safety wire, check to ensure the right hand thread rod ends are still turned past the witness holes, adjust as required.

F. Remove the fixture used to center the tail rotor control pedals.

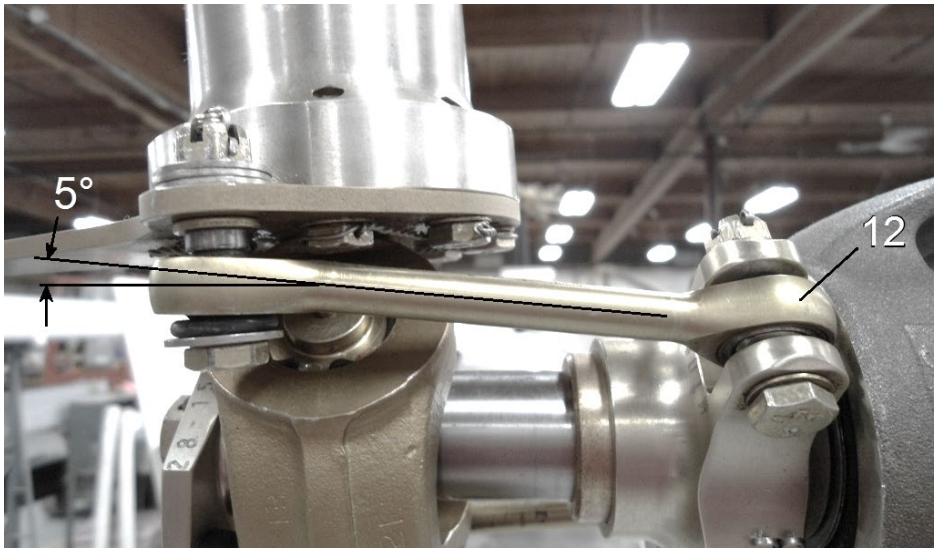
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* WASHER THICKNESS AND QUANTITY MAY VARY DEPENDING ON DYNAMIC BALANCE REQUIREMENTS FOR THE TAIL ROTOR ASSEMBLY

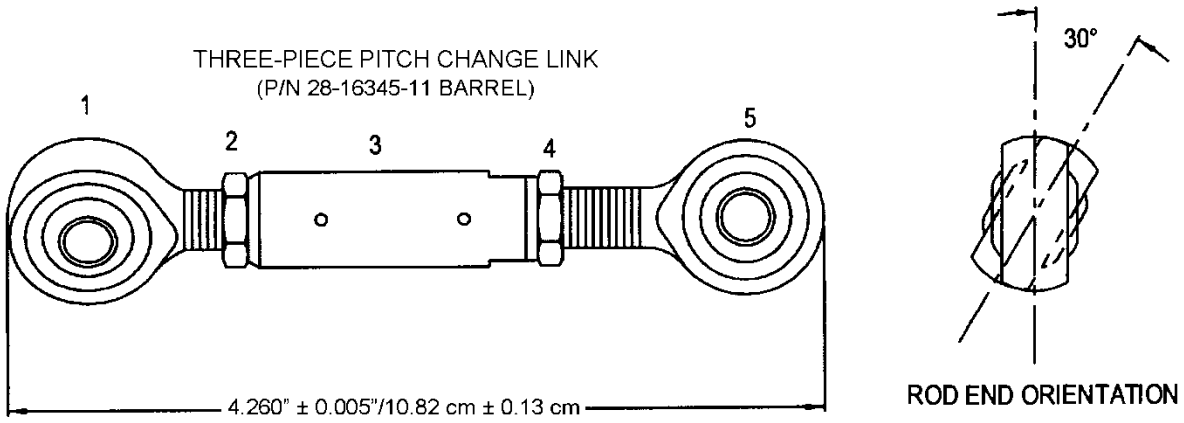
** INSTALL PITCH CHANGE LINK ROD END WITH ARROW POINTING TOWARD THE TAIL ROTOR BLADE (APPLICABLE TO AIRCRAFT MANUFACTURED OR MODIFIED WITH P/N 28-16391-3 PITCH CHANGE LINK ASSEMBLY)

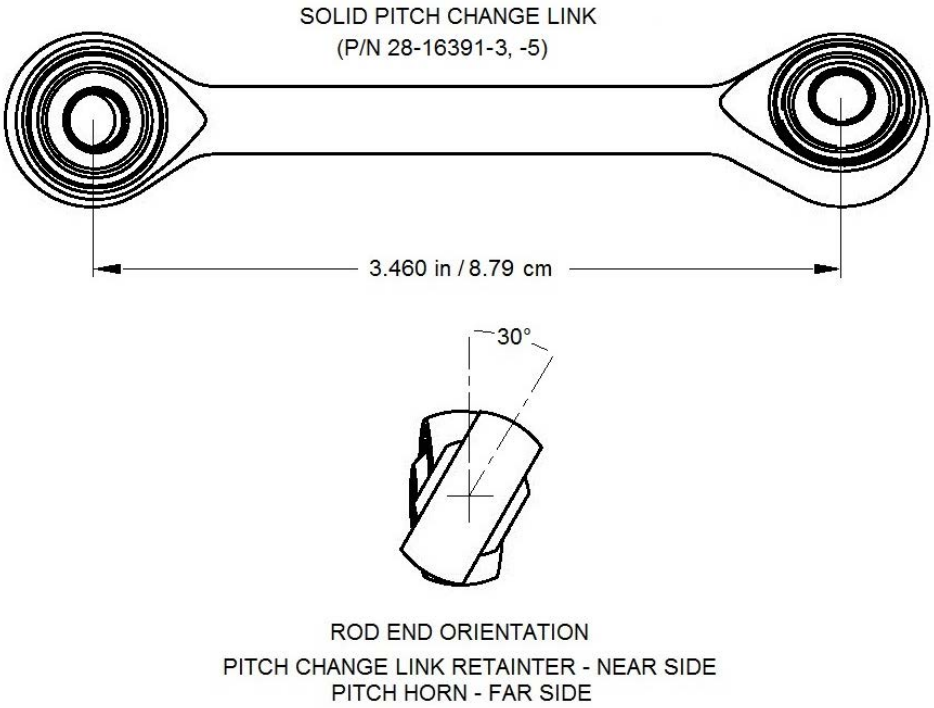


1. Bolt
2. Washer
3. Spacer
4. Pitch Change Link Rod End
5. Washer
6. Nut
7. Cotter Pin
8. Harper Washer
9. Spacer
10. Spacer
11. O-ring
12. Pitch Change Link (28-16391-3, -5 shown)
13. Washer

Figure 12-28. Tail Rotor Pitch Change Link Installation

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1. Rod End Bearing (L/H)
2. Jam Nut (L/H)
3. Barrel
4. Jam Nut (R/H)
5. Rod End Bearing (R/H)

Figure 12-29. Tail Rotor Pitch Change Link

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12-127. Consumable Materials List

ITEM	DESCRIPTION	PART NUMBER
Adhesive	“Hot Stuff” Brand	HS-3
Cleaner	Contact Cleaner (any brand)	
Corrosion Preventive Compound	Corrosion Preventive Compound, Black Bear Brand	Par-Al-Ketone[1]
Grease	Grease, Lubriplate Brand	630-AA[2] (06701)
Grease	Grease	MIL-PRF-81322
Lockwire	Lockwire, .025”	MS20995C25
Lockwire	Lockwire, .032”	MS20995C32
Oil	Any grade internal combustion engine motor oil	
Retaining Compound	Loctite 635	63531
Solvent	Citra-Safe, Inland Technology Incorporated	6850-01-378-( )
Solvent	Extreme Simple Green, Sunshine Makers, Inc.	13440
String	Cotton string	
Tape	Double back foam tape, 3M Brand	4016-1
Thread Sealant	Thread sealant, Loctite 277	27731
Thread Sealant	Thread sealant, Loctite Threadlocker Blue 242[3]	24200
Thread Sealant	Thread sealant, Vibra-Tite Brand	VC-3

[1] Or MIL-C-52, Type 1
[2] MIL-PRF-81322 is an acceptable alternate.
[3] Acceptable alternate for Vibra-Tite VC-3.

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ENSTROM TH-28/480 SERIES MAINTENANCE MANUAL

SECTION 13

POWERPLANT

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SECTION 13

POWERPLANT

13-1. Powerplant

13-2. Description – Powerplant

Enstrom TH-28/480 series helicopters are equipped with a Rolls-Royce 250-C20W reverse flow, free power turbine, turbo-shaft engine. The engine is rated at 420 SHP (313 kW); however, engine power is limited depending on model and drive system configuration of the helicopter (Refer to Table 13-1). The Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) contains a complete description of the engine and its specifications.

The engine is mounted in the center air frame pylon in an exhaust down, compressor aft orientation by three engine mounts located on the accessory gearbox. Access to the engine is provided by two large hinged panels, one on either side of the aircraft, and a bottom access panel located underneath the engine. The engine is equipped with adapting parts and connections to the fuel, oil, electrical, instrument, and engine control systems. Maintenance instructions which pertain specifically to the engine are contained in the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

Table 13-1. Engine Power Limitations

Helicopter Model	Takeoff Rating (5 Minute Maximum)	Maximum Continuous Power
TH-28 and 480	285 SHP (213 kW)	256 SHP (191 kW)
480 equipped with Increased Rotor Speed Kit (P/N 4230002)	290 SHP (216 kW)	268 SHP (200 kW)
480B	305 SHP (227 kW)	277 SHP (206 kW)

13-3. Engine Assembly

13-4. Troubleshooting – Engine Assembly

A. See the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) for troubleshooting procedures for the engine.

B. Power Assurance Check

If the actual TOT reading is higher than the calculated TOT of the **Engine Power Assurance Chart** in the applicable Rotorcraft Flight Manual and pilot error has been ruled out, the engine will not meet the performance figures called out in the **Performance Data** section of the applicable

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Rotorcraft Flight Manual. Turbine engines normally degrade or lose power through engine operation (Refer to the **Trend Check Procedure** section of the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for further information). A gradual increase in TOT that is above the normal engine degradation trend line normally is caused by a dirty compressor. Performing a compressor wash will normally return the TOT indications to the normal engine degradation trend line. If the actual TOT readings significantly increase or decrease over a short period of time, a potential problem may exist with the engine or an airframe system related to the engine. The following list of maintenance checks will help to determine the cause of the TOT increase or decrease:

(1) Check the engine anti-ice, scavenge air, heater, and defroster valves for proper operation and rigging.

(2) Perform a compressor wash.

(3) Inspect the compressor for FOD.

(4) Inspect the TOT indicating system for proper calibration and operation.

(5) Inspect the torque indicating system for proper calibration and operation.

(6) Refer to the **Low power with high TOT** section of the troubleshooting table in the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

13-5. Internal Cleaning – Engine Assembly

NOTE

Refer the Rolls-Royce 250-C20 Series Operation and Maintenance Manual for the specific maintenance procedures for internally cleaning or flushing the engine.

NOTE

If the optional engine flush kit is installed, the only change in the procedure will be removing the cap from the flush kit fitting and connecting the flush can to the fitting. Reverse the procedure when the cleaning or flushing is complete.

A. Remove the left side aft side cowling from the aircraft (TH-28 and early 480 series).

B. Remove the left side transfer duct (para. 13-23) (TH-28 and early 480 series).

C. Remove the discharge hose from the bleed air collector and remove the top half of the collector.

NOTE

Cap and plug all open lines and fittings to prevent contamination of the engine and airframe systems.

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D. Remove the Scroll to P_C Filter and the Scroll to Bleed Air Valve lines from the engine.

E. Disconnect the customer bleed air lines from the compressor scroll.

F. Ensure the engine anti-ice valve is closed.

G. Pull out the IGN EXCITE circuit breaker.

H. Position the starter ignition lock to ON.

I. Clean the compressor I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

J. Reinstall and reconnect the lines removed or disconnected.

K. Install the top half of the bleed air collector and install the discharge hose.

L. Install the transfer duct (para. 13-26).

WARNING

The following step is to be performed by authorized personnel.

M. Ground run the aircraft for 5 minutes to dry the engine. Open the engine anti-ice valve and operate the customer bleed air systems. Complete the engine drying as soon as possible after the cleaning process.

13-6. Removal – Engine Assembly

NOTE

The following instructions are only for a standard aircraft. Additional steps may be required depending on installed optional equipment.

A. Disconnect the battery and pull the fuel shutoff valve "OFF."

B. Remove the left and right side engine access panels, left and right aft side cowling, engine fire pan and burner drain lines, baggage compartment forward access panels, co-pilot side belly access panel, and bottom engine access panel.

C. Remove the upper plenum/air inlet and transfer ducts.

D. Drain the engine oil reservoir (para. 4-8).

E. Remove the forward flex plate assembly (para. 11-19, F).

F. Remove the eductor and exhaust stacks (para. 13-11 and 13-16).

G. Disconnect the engine anti-ice cable from the anti-ice valve and remove the switch and bracket from the valve. Remove the cable bracket from the bottom of the engine.

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H. Remove the fire curtain aft panel.

I. Remove the cowl support between the lower fire curtain aft panel and the lower aft cowl assembly.

J. Disconnect the following electrical connections:

(1) Upper and lower chip detectors

(2) Ignition module

(3) N_1 and N_2 tach generators

(4) Fuel filter differential pressure switch

(5) Starter-generator

(6) Turbine outlet temperature (TOT)

K. Disconnect the customer bleed air lines from the compressor scroll and scavenge air valve from scavenge air flex-line.

NOTE

Cap and plug all open lines and fittings to prevent contamination of the engine and airframe system.

L. Disconnect the following engine oil lines:

(1) Torque pressure

(2) Engine oil pressure

(3) Oil inlet

(4) Oil Outlet

(5) Oil vent

M. Disconnect the fuel inlet line.

N. Disconnect the accessory gearbox vent.

O. Disconnect the linear actuator from the power turbine control arm and remove the droop compensation system (para. 13-110).

P. Remove the oil line between the engine gearbox and the no. 7 and no. 8 nozzle.

Q. Disconnect the control cable from the gas producer control arm and remove the cable bracket from the engine fire pan.

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R. Disconnect the fire curtain from the forward firewall bulkhead.

S. Remove the fire detection system from the mounting clips along the pylon bay tubes and the mounting clips on the engine. Coil the fire detector and position it in the forward-left position of the bay.

T. Disconnect the fuel lines from the fuel flow transducer and their mounting clamps from the pylon (optional equipment).

U. Remove the pylon bay tubes.

V. Remove the bell mouth inlet from the compressor inlet.

NOTE

Install a cover over the compressor inlet to prevent foreign debris from entering the compressor.

W. Install the engine hoist (T-0137) and connect to the top engine mount using the following procedures:

(1) Clamp the hoist onto the left side of the aft crosstube.

NOTE

The use of some older engine removal hoists may require removal of the maintenance step from the aft cross tube.

(2) Install the pulley bracket assembly by removing the nuts and washers from the main rotor transmission aft mounting bolts, install the bracket assembly, and reinstall one washer and nut on the bolts. Route the hoist cable and pulley assembly through the pylon and hook the pulley on the bracket assembly.

(3) Install the end of the hoist cable into the top engine mount and take up the slack in the cable with the hoist.

(4) Place adequate padding under the engine to prevent damage to the engine in the event that the hoist cable breaks.

X. Loosen the top engine to pylon mount nuts.

Y. Remove the left and right side engine to pylon mount nuts, washers, shims, and bolts.

NOTE

Keep the shim stack-ups together to properly position the engine during reinstallation.

Z. Remove the top mount nuts and lower engine to a suitable dolly using the hoist.

AA. Disconnect the hoist cable from the top engine mount and remove the engine hoist from the aircraft.

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AB. If the same built up engine is to be reinstalled, refer to paragraph 13-7 (Installation - Engine Assembly). If the engine adapting assembly is to be removed, refer to paragraphs 13-116 and 13-117 (Removal and Installation - Engine Adapting Assembly).

13-7. Installation - Engine Assembly

NOTES

The following instructions are only for a standard aircraft. Additional steps may be required depending on installed optional equipment.

Torque all bolt assemblies and fitting connections to standard torque if the torque is not specified in the instructions.

A. Position the engine under the aircraft.

B. Install the engine hoist (T-0137) and connect to the top engine mount using the following procedures:

(1) Clamp the hoist onto the left side of the aft crosstube.

NOTE

The use of some older engine removal hoists may require removal of the maintenance step from the aft cross tube.

(2) Install the pulley bracket assembly by removing the nuts and washers from the main rotor transmission aft mounting bolts, install the bracket assembly, and reinstall one washer and nut on the bolts. Route the hoist cable and pulley assembly through the pylon and hook the pulley on the bracket assembly.

(3) Route the hoist cable through the top engine mount nut and jam nut and the pylon top engine mount and install the end of the hoist cable into the top engine mount.

(4) Place adequate padding under the engine to prevent damage to the engine in the event that the hoist cable breaks.

C. Lift the engine from the dolly using the hoist, start the top mount through the pylon mount, install the pylon mount nut and jam nut.

D. Install the shim stack-ups, washers, bolts, and nuts in the left and right engine to pylon side mounts; torque the nuts.

CAUTION

Do not overtighten the pylon mount and jam nuts. Stress on the pylon structure and misalignment of the drive and other associated engine systems may result.

E. Turn the top mount nut until it contacts the pylon mount and tighten one more flat (1/6 of a turn). Lower the jam nut against top mount nut, tighten and safety wire (.032).

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F. Disconnect the hoist cable from the top mount and remove the engine hoist from the aircraft. Install new nuts on the main rotor transmission aft mount bolts and torque to 240 in-lbs/27.3 Nm. Reinstall the maintenance step as required.

G. Install the pylon bay tubes.

H. Connect the fuel lines to the fuel flow transducer and attach the support clamps to the pylon (optional equipment).

I. Uncoil the fire detector and install it in the mounting clips.

J. Install the bell mouth inlet on the compressor inlet.

K. Attach the fire curtain to the forward bulkhead firewall.

L. Install the gas producer control cable bracket on the engine fire pan and connect the cable to the gas producer control arm.

M. Connect the oil line between the engine gearbox and the no. 7 and no. 8 nozzle.

N. Install the droop compensation system (paragraph 13-113) and connect the linear actuator to the power turbine control arm.

O. Connect the accessory gearbox vent.

P. Connect the fuel inlet line.

Q. Connect the following engine oil lines:

(1) Oil vent

(2) Oil outlet

(3) Oil inlet

(4) Engine oil pressure

(5) Torque pressure

R. Connect the customer bleed air lines to the compressor scroll, connect the scavenge air valve to the scavenge air flex-line.

S. Connect the following electrical connections:

(1) TOT

(2) Starter-generator

(3) Fuel filter differential pressure switch

(4) N_1 and N_2 tach generators

(5) Ignition module

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(6) Upper and lower chip detectors

NOTE

If installing an engine other than the one removed, calibrate the “Passive” TOT indicating system (para. 7-53).

NOTE

If the lower pulley position and the drive belt tension were not changed during the engine removal/replacement procedure, the lower pulley alignment check may be omitted. Perform the alignment check if the alignment is in question.

T. Verify the engine output shaft to lower drive pulley alignment (para. 11-17).

U. Install the forward flex plate assembly (para. 11-24, F).

V. Service the engine oil reservoir (para. 4-7).

W. Check the rigging of engine power controls and the droop compensation system (para. 13-93 through 13-93.1 and 13-109).

NOTE

Ensure that the position of the engine anti-ice control cable and the valve agree before reconnecting.

X. Install the anti-ice cable bracket onto the bottom of the engine. Connect the engine anti-ice cable to the anti-ice valve and install the anti-ice switch and bracket onto the valve. Adjust the switch so that the ANTI-ICE segment of the caution panel illuminates when the valve is moved from the closed position.

CAUTION

Remove the covers from the lower plenum assembly and inspect the lower plenum for FOD before motoring the engine.

NOTE

Before motoring the engine, ensure the IGN EXCITE circuit breaker is pulled out.

Y. Push the fuel valve "ON", bleed the engine fuel system (refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual).

Z. Connect the battery, motor the engine and ensure engine oil pressure is indicated in the cockpit. If no pressure indication, refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

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AA. Install the cowl support.

AB. Install the fire curtain aft panel.

AC. Install the exhaust stacks and the eductor (para. 13-19 & 13-14). Ensure the eductor does not contact the engine exhaust stacks.

AD. Install upper plenum/air inlet and transfer ducts (para. 13-31).

AE. Test run the engine I/A/W the Rotorcraft Flight Manual. Check for fuel and oil leaks.

AF. Perform a post installation inspection I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

AG. Install the bottom engine access panel, engine fire pan and burner drain lines, left and right aft side cowlings, baggage compartment forward access panels, co-pilot side belly access panel, and left and right side engine access panels.

AH. Perform a maintenance test flight (para. 4-61).

13-8. Engine Exhaust System

13-9. Description – Engine Exhaust System

The exhaust system consists of two (2) exhaust stacks and clamps and an exhaust eductor. The right side exhaust stack also has a fitting that is attached to the accessory gearbox vent line. The eductor which is mounted to the aft crosstube is used to further direct the exhaust gases coming out of the stacks and to cool the exhaust gases using the surrounding ambient air.

13-10. Eductor

13-11. Removal – Eductor

A. Remove the four screw and nut assemblies attaching the eductor to the mounting clamps and remove the eductor from the aircraft.

13-12. Inspection – Eductor

A. Inspect the eductor and mounting clamps for cracks, dents, and burned out or buckled areas.

13-13. Repair – Eductor

A. Stop drill small cracks in the eductor.

B. Repair larger cracks and burnt out areas of the eductor I/A/W AC 43.13-1B.

C. Replace components of the eductor that are not repairable or economically unrepairable.

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13-14. Installation – Eductor

A. Place the eductor into position and install the mounting hardware. Do not tighten the hardware at this time.

B. Position the eductor so that exhaust stacks are centered in the front side of the eductor and the aft side is oriented 7°±1° down in reference to the longitudinal leveling location (Figure 4-13). Ensure a 3/8 in/9.5 mm clearance between the forward, outboard bottom edges of the exhaust stacks and the interior edge of the eductor. Tighten the mounting hardware.

NOTE

Adjust the position of the eductor and/or exhaust stacks if the eductor contacts the exhaust stacks after the mounting hardware is tightened.

13-15. Exhaust Stacks

13-16. Removal – Exhaust Stacks

A. Remove the eductor (para. 13-11).

B. Remove the bottom engine access panel.

C. Disconnect the accessory gearbox vent line from the right side exhaust stack.

D. Remove the exhaust clamps and the exhaust stacks from the mounting flanges on the engine.

13-17. Inspection – Exhaust Stacks

A. Inspect the exhaust stacks for cracks, dents, and burned out or buckled areas. Inspect the exhaust stack flanges for evidence of exhaust gas blow-by.

B. Inspect the exhaust clamps for cracks, dents, corrosion, and nicks.

13-18. Repair – Exhaust Stacks

A. Stop drill cracks and repair I/A/W AC 43.13-1B.

B. Patch burnt out areas I/A/W AC 43.13-1B.

C. Replace exhaust stacks that are not repairable or economically unrepairable.

D. Blend out minor nicks and damage from the exhaust clamps.

E. Replace clamps that are cracked or uneconomically repairable.

13-19. Installation – Exhaust Stacks

A. Position the exhaust stacks on engine flanges and install the exhaust clamps.

B. Position the stacks so the outlets are level and orientated down the aircraft centerline. Ensure a 1/2 in/12.7 mm clearance between the inboard sides of the exhaust stacks.

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C. Torque the exhaust clamps to 40 in-lbs/4.5 Nm and tap the clamps with a plastic mallet. Re-torque the clamps and re-tap the clamps until torque holds at 40 in-lbs/4.5 Nm. Safety wire the clamps (.032).

D. Reconnect the accessory gearbox vent line to the right side exhaust stack.

E. Install the bottom engine access panel.

F. Install the eductor (para. 13-14).

13-20. Air Induction System

13-21. Description – Air Induction System (Figure 13-1)

The upper plenum chamber is equipped with dual full flow swirl tube inertial type particle separators. Particle laden air is directed into the upper plenum chamber through a series of swirl tubes which impart a centrifugal spin to the air as it enters the tubes, thereby inertially separating the heavier foreign matter. The particulate matter falls down into a collector and is then purged overboard through one of two bleed air driven venturi-type ejectors that exit at the aft side of the upper plenum. Operation of the scavenge ejectors is manually controlled by the pilot. During takeoff, hovering, or cruise operations in dusty atmospheric conditions, the bleed air shutoff valve can be opened by placing the SCAV AIR control handle to the ON position. The inlet air moves from the upper plenum chamber to the lower plenum chamber via two (2) transfer ducts located on either side of the aircraft. The lower plenum chamber is mounted directly behind the engine and is connected to the engine by a bell mouth inlet. The inlet is attached to the engine and a seal on the inlet provides the seal between the inlet and the lower plenum chamber. The lower plenum chamber has drain holes located at its lowest point to drain any moisture that might happen to accumulate during operation or while the engine is not running. A fitting is also installed in the left side of the lower plenum for connection to the ENG INLET AIR caution light differential pressure switch.

13-22. Transfer Ducts

13-23. Removal – Transfer Ducts

A. Remove the left and right aft side cowlings.

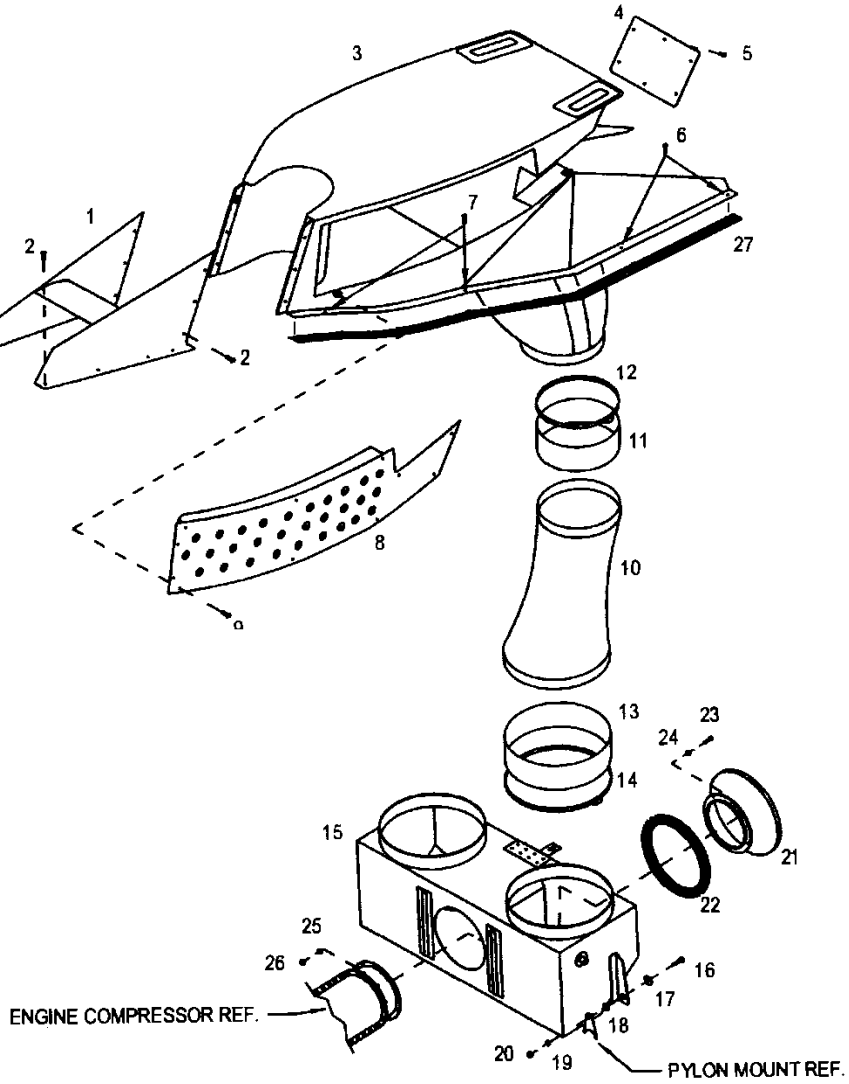
B. Loosen the clamps securing the duct boots to the upper and lower plenums.

C. Remove the ducts by rolling the ends of the duct boots off of the seal lips of the upper and lower plenums and back onto the duct.

CAUTION

Install covers over the lower plenum openings to prevent the entry of foreign debris into the lower plenum and the engine.

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1.	Forward Scoop	15.	Lower Plenum
2.	Screw	16.	Bolt
3.	Upper Plenum/Air Inlet	17.	Washer
4.	Access Panel	18.	Spacer
5.	Screw	19.	Washer
6.	Screw	20.	Nut
7.	Screw	21.	Inlet
8.	Particle Separator	22.	Seal
9.	Screw	23.	Screw
10.	Transfer Duct	24.	Washer
11.	Boot	25.	Washer
12.	Clamp	26.	Nut
13.	Boot	27.	Spacer
14.	Clamp		

Figure 13-1. Air Induction System

13-24. Inspection - Transfer Ducts

A. Inspect the ducts for cracks and overall condition.

B. Inspect the duct boots for tears, separation of the boot seams, and security of the bond to the transfer duct.

13-25. Repair - Transfer Ducts

A. Repair damage to the ducts I/A/W AC 43.13-1B.

B. Replace duct boots that are torn. Bond the rubber boots to the transfer duct using the following procedure:

(1) Thoroughly degrease both ends of the transfer duct for 3-4 inches/7.6-10.2 cm and the rubber boots if the old boots are being rebonded.

(2) Lightly sand the ends of the transfer ducts and the rubber boots.

(3) Apply three (3) coats of EC776 3M Adhesive to the ends of the transfer ducts to approximately a width of 1.25 inches/3.2 cm from the end of the ducts. Allow the adhesive to become tacky between coats.

(4) Install the rubber boots onto the transfer duct while the third coat of adhesive is still tacky. Install the boot so that approximately one half (½) of the boot width is bonded on the duct.

C. Rebond boot seams using Scotch-Grip™ 2141 Rubber and Gasket Adhesive.

13-26. Installation - Transfer Ducts

CAUTION

Ensure the covers are removed from the lower plenum openings and inspect inside the lower plenum for FOD before installing the transfer ducts.

A. Install the ducts into position and unroll the rubber boots off of the ducts and onto the seal lips on the upper and lower plenums.

CAUTION

Do not over tighten the clamps used to secure the transfer ducts. If the clamps are over tightened they can cause damage to the seal lips on the upper and lower plenums.

B. Position the clamps above the upper plenum seal lip and below the lower plenum seal lip, ensure enough of the duct boot is past the seal lip to seal the duct and tighten the clamps.

C. Install the left and right aft side cowlings.

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13-27. Upper Plenum/Air Inlet

13-28. Removal - Upper Plenum/Air Inlet

A. Remove the transfer ducts (para. 13-23).

B. Remove the air exit ducting the aft end of the upper plenum.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

C. Disconnect the scavenge air line from the upper plenum.

D. Disconnect the anti-collision beacon electrical connector if applicable.

E. Remove the screws attaching the upper plenum to the aircraft.

F. Remove the plenum by slightly lifting it and pulling aft.

G. Place the upper plenum in a location that will prevent the plenum from being damaged.

13-29. Inspection - Upper Plenum/Air Inlet

A. Inspect the upper plenum for cracks, cleanliness, condition of the outlets, security and overall condition of the particle separators and the air lines in the upper plenum/air inlet.

B. Inspect for indications of the drive belt rubbing on the upper plenum/air inlet assembly.

13-30. Repair - Upper Plenum/Air Inlet

A. Repair damage to the upper plenum/air inlet I/A/W AC 43.13-1B. Replace the upper plenum/air inlet if not repairable.

(1) Install new hand-holds in the plenum/air inlet in accordance with the following procedure (Figure 13-1).

a. Remove plenum/air inlet assembly (3).

b. Remove aft access plate (4) and swirl tube assemblies (8).

c. Use a suitable grinder to grind off the bonded flange of the hand-hold assembly from the plenum/air inlet. After grinding off the flange and any excess residue, remove the remainder of the hand-hold from the plenum/air inlet assembly. (The adhesive used to attach the hand-hold is blue or green.)

d. Remove grinding residue from the plenum/air inlet assembly and wipe clean.

e. Bond the replacement hand-hold into the plenum/air inlet with Hysol 9359.3, or equivalent (locally procured).

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f. Repair the paint on the plenum/air inlet as necessary.

g. Install the aft access plate (4) and the swirl tube assemblies (8).

h. Install the plenum/air inlet assembly (para. 13-31).

B. Shim the upper plenum/air inlet assembly to obtain the minimum drive belt clearance using the following procedure:

(1) Remove the upper plenum/air inlet assembly.

(2) Remove the foam tape from the assembly mounting flanges and clean the mounting flanges.

(3) Position a shim, P/N 4120525-11 (.063”/1.6 mm) or 4120525-13 (.125”/3.2 mm), on each mounting flange and trim to fit as required. Determine shim thickness from previous clearance check.

(4) Bond the shims to the mounting flanges using WELD-ON® 45™ or Loctite® H3300™ or equivalent.

(5) Drill through the shims at the hardware locations on the flanges.

(6) Install the upper plenum/air inlet assembly and check for minimum clearance.

13-31. Installation - Upper Plenum/Air Inlet

A. Install the plenum by positioning it with the outlets over the area where the baffling is installed. Lower the plenum until it is about to contact the aircraft, then slide the plenum forward until the outlets are properly positioned under the fuel bladder support structure and the forward edge of the plenum is properly mated with the air deflector on top of the cabin.

B. Install the attaching screws and tighten. Check for .125”/3.2 mm minimum clearance between the drive belt and the upper plenum/air inlet. Refer to the shimming procedure in paragraph 13-30. B. if clearance is less than .125”/3.2 mm.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

C. Connect the anti-collision light electrical connector if applicable.

D. Connect the scavenge air line and tighten.

E. Install the air exit ducting.

(1) Remove old 732 RTV residue with a plastic putty knife, or equivalent.

(2) Apply a bead of 732 RTV between the air exit ducting closeout and the air exit duct assemblies, as required.

F. Install the transfer ducts (para. 13-26).

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13-32. Particle Separator

13-33. Removal - Particle Separator

A. Remove the access panel located on the aft side of the upper plenum.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

B. Disconnect and remove the scavenge air lines from the tee and the particle separators.

C. Remove the attachment screws and remove the particle separator from the upper plenum.

D. If required, remove the ejectors by removing the bolts and clamps that attach the ejector to the particle separator.

E. If required, remove the scavenge air line fitting.

13-34. Inspection - Particle Separator

A. Inspect the particle separator for broken swirl tubes, cracks, cleanliness, and overall condition and security of the ejectors.

B. Inspect the scavenge air lines and fittings for dents, nicks, scratches, and security of installation.

13-35. Repair - Particle Separator

A. Contact The Enstrom Helicopter Corporation Customer Service for detailed damage and repair limitations for the particle separators.

NOTE

The following repair procedure only applies to Pall Land and Marine Corp. Centrisep® particle separator, P/N ECD4066-3 & -4 (CE-00902-1L & -1R) .

B. Replace broken swirl tubes in using the following procedure:

NOTE

Replacement of broken swirl tubes is limited to 10% (18 tubes) of the total tubes in a particle separator. Additionally, the replacement tubes must be distributed over a wide area of the particle separator. For example; replace the particle separator if more than nine (9) adjacent tubes must be replaced.

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CAUTION

The particle separators do not have to be removed from the upper plenum/air inlet assembly for replacement of broken swirl tubes; however, pieces of the broken swirl tube that cannot be removed from the separator through the installation hole must be removed by removing the separator from the upper plenum/air inlet and removing the ejectors from the particle separator

CAUTION

Do not damage the rim of the installation hole in the inlet panel. Do not pull the tube with excessive force because this will cause damage to the thin sheet metal inlet panel.

(1) Using a needle nose pliers, remove the remains of the damaged swirl tube. This can be accomplished by carefully gripping the center of the swirl tube with the needle nose pliers and twisting to break the tube into pieces. Do not remove or damage the outlet tube (See Figure 13-2).

(2) Position the repair tube in the vacant hole. Push the repair tube through the hole using thumb pressure until the groove in the tube O.D. engages the inlet panel. A shop towel is recommended for thumb protection and ease of inserting the tube.

(3) The tube is correctly installed when the groove on the repair tube fully engages with the inlet panel hole. The repair tube must be tight and should not rotate or appear loose.

C. Remove minor nicks and scratches from the scavenge air lines and fittings. Replace scavenge air lines and fittings that cannot be repaired I/A/W AC 43.13-1B.

D. Tighten loose lines and fittings.

13-36. Installation - Particle Separator

A. If removed, install the ejectors and the scavenge air line fittings.

B. Position particle separator in upper plenum, install attaching screws and tighten.

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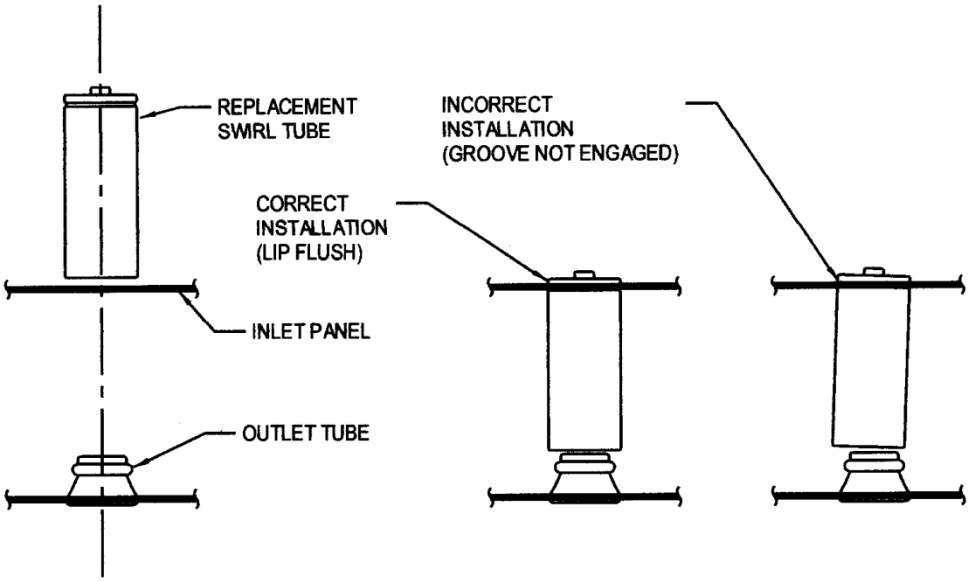


Figure 13-2. Swirl Tube Replacement

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CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

C. Install and tighten the scavenge air line between the particle separator and the tee.

D. Install the access panel on the upper plenum.

13-37. Lower Plenum

13-38. Removal – Lower Plenum

A. Remove the bottom aft cowling.

B. Remove the eductor.

C. Remove the cowling mounting bracket located above the aft crosstube.

D. Remove the transfer ducts (para. 13-23).

NOTE

Removal of the upper plenum (para. 13-28) is not required; however, it would provide more access to the area.

CAUTION

Ensure that all the attachment hardware from the bell mouth is accounted for and that the engine inlet is covered when the bell mouth inlet is removed.

E. Remove the bell mouth inlet from the engine inlet and remove the inlet from the lower plenum via the plenum inlet on the left side.

F. Disconnect the differential pressure air line from the right side of the lower plenum.

G. Disconnect the engine wash line from the aft side of the lower plenum.

H. Remove the hardware from the lower plenum mounting brackets.

CAUTION

Care must be used to prevent damage to the lower plenum during removal.

I. Remove the lower plenum via the bottom of the aircraft.

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13-39. Inspection – Lower Plenum

A. Inspect the lower plenum for cracks, damage, cleanliness, condition and security of mounting brackets, condition and security of the protective shield, and differential air pressure line fitting for condition and security. Ensure the drain holes are open and clean.

B. Inspect the bell mouth inlet for cleanliness and cracks.

C. Check the bell mouth inlet seal for condition and loose bonding.

13-40. Repair – Lower Plenum

A. Repair damage to the lower plenum I/A/W AC 43.13-1B.

B. Bond the mounting brackets and the air line fitting to the lower plenum using acrylic adhesive (Magnacryl Brand # 506).

C. Replace the mounting brackets if not repairable.

D. Replace the protective shield double back adhesive tape as required.

E. Replace the bell mouth inlet if cracked.

F. Replace bell mouth inlet seal if worn or damaged. Use the following procedure to replace the seal.

G. Bond the seal to the bell mouth inlet as follows:

WARNING

Methylethylketone (MEK) is toxic and must be used with extreme caution. Make sure adequate ventilation is provided. Repeated or prolonged contact with the skin should be avoided. Low-volatile substitutes, such as Extreme Simple Green or Citra-Safe, are preferred solvents.

(1) Remove the existing seal and clean the bond surface on the bell mouth inlet with Extreme Simple Green, or equivalent. Lightly abrade the bond surface with 220 grit sandpaper or equivalent. Repeat cleaning the bond surface.

(2) Apply a coat of EC776 3M™ Adhesive or equivalent to the bell mouth bond surface and to the seal bond surface. Allow the adhesive to dry until no longer tacky (approximately 30 minutes). Apply a second coat of adhesive and allow to dry until no longer tacky.

(3) Revive the adhesive on both bond surfaces with Extreme Simple Green, or equivalent, and carefully fit the seal onto the bell mouth. Apply weighted uniform pressure to ensure a good bond and allow two (2) hours curing time before reinstalling the bell mouth inlet. Allow twenty four (24) hours curing time before using the aircraft.

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13-41. Installation – Lower Plenum

CAUTION

Care must be used to prevent damage to the lower plenum during installation.

A. Install the plenum in the airframe by reversing the removal procedure (paragraph 13-38).

B. Install the mounting hardware but do not tighten at this time.

CAUTION

Remove the cover from the engine inlet and perform a visual inspection of the inlet before installing the bell mouth inlet.

C. Install the bell mouth inlet through the left side inlet of the plenum. Attach the inlet to the engine and torque the hardware to 10-15 in-lbs/1.1-1.7 Nm.

D. Position the plenum so a good seal is formed between the plenum and the bell mouth inlet, tighten the mounting hardware.

(1) Install spacers (Figure 13-1, 18), as required, between the tab on the pylon and the plenum attachment bracket to ensure contact between the plenum and the bellmouth seal.

E. Connect the differential pressure air line to the plenum fitting. Torque 7-10 in-lb/0.8-1.0 Nm.

F. Connect the engine wash line to the plenum fitting.

G. If removed, install the upper plenum (para. 13-31).

H. Install the transfer ducts (para. 13-26).

I. Install the cowling mounting bracket.

J. Install the eductor.

H. Install bottom aft cowling.

13-42. Scavenge Air Lines

13-43. Removal – Scavenge Air Lines

A. Remove the left and right aft side cowlings.

B. Remove the eductor (para. 13-11).

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

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C. Disconnect the scavenge air line sections from the unions.

D. Remove the lines from the mounting clamps.

E. Disconnect the control cable from the scavenge air valve.

F. Disconnect the scavenge air valve from the bleed air manifold and remove.

13-44. Inspection – Scavenge Air Lines

A. Inspect the lines for cracks, dents, nicks, and scratches.

B. Inspect the scavenge air valve for proper operation.

13-45. Repair – Scavenge Air Lines

A. Remove minor nicks and scratches from the air lines.

B. Replace lines that are cracked, kinked or dented.

C. Replace the valve assembly if not operating properly and cannot be economically repaired.

13-46. Installation – Scavenge Air Line

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

A. Connect the scavenge air valve to the bleed air manifold.

B. Connect the control cable to the scavenge air valve and ensure the valve position agrees with the control cable position.

C. Install the lines in the mounting clamps.

D. Connect the line segments to the unions.

E. Install the fire curtain aft panel.

F. Install the eductor (para. 13-14).

G. Install the left and right aft side cowlings.

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13-47. Scavenge Air Control Cable

13-48. Removal – Scavenge Air Control Cable

NOTE

Be thoroughly familiar with the cable routing before removing the cable.

A. Open the right side engine access panel.

B. Remove the right and left side keel access panels.

C. Disconnect the control cable from the scavenge air valve.

D. Remove the cable from the mounting clamps.

E. TH-28, S/N 3004 and 3006:

(1) Remove the control box from the aft end of the center pedestal.

(2) Remove the retaining nut from the backside of the control cable and pull the cable out of the aircraft through the control box.

F. 480, S/N 5001:

(1) Remove the control box from the left side of the center pedestal.

(2) Remove the retaining nut from the backside of the control cable and pull the cable out of the aircraft through the control box.

G. All subsequent TH-28, 480, and 480B:

(1) Remove the slider control panel from the aft end of the center pedestal.

(2) Loosen the set screws in the cable clamp and the cable stop for the control cable.

(3) Remove the control cable and the cable stop.

13-49. Inspection – Scavenge Air Control Cable

A. Inspect the control cable for kinks, breaks, and proper operation and mounting.

B. Inspect the mounting bracket and clamps for condition and security of installation.

13-50. Repair – Scavenge Air Control Cable

A. Replace the control cable if damaged or it does not operate properly.

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B. Tighten or replace loose mounting clamps.

C. Repair minor damage to the mounting bracket. Replace if not repairable or economically unrepairable.

13-51. Installation – Scavenge Air Control Cable

A. TH-28/480, S/N 3004 and 3006/5001:

(1) Place the control cable through the opening in the control box and start the retaining nut on the control cable.

(2) Install the cable in the aircraft following the correct routing.

(3) Tighten the retaining nut on the backside of the control box after the cable has been correctly routed and install the control box.

B. All subsequent TH-28, 480, and 480B:

(1) Install the cable in the aircraft following the correct routing.

(2) Install the cable stop into the SCAV AIR slider.

(3) Install the end of the cable into the cable stop, apply thread sealant (VC-3 Vibra-tite) to the engaging threads of the set screw, and tighten the set screw.

(4) Position the cable in the cable clamp and tighten the clamp set screws.

(5) Install the slider control panel on the aft end of the center pedestal.

C. Install the cable in its mounting clamps and tighten the clamps.

D. Ensure the position of the scavenge air valve and the control cable agree and connect the cable to the valve. Check for proper operation of the cable and valve.

E. Install the keel access panels.

F. Close the right side engine access panel.

13-52. Anti-ice Control Cable

13-53. Removal – Anti-ice Control Cable

NOTE

Be thoroughly familiar with the cable routing before removing the cable.

A. Open the left side engine access panel.

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B. Remove the left side keel access panel and the bottom engine access panel.

C. Disconnect the control cable from the anti-ice valve.

D. Remove the cable from the mounting clamps.

E. TH-28, S/N 3004 and 3006:

(1) Remove the control box from the aft end of the center pedestal.

(2) Remove the retaining nut from the backside of the control cable and pull the cable out of the aircraft through the control box.

F. 480, S/N 5001:

(1) Remove the control box from the left side of the center pedestal.

(2) Remove the retaining nut from the backside of the control cable and pull the cable out of the aircraft through the control box.

G. All subsequent TH-28, 480, and 480B:

(1) Remove the slider control panel from the aft end of the center pedestal.

(2) Loosen the set screws in the cable clamp and the cable stop for the control cable.

(3) Remove the control cable and the cable stop.

H. Remove the mounting bracket from the bottom of the engine.

13-54. Inspection – Anti-ice Control Cable

A. Inspect the control cable for kinks, breaks, and proper operation and mounting.

B. Inspect the mounting bracket and clamps for condition and security of installation.

13-55. Repair – Anti-ice Control Cable

A. Replace the control cable if damaged or it does not operate properly.

B. Tighten or replace loose mounting clamps.

C. Repair minor damage to the mounting bracket. Replace if at repairable or economically unrepairable.

13-56. Installation – Anti-ice Control Cable

A. Install the cable mounting bracket on the bottom of the engine.

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B. TH-28/480, S/N 3004 and 3006/5001:

(1) Place the control cable through the opening in the control box and start the retaining nut on the control cable.

(2) Install the cable in the aircraft following the correct routing.

(3) Tighten the retaining nut on the backside of the control box after the cable has been correctly routed and install the control box.

C. All subsequent TH-28, 480, and 480B:

(1) Install the cable in the aircraft following the correct routing.

(2) Install the cable stop into the ANTI ICE slider.

(3) Install the end of the cable into the cable stop, apply thread sealant (VC-3 Vibra-tite) to the engaging threads of the set screw, and tighten the set screw.

(4) Position the cable in the cable clamp and tighten the clamp set screws.

(5) Install the slider control panel on the aft end of the center pedestal.

D. Install the cable in its mounting clamps and tighten the clamps.

E. Ensure the position of the anti-ice valve and the control cable agree and connect the cable to the valve. Check for proper operation of the cable and valve.

F. Install the keel access panel and the bottom engine access panel.

G. Close the left side engine access panel.

13-57. Engine Oil System

13-58. Description – Engine Oil System (Figures 13-3 & 13-4)

The engine oil system consists of an engine oil reservoir, oil cooler, blower assembly, scavenge oil filter, and connecting lines and fittings. The oil reservoir is located on the right side of the engine compartment and is accessible through the right side engine access panel. The oil cooler is located on the right side of the aircraft and is accessible through the oil cooler access panel. The scavenge oil filter with an integral impending bypass pop-out indicator, located at the bottom of the filter bowl, is located on the right side of the aircraft and is accessible through the step access panel. The blower assembly is located behind the lower drive pulley. The assembly consists of a fan mounted on a drive shaft which is mounted on a platform, a connecting drive shaft between the lower pulley and the fan drive shaft, and air intake and exhaust ducts. A thermal bypass valve is not incorporated in the engine oil system.

13-58.1. Bleeding – Engine Oil System

A. Fill the reservoir with oil.

B. Loosen the oil pressure screen cover to provide an air gap between the cover and the housing.

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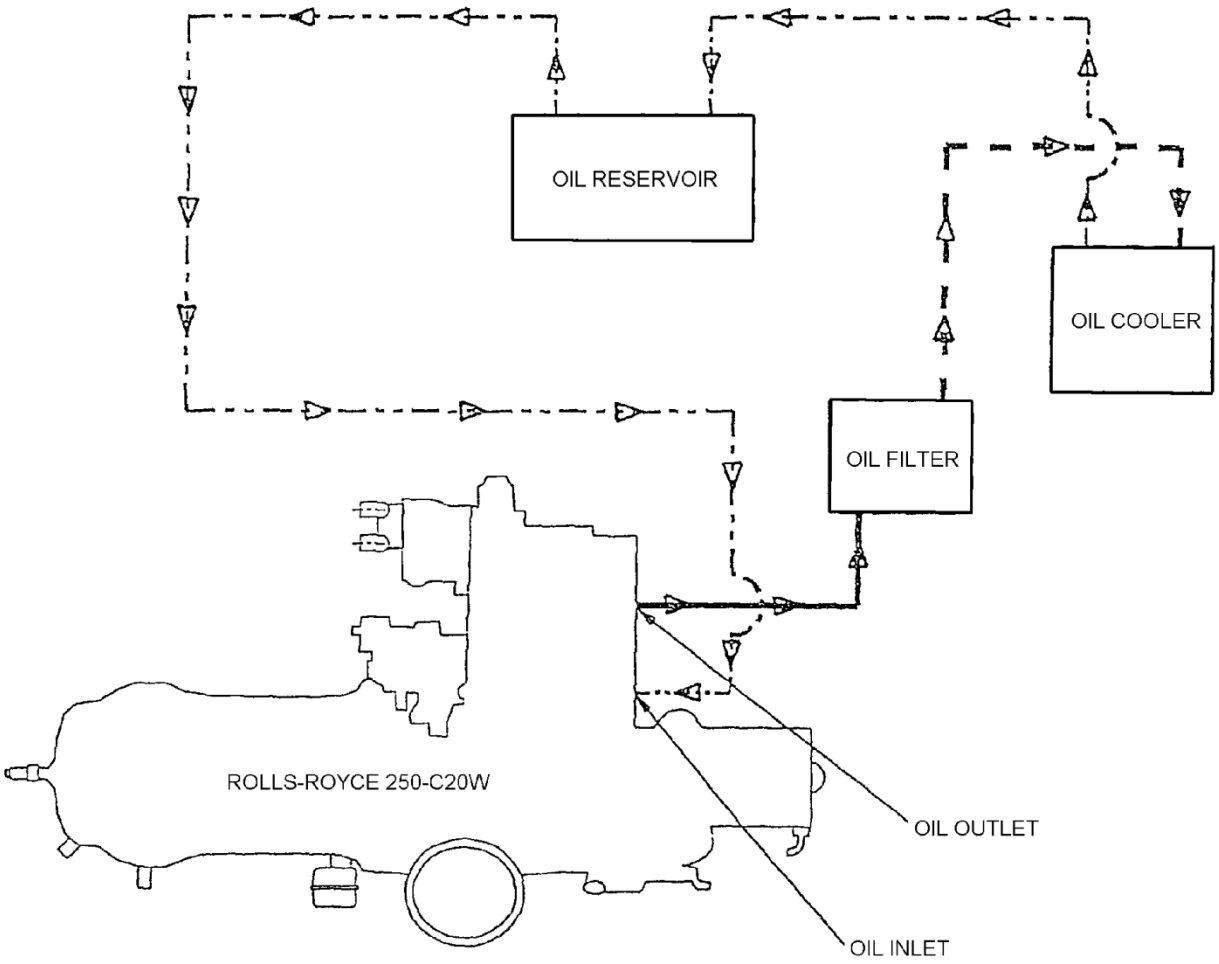
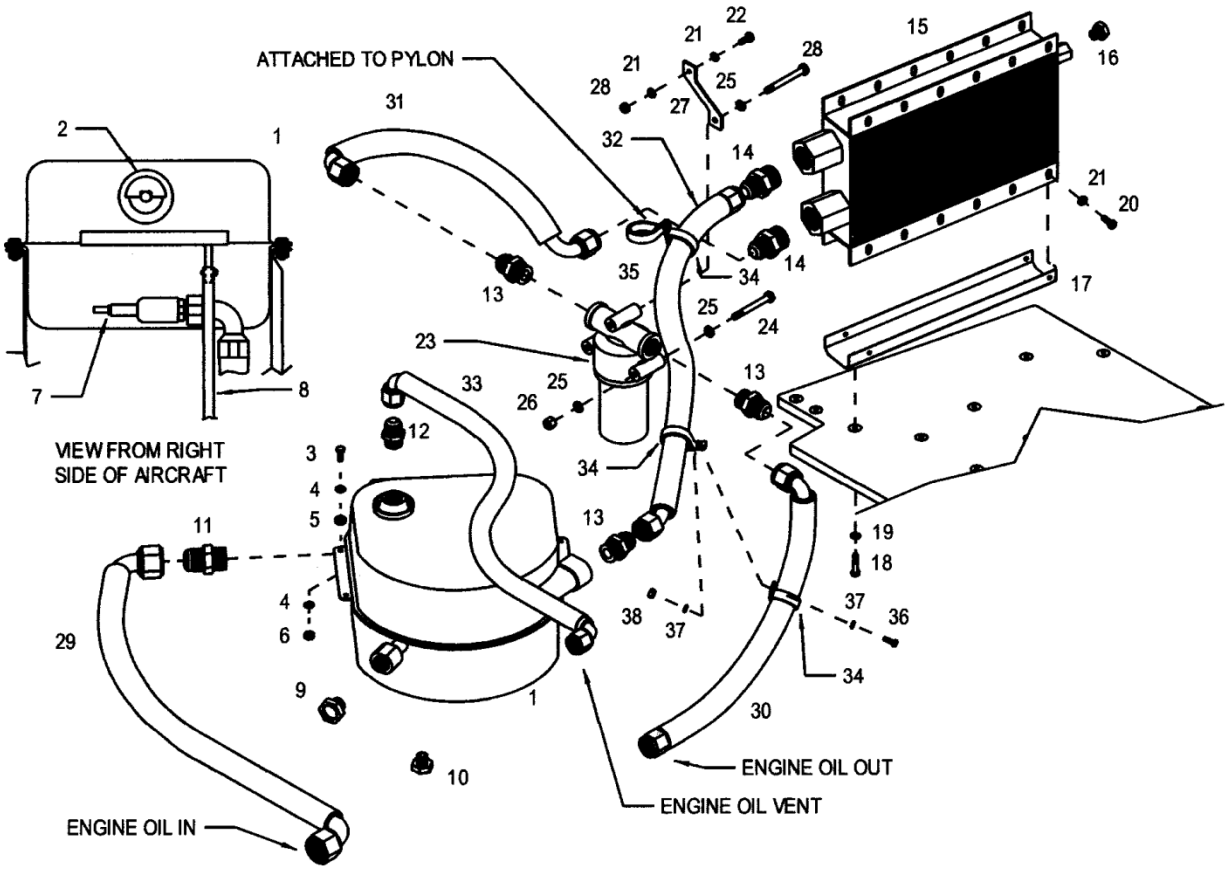


Figure 13-3. Engine Oil System Schematic Diagram

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1.	Engine Oil Reservoir	20.	Screw
2.	Filler Cap Assembly	21.	Washer
3.	Bolt	22.	Bolt
4.	Washer	23.	Scavenge Filter Assembly
5.	Grommet	24.	Bolt
6.	Nut	25.	Washer
7.	Temperature Probe	26.	Nut
8.	Scupper Drain Line	27.	Mounting Bracket
9.	Plug Assembly	28.	Nut
10.	Plug Assembly	29.	Oil Line Assembly
11.	Fitting Assembly	30.	Oil Line Assembly
12.	Fitting Assembly	31.	Oil Line Assembly
13.	Fitting Assembly	32.	Oil Line Assembly
14.	Fitting Assembly	33.	Oil Line Assembly
15.	Oil Cooler	34.	Clamp
16.	Plug Assembly	35.	Clamp
17.	Mounting Bracket	36.	Screw
18.	Screw	37.	Washer
19.	Washer	38.	Nut

Figure 13-4. Engine Oil System Installation

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C. Pull the igniter circuit breaker.

D. Motor the engine with the starter until oil flows from the oil pressure screen cover.

E. Tighten the cover.

F. Motor the engine with the starter (complying with starter limitations) until there is oil pressure showing on the oil pressure gauge.

G. Reset the igniter circuit breaker.

13-59. Oil Reservoir

13-60. Removal – Oil Reservoir

A. Remove the right side engine access panel and the right aft side cowling.

B. Drain the oil reservoir (para. 4-8).

C. Disconnect the engine oil temperature probe.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

CAUTION

Cap or plug all open lines or fittings to prevent contamination.

D. Disconnect the following oil lines:

(1) Oil inlet

(2) Oil Outlet

(3) Oil Vent

E. Remove the mounting hardware and remove the reservoir from the mounting brackets.

F. If required, remove the oil line fittings, temperature probe, and drain valve from the reservoir.

13-61. Inspection – Oil Reservoir

A. Inspect reservoir for dents, cracks, cleanliness, and security of installation.

B. Inspect the filler cap for proper operation and condition of the o-ring seal.

C. Inspect the reservoir for contamination.

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13-62. Repair – Oil Reservoir

NOTE

The reservoir does not have to be pressure tested if the repair was only to the mounting flange.

A. Repair minor cracks in the reservoir I/A/W AC 43.13-1B. Pressure test the reservoir to 5 psi/34 kPa after repairing.

B. Replace the reservoir if any damage affects the capacity or function of the reservoir.

NOTE

Remove the reservoir from the aircraft before flushing to prevent contaminating the engine or oil cooler.

C. Remove contamination from the reservoir by flushing with clean engine oil or solvent. Replace the reservoir if the contamination cannot be removed.

D. Replace o-ring on the filler cap if damaged.

E. Replace the filler cap if not functioning properly.

13-63. Installation – Oil Reservoir

NOTE

Replace all used packing/o-rings.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

A. If removed, install the temperature probe, oil line fittings, and drain plug.

B. Position the reservoir in the mounting brackets, install the mounting hardware.

C. Install the following oil lines:

(1) Oil vent

(2) Oil inlet

(3) Oil outlet

D. Reconnect the engine oil temperature probe.

E. Ensure the drain plug is installed, service the engine oil reservoir (para. 4-7).

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WARNING

The following step is to be performed by authorized personnel only.

F. Ground run the aircraft and check for oil leaks.

G. Install right side engine access panel and the right aft side cowling.

13-64. Oil Cooler

13-65. Removal – Oil Cooler

A. Remove the right side engine access panel and the right aft side cowling.

B. Remove the forward sheet metal structure from the baggage compartment.

C. Drain the cooler via the bottom drain plug.

NOTE

Some residual oil will remain in the lines due to the design of the oil system.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

CAUTION

Cap or plug all open lines or fittings to prevent contamination.

D. Disconnect the oil in and oil out lines from the cooler.

E. Remove the outlet duct from the cooler.

F. Remove the cooler from the mounting bracket/duct.

G. If required, remove the oil line fittings.

NOTE

Replace all used packing/o-rings.

H. Reinstall the bottom drain plug.

13-66. Inspection – Oil Cooler

A. Inspect cooler for dents, cracks, cleanliness, and security of installation.

B. Inspect for bent, damaged, or missing cooling fins.

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C. Inspect the cooler for contamination if removed.

13-67. Repair - Oil Cooler

A. Replace the oil cooler if leaking from the cooling core or seams.

B. Straighten bent cooling fins carefully to prevent from damaging the cooling core.

NOTE

Remove the oil cooler from the aircraft before flushing to prevent contaminating the oil reservoir or the scavenge oil filter.

C. Flush contamination from the cooler using clean engine oil or solvent.

13-68. Installation - Oil Cooler

NOTE

Replace all used packing/o-rings.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

A. If removed, install the oil line fittings.

B. Position the cooler in the mounting bracket, install the hardware.

C. Install the outlet duct.

D. Connect the oil out and oil in lines.

WARNING

The following step is to be performed by authorized personnel only.

E. Ground run the aircraft and check for oil leaks.

F. Service engine oil reservoir (para. 4-7).

G. Install the forward sheet metal structure in the baggage compartment.

H. Install right side engine access panel and the right aft side cowling.

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13-69. Scavenge Oil Filter

13-70. Removal - Scavenge Oil Filter

A. Remove the step access panel.

B. Place a suitable container under the filter assembly and remove the filter bowl.

C. Remove the filter element from the filter assembly.

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

CAUTION

Cap or plug all open lines or fittings to prevent contamination.

D. Disconnect the oil lines from the filter assembly.

E. Remove the filter assembly from the mounting brackets.

13-71. Inspection - Scavenge Oil Filter

A. Inspect the filter assembly for damage, leaks, and cleanliness.

B. Inspect the filter element for metal or carbon particles. Refer to the **Lubrication System** section of the Rolls-Royce 250-C20 Series Operators and Maintenance Manual for specific maintenance actions for a contaminated filter element.

NOTE

The following bypass indicator functional test is only applicable to helicopters equipped with the Purolator/Facet Scavenge Oil Filter Assembly, P/N 1740001-01. 480Bs, serial number 5044 and subsequent are equipped with the Purolator/Facet Scavenge Oil Filter Assembly; however, the oil filter assembly is eligible for installation on all TH-28, 480, and 480B serial numbers.

C. Perform a bypass indicator functional test every 600 hours as follows:

(1) Remove safety wire from the filter bowl to the filter head, unscrew bowl and remove and discard installed filter element.

(2) Install Facet test tool part number 1741145 and reinstall bowl (do not safety wire at this time). Leave cowling open or removed for visual access to the filter assembly.

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WARNING

The following step is to be performed by authorized personnel only.

(3) Start engine and operate at ground idle until normal operating temperatures have been reached and the filter bypass indicator button extends. The bypass indicator must reach 38°C ± 9°C to operate.

(4) If the bypass indicator extends, it is functioning properly. Secure the engine and remove the filter bowl and test tool. Install a new seal kit and filter element. Reinstall and safety wire the filter bowl to the filter head. Reset the bypass indicator button by pressing in and rotating.

(5) Should the bypass indicator fail to extend or will not reset, contact Facet Filter Products Division of Purolator Products Company. Do not attempt to adjust or replace the bypass indicator.

13-72. Repair - Scavenge Oil Filter

NOTE

The scavenge oil filter element is a throw away element and is not cleaned.

A. Replace the filter element every 200 hours as follows:

(1) Remove head to bowl safety wire and unscrew bowl.

(2) Remove dirty filter element.

(3) Install new filter element and seal kit.

(4) Hand tighten filter bowl until tight against head and safety wire (.025”).

B. Replace the filter assembly if damage causes the assembly to be unserviceable.

13-73. Installation - Scavenge Oil Filter

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

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NOTE

Replace all used packing/o-rings.

A. Install a new filter element in the filter bowl.

B. Install the filter bowl on the filter assembly, tighten hand tight and lockwire (.032).

C. Install filter assembly on its mounting brackets

D. Connect the oil lines.

WARNING

The following step is to be performed by authorized personnel only.

E. Ground run the aircraft and check for oil leaks

F. Service the engine oil reservoir (para. 4-7).

G. Install the right aft side cowling.

13-74. Blower Assembly (Figure 13-5)

13-75. Removal – Blower Assembly

A. Remove the baggage compartment door and left and right side aft cowling.

B. Remove the forward sheet metal panels from the baggage compartment.

C. Remove the oil cooler blower air inlet duct.

D. Remove the left side air transfer duct.

CAUTION

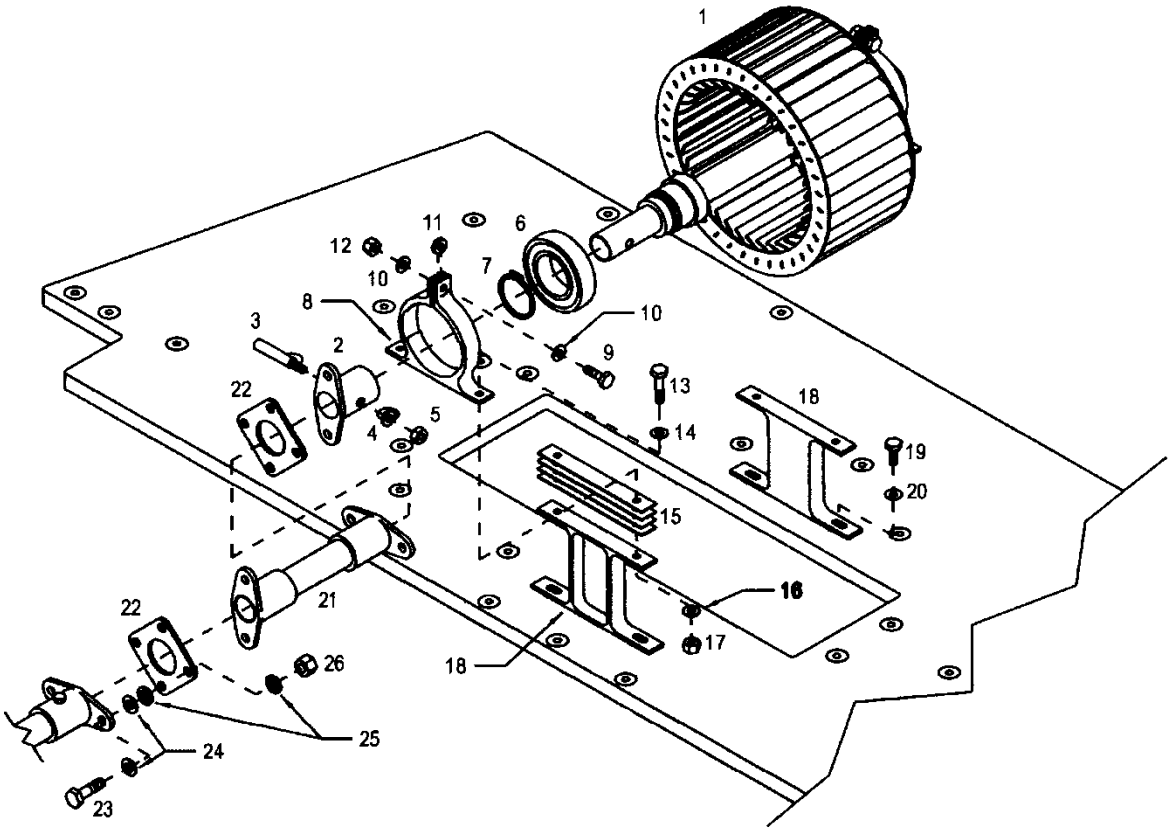
Install a protective cover on the lower plenum assembly inlet to preclude accumulation of debris and subsequent foreign object damage to the compressor.

E. Remove the oil cooler blower intermediate drive shaft from between the lower drive pulley and the impeller shaft.

F. Remove the flex packs from the oil cooler blower intermediate shaft or from the drive hubs on the lower pulley assembly and the oil cooler blower assembly.

G. Remove the bell mouth from the front side and the closeout from the aft side of the impeller shroud.

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1.	Impeller Shaft Assembly	14.	Washer
2.	Coupling	15.	Shims
3.	Taper Pin	16.	Washer
4.	Washer	17.	Nut
5.	Nut	18.	Bearing Housing Support
6.	Bearing	19.	Bolt
7.	Retaining Ring	20.	Washer
8.	Bearing Housing	21.	Intermediate Drive Shaft
9.	Bolt	22.	Flex Pack
10.	Washer	23.	Bolt
11.	Spacer	24.	Washer
12.	Nut	25.	Beveled Washer
13.	Bolt	26.	Nut

Figure 13-5. Blower Assembly Installation

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H. Remove the hardware securing the impeller drive shaft bearing housing mounting brackets to the oil cooler shelf.

CAUTION

Place a piece of tape on the blower shaft were the split clamp contacts the shaft during removal of the bearing housing to protect the shaft from damage

I. Loosen the clamping bolt assembly on the aft bearing split clamp (bearing housing). Rotate the split clamp until the recessed area of the clamp is aligned with the outer race of the drive shaft bearing. Remove the clamp and mounting bracket from the drive shaft.

J. Remove the blower assembly through the forward side of the impeller shroud.

13-76. Disassembly – Blower Assembly

CAUTION

The blower assembly is dynamically balanced as an assembly. The bearings may be replaced without having to rebalance the assembly if the parts removed are index marked to be reinstalled in the same position.

A. Remove the roll pins or taper pins securing the drive hub and remove drive hub from the blower assembly.

B. Loosen the clamping bolt assembly and remove the bearing from the forward clamp (bearing housing) and mounting bracket.

C. Remove the retaining rings from the forward and aft bearing collars.

D. Press the bearings off of the bearing collars using an arbor press.

E. Remove the impeller from the drive shaft.

NOTE

Keep the shim stack-ups together for alignment purposes.

F. Remove the split clamps (bearing housings) from the mounting brackets.

13-77. Inspection – Blower Assembly

A. Inspect the condition of the shaft hub, condition of the roll/taper pins, cracks, bends, and any evidence of chaffing.

NOTE

The current production intermediate shaft has hubs that are brazed onto the shaft.

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B. Inspect the intermediate shaft condition and parallelism of the shaft hubs, cracks, bends, and any evidence of chaffing, or if the hubs are secured with roll pins.

C. Inspect the impeller for cracks, deformity, and missing blades.

D. Inspect the impeller shaft and intermediate shaft flex packs for scratches, cracks, corrosion, or deformation.

(1) Mark one edge of the flex pack with a marker to maintain disassembly order.

(2) Remove the plastic tie-wraps holding the flex pack together.

(3) Using a ten power glass, inspect each flex pack element for cracks originating from the bolt holes, the bevel washer contact area, and/or the area where the tie-wraps hold the flex pack together.

NOTE

Maintain the order of the flex plates in the stack.

(4) If no damage is found, reassemble the flex packs in the same order and tie-wrap.

E. Inspect the bearings for excessive play, and roughness.

F. Inspect the bearing clamps and mounting brackets for cracks, deformities, scratches, and general condition.

13-78. Repair – Blower Assembly

A. Blend out minor scratches and nicks from all components of the blower assembly.

B. Replace flex packs that are cracked, excessively deformed, or exhibit corrosion, scratches, or other defect with a depth greater than 0.001 in. Fretting, nicks, or scratches less than 0.001 in deep (limited to 2 elements) may be blended smooth and polished. Repair limit is equal to or less than 0.001 in deep.

C. Replace the impeller shaft if the shaft or hub is cracked or bent or the roll/taper pins or holes are worn or damaged.

D. Replace the intermediate shaft if the shaft or hubs are cracked, the parallelism of the hub flanges exceeds .005 in/.13 mm, or the hubs are secured with roll pins.

E. Replace the bearings if worn, rough, or the bearing clamps show indications of bearing over temperature.

F. Replace the impeller if cracked or bent.

G. Replace bearing clamps or mounting brackets that are cracked or bent.

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13-79. Assembly – Blower Assembly

CAUTION

If any dynamic part of the blower assembly is replaced except for the bearings, the blower assembly must be dynamically rebalanced.

A. Install the split clamps (bearing housings) on the mounting brackets.

B. Install the impeller on the drive shaft.

C. Install the bearings on the bearing collars using an arbor press.

D. Install the retaining rings onto the bearing collars.

E. Install the bearing into the forward bearing clamp (bearing housing).

NOTE

The current production impeller shaft assembly uses taper pins to secure the drive hub. Enstrom no longer maintains spare/repair parts for impeller shaft assemblies with roll pins.

F. Install the drive hub onto the forward end of the blower assembly. Install the roll pins and lockwire (.020) or install the taper pin and torque the nut to 25 in-lbs/2.8 Nm.

13-80. Installation – Blower Assembly

A. Install the blower assembly through the front side of the impeller shroud.

B. Install the aft bearing clamp (bearing housing) and mounting bracket on the aft bearing.

C. Install the forward and aft mounting bracket hardware. Do not tighten the hardware.

D. Align the blower assembly to the lower drive pulley (para. 11-17).

NOTE

Ensure the spacers are installed in the bearing clamps (bearing housings). Failure to install the spacers can result in improper preload on the bearings and premature removal of the bearings.

E. Ensure the clamping hardware on the bearing housings are torqued.

F. Install the bell mouth on the front side and the closeout on the aft side of the impeller shroud.

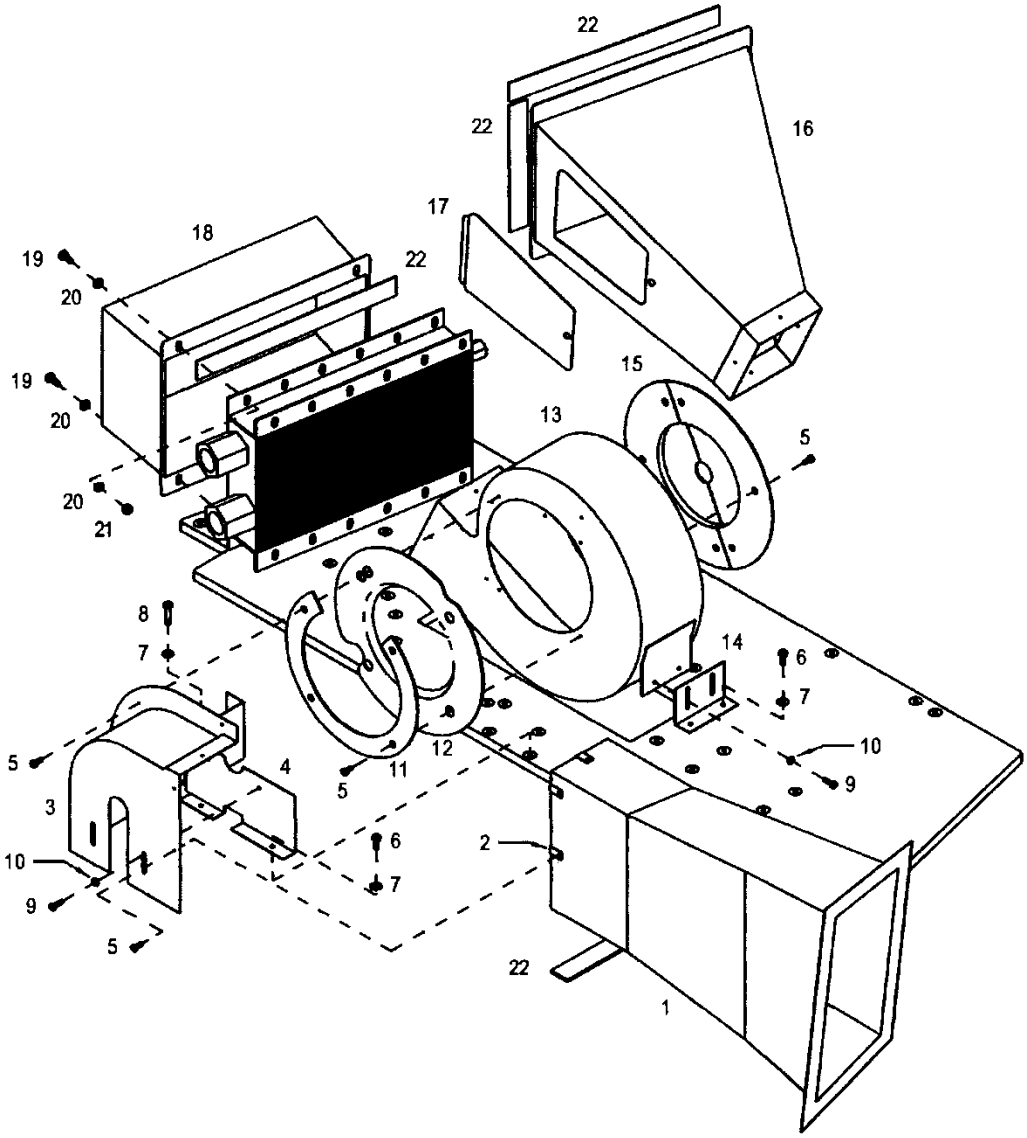
NOTE

Ensure the spacers are installed with the beveled side toward the flex pack.

G. Install the flex packs.

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1.	Inlet Duct	12.	Bell Mouth
2.	Nut Plate	13.	Fan Shroud
3.	Center Duct	14.	Angle
4.	Flange	15.	Plate
5.	Screw	16.	Blower Exit Duct
6.	Screw	17.	Access Cover
7.	Washer	18.	Oil Cooler Exit Duct
8.	Screw	19.	Bolt
9.	Screw	20.	Washer
10.	Washer	21.	Nut
11.	Ring	22.	Foam Tape

Figure 13-6. Blower Air Duct Installation

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H. Install the intermediate drive shaft.

I. Install the air inlet duct.

J. Install the forward sheet metal panels in the baggage compartment.

K. Install the left and right side aft cowling and baggage compartment door.

13-81. Blower Air Ducts (Figure 13-6)

13-82. Removal – Blower Air Ducts

A. Remove the left and right aft side cowlings.

B. Remove the baggage box.

C. Remove the air inlet duct.

D. Remove the blower assembly (para. 13-75).

E. Remove the oil cooler duct.

F. Remove the impeller shroud.

G. Remove the air outlet from the oil cooler.

13-83. Inspection – Blower Air Ducts

A. Inspect the blower air ducts for cracks, cleanliness, general condition, and security of the mounting hardware.

13-84. Repair – Blower Air Ducts

A. Repair the blower air ducts I/A/W AC 43.13-1B.

13-85. Installation – Blower Air Ducts

A. Install the air outlet duct on the oil cooler.

B. Install the impeller shroud.

C. Install the oil cooler duct.

D. Install the blower assembly (para. 13-80).

NOTE

Ensure the spacers are installed with the beveled side toward the flex pack.

E. Install the intermediate blower shaft.

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F. Install air inlet duct.

G. Install the baggage box.

H. Install the left and right aft side cowlings.

13-86. Oil Lines and Fittings

13-87. Removal – Oil Lines and Fittings

A. Remove the right side engine access panel and right aft side cowling.

NOTE

Do not drain the engine oil reservoir if removing only the reservoir vent line.

B. Drain the engine oil reservoir (para. 4-8).

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

CAUTION

Cap or plug all open lines or fittings to prevent contamination.

C. Disconnect the oil lines from the oil fittings.

D. Remove the oil lines from the support clamps.

E. If required, remove the oil fittings from the system components.

13-88. Inspection – Oil Lines and Fittings

A. Inspect the oil lines for leaks, kinks, twists, chaffing, and security of installation.

B. Inspect the oil fittings for leaks, damage, and security of installation.

C. Inspect the oil lines for contamination if removed.

13-89. Repair – Oil Lines and Fittings

A. Replace fittings that have thread or flare damage that cannot be repaired or polished out.

B. Replace fitting o-rings if leaking.

C. Replace oil lines that are kinked, leaking, the outer surface is chaffed through, or twisted and repositioning will not remove the twist.

D. Reposition lines that are being chaffed or twisted.

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NOTE

Remove the oil lines before flushing to prevent from contaminating other components of the engine oil system.

E. Flush the oil lines with clean engine oil or solvent.

13-90. Installation – Oil Lines and Fittings

CAUTION

Use a backing wrench when loosening or tightening air/fluid lines and fittings to prevent damage to the lines or fittings.

NOTE

Replace all used packing/o-rings.

A. If removed, install the oil fittings.

B. Install the oil lines in the support clamps.

C. Connect the oil lines to the fittings.

D. If required, service the engine oil reservoir (para. 4-7).

WARNING

The following step is to be performed by authorized personnel only.

E. Ground run the aircraft and check for oil leaks.

F. Install the right side engine access panel and right aft side cowling.

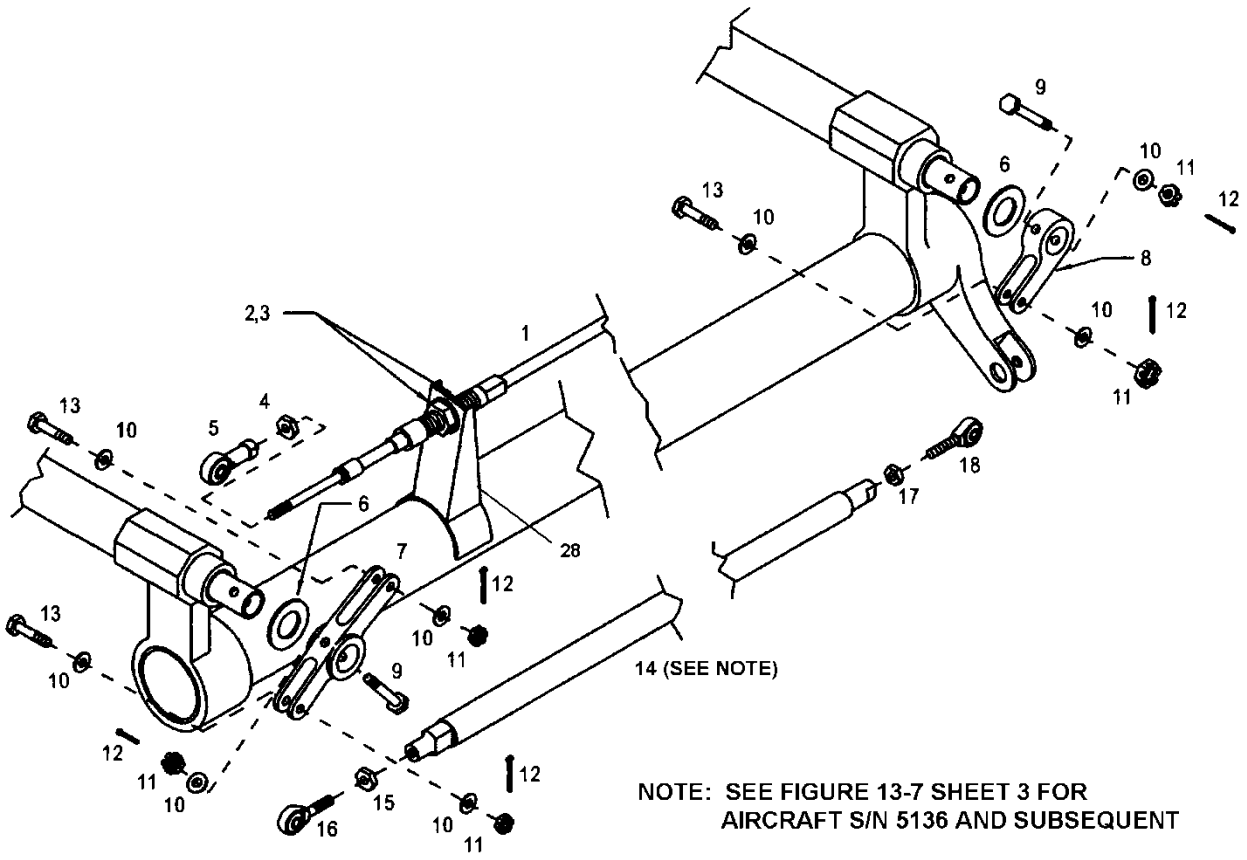
13-91. Engine Power Controls

13-92. Description – Engine Power Controls (Figure 13-7)

The engine power control system is a mechanical linkage/cable system, actuated by a twist-grip on the collective sticks, which provides manual control of the power lever on the fuel control unit. The idle stop release may be configured one of two ways. For aircraft S/N 5136 and subsequent equipped with dual collective engine start and idle stop controls, the idle stop control is located on both the pilot and copilot collective control head. On aircraft S/N 5135 and earlier, the idle release control is located above the throttle twist grip in the pilot's collective stick. The stop prevents the engine power setting from being reduced below the idle position causing an engine shutdown. The release does not have to be pushed for engine start or run-up but does have to be pushed for engine shutdown. An electrically operated linear actuator operates a lever connected to the power turbine governor to adjust the power turbine (N_2) RPM and is operated via the governor INCR/DECR switch located in the control box on the collective sticks. A droop compensation system is incorporated to stabilize N_2 RPM as the engine load fluctuates with changes in the main rotor pitch.

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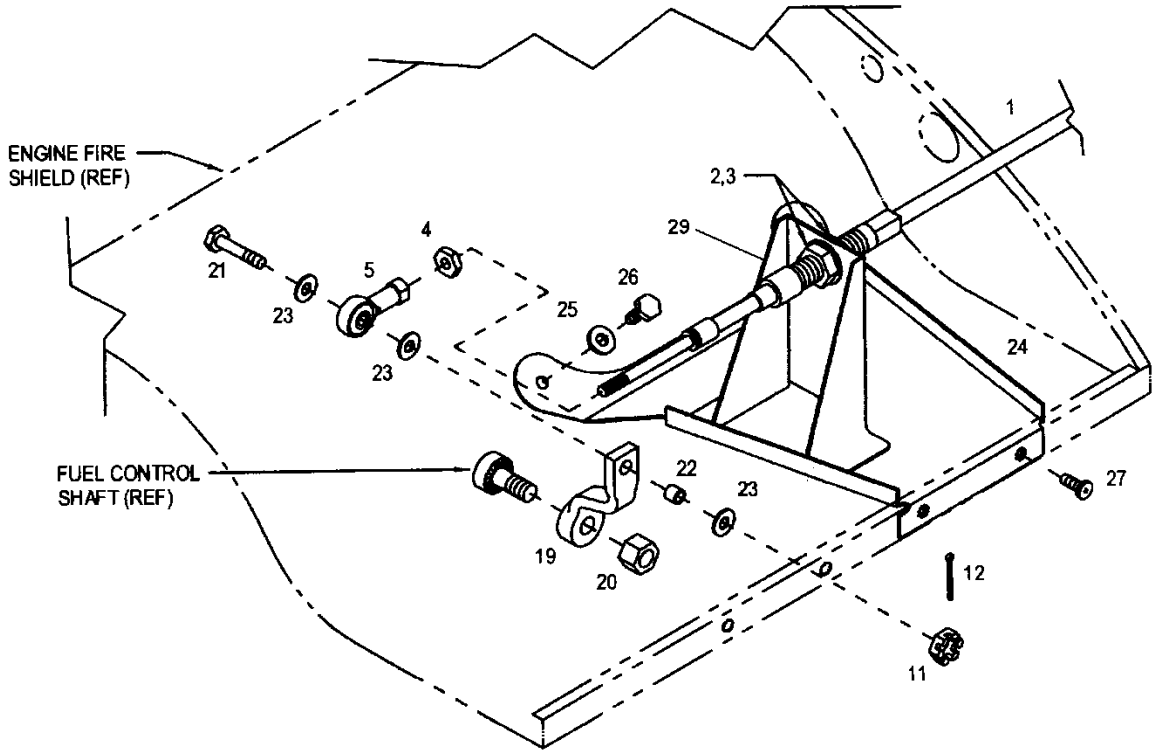


1.	Control Cable	15.	Nut
2.	Lock Washer	16.	Rod End Bearing (Left-Hand)
3.	Nut	17.	Nut
4.	Nut	18.	Rod End Bearing (Right-Hand)
5.	Rod End Bearing	19.	Throttle Arm
6.	Washer	20.	Nut
7.	Bellcrank	21.	Bolt
8.	Bellcrank	22.	Bushing
9.	Bolt	23.	Washer
10.	Washer	24.	Bracket Assembly
11.	Nut	25.	Washer
12.	Cotter Pin	26.	Bolt
13.	Bolt	27.	Screw
14.	Control Rod (S/N 5135 and Earlier)	28.	Torque Tube Bracket
		29.	Throttle Bracket

Sheet 1 of 3

Figure 13-7. Engine Power Controls

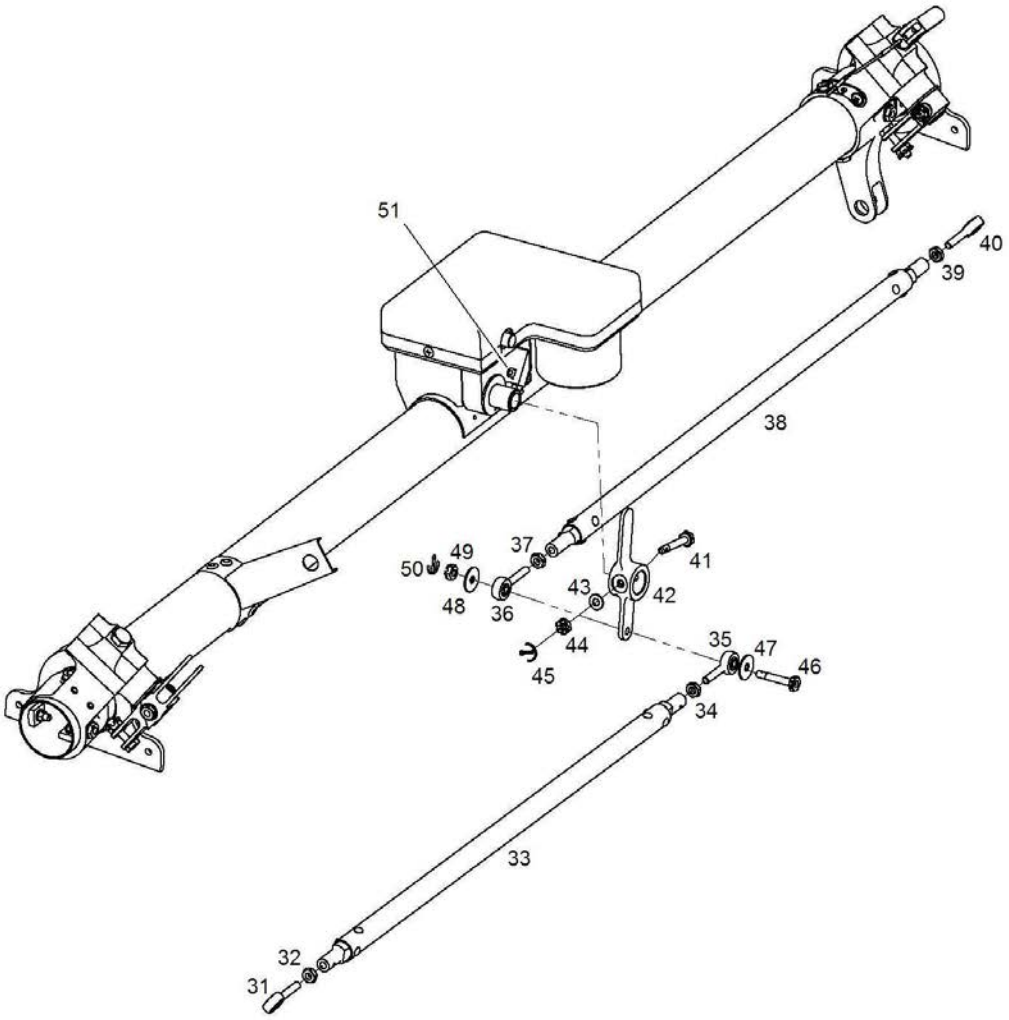
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Sheet 2 of 3

Figure 13-7. Engine Power Controls

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31.	Rod End Bearing, RH	42.	Bellcrank
32.	Nut	43.	Washer
33.	Control Rod	44.	Nut
34.	Nut	45.	Cotter Pin
35.	Rod End Bearing, LH	46.	Bolt
36.	Rod End Bearing, LH	47.	Washer
37.	Nut	48.	Washer
38.	Control Rod	49.	Nut
39.	Nut	50.	Cotter Pin
40.	Rod End Bearing, RH	51.	Fixed Idle Stop
41.	Bolt		

Sheet 3 of 3

Figure 13-7. Engine Power Controls

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13-93. Rigging – Engine Power Controls (S/N 5135 and Earlier)

NOTE

The following rigging procedure is applicable to aircraft S/N 5135 and earlier.

A. Remove the seat from the left side of the aircraft.

B. Remove the collective cover.

C. Ensure the cable rod ends at both ends of the throttle cable are at the midpoint position. Ensure the throttle cable is installed in the mounting brackets at the midpoint adjustments.

D. If not connected, connect the throttle cable to the throttle cable arm and to the fuel control arm.

E. Place the left throttle twist grip in the OFF position. Observe that the position of the fuel control arm is against the fuel control stop.

(1) Check to ensure that sufficient travel is provided to allow physical contact with the fuel control minimum stop at or before the full closed position of the twist grip.

F. Place the left throttle twist grip in the ON position. Observe that the position of the fuel control arm is against the fuel control stop.

(1) Check the travel at the fuel control. Physical contact must be made with the fuel control maximum stop at or before the full open position of the twist grip.

G. Check the idle position as follows:

(1) Start with the twist grip at the full open position then rotate the grip to the IDLE position. The fuel control pointer must be at the 30 degree mark.

(2) Start with the throttle at the full closed position then rotate the grip to the IDLE position against the idle stop. The pointer must be no more than 5/64 in. (2.0 mm) below the 30 degree mark.

H. Make adjustments to the throttle cable rod end at the fuel control and to the cable mounting nuts at the cable mounting bracket on the engine fire pan until the throttles meet the rigging requirements I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

I. Install the collective cover.

J. Install the seat.

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13-93.1. Rigging – Engine Power Controls (Figure 13-7, S/N 5136 and Subsequent)

NOTE

The following rigging procedure is applicable to aircraft S/N 5136 and subsequent.

A. Remove the left, right, and back seats from the aircraft.

B. Remove the collective covers.

B. If not connected, install the throttle cable (1) at the engine.

(1) Remove the rod end jam nut (4), dust covers, and one large lock nut with star washer.

(2) Insert the end of the throttle cable into the hole in the throttle bracket (29).

(3) Position the remaining large jam nut (3) with lock washer (2) approximately 0.5" from the base of the thread of the outer sheath.

(4) Install the other lock washer (2) and large jam nut (3).

(5) Install the dust covers and the rod end jam nut (4). Ensure that two threads are exposed on the end of the outer sheath next to the large jam nut.

C. If not connected, install the throttle arm rod end (5) to the end of the throttle cable (1). Thread it completely on and then back off two turns.

D. If not connected, install the throttle cable (1) at the collective bellcrank (7).

(1) Remove the rod end jam nut (4), dust covers, and one large lock nut (3) with lock washer (2).

(2) Insert the end of the throttle cable (1) into the hole in the collective torque tube bracket (28).

(3) Install the large jam nut (3) with lock washer (2) in a position that allows the cable to operate freely.

(4) Install the other lock washer (2) and large jam nut (3).

(5) Install the dust cover and jam nut (4).

E. Install the collective bellcrank rod end (5) onto the throttle cable (1). Adjustment of the rod ends must conform to AC 43.13 para. 7-167.

F. Position the throttle control arm (19) on the fuel control to the 30 degree mark.

G. Set the pilot collective throttle grip bellcrank (7) to idle, approximately 76° inboard.

H. Adjust the throttle arm rod end (5) to the collective throttle bellcrank (7); slip fit bolt (13).

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J. Roll the pilot throttle grip to full OPEN. Check that all rod ends have proper clearance.

K. Roll the pilot throttle grip to IDLE. The fuel control indicator should display 30°.

L. Roll the pilot throttle grip to full OFF. Adjust the rod end (5) at the collective bellcrank (7) to ensure the throttle arm at the fuel control is on full OFF on the stop position. Adjustments can also be made by repositioning the two large jam nuts (3) that anchor the cable.

M. Roll the pilot throttle grip to IDLE. The fuel control indicator at the engine should read 30°. If it is not, adjust the push-pull rod (33) to the pilot bellcrank (7) to ensure a reading of 30°.

N. Roll the copilot throttle grip to IDLE. The fuel control indicator at the engine should read 30°. If it is not, adjust the push-pull rod (38) to the copilot bellcrank (8) to ensure a reading of 30°.

O. Roll the copilot throttle to full OFF. Ensure that the throttle control arm (19) is on the full OFF on the stop position.

P. Adjust the fixed stop (51) for the idle stop bellcrank (42).

(1) At idle stop, adjust the fixed stop (51) to make contact with the bellcrank (42) and then back off one half turn from the bellcrank (42).

(2) Tighten the jam nut on the idle stop.

Q. Move the pilot collective stick up and down through the full range of movement. Check for proper clearance and free movement of all components. Ensure that none of the rod end and bellcrank locations travel “over center”.

R. Lockwire all appropriate hardware.

S. Vibra-Tite all jam nut locations.

13-94. Removal – Engine Power Controls

A. Remove the pilot and copilot seats.

B. Disconnect the throttle cable from the fuel control arm and the throttle arm. Remove the cable form the mounting brackets and support clamps. Pull the cable through the fire wall and remove from the aircraft.

C. Remove the throttle arm from the collective stick.

D. Remove the cable mounting bracket from the engine fire pan.

13-95. Inspection – Engine Power Controls

A. Inspect the throttle cable for kinks, fraying, and binding. Inspect the cable rod ends for binding and excessive play.

B. Inspect the power control brackets for cracks, bends, and scratches.

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13-96. Repair – Engine Power Controls

A. Replace the throttle cable if kinked, frayed, or binding.

B. Replace the rod ends if excessively worn or worn and the throttle rigging cannot be accomplished.

C. Replace power control brackets that are cracked or bent. Blend out minor scratches and nicks.

13-97. Installation – Engine Power Controls

A. Install the throttle cable mount bracket on the engine fire pan.

B. Install the throttle arm on the collective stick.

C. Route the throttle cable over the collective control torque tube and through the fire wall. Attach the support clamps and install the cable in the mounting brackets. Connect the cable to the throttle arm and to the fuel control arm.

D. Rig the engine power controls (para. 13-93 through 13-93.1).

E. Install the pilot and copilot seats.

13-98. Idle Stop Release

NOTE

Paragraphs 13-99 through 13-102 are applicable to aircraft S/N 5135 and earlier. The idle stop release is located above the throttle twist grip in the pilot's collective stick. Paragraphs 13-102.1 through 13-102.5 are applicable to aircraft S/N 5136 and subsequent. The engine idle stop control is located on both the pilot and copilot collective control head.

13-99. Removal – Idle Stop Release (S/N 5135 and Earlier)

NOTE

The pilot's controls are on the right side of the aircraft for a TH-28 and on the left side for a 480.

A. Remove the snap ring retaining the idle release collar.

B. Remove the idle release collar.

C. Remove the idle release and spring from the collective stick.

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13-100. Inspection – Idle Stop Release

A. Inspect the idle release for damage, excessive wear, and lubrication.

B. Inspect the idle release spring for damage and excessive wear.

C. Inspect the snap ring for serviceability.

D. Inspect the idle release slot in the collective stick for damage and excessive wear.

13-101. Repair – Idle Stop Release

A. Replace components of the idle release that are damaged or worn.

13-102. Installation – Idle Stop Release

A. Rotate throttle until the idle release slot will allow installation of the release.

B. Install the idle release spring and idle release.

C. Install the idle release collar.

D. Push the idle release collar down and install the retaining snap ring.

E. Check the idle release for proper operation.

13-102.1. Engine Idle Stop Assembly (S/N 5136 and Subsequent, Figure 13-7.1)

13-102.2. Removal – Engine Idle Stop Assembly

A. Ensure all electrical power is off and disconnect the battery.

B. Remove the pilot's seat and, as applicable, stow (fold-up) the center bench seat or remove the 2 + 2 bench seat.

C. Remove the center torque tube cover.

D. Disconnect the push-pull tubes (16, 17) from the idle stop bellcrank (36).

E. Remove the idle stop assembly cover (1).

F. Remove the idle stop relay (7).

G. Remove the relay socket (8) and support off to the side.

H. Loosen the set screw (20) in the pivot arm (21) on the rotary solenoid (9).

I. Remove the mounting hardware from the rotary solenoid (9) and support off to the side.

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J. Remove lock wire (6) and the three bolts (3,4) that connect the idle stop assembly to the bracket (10).

K. Remove the idle stop assembly (18).

13-102.3. Inspection – Engine Idle Stop Assembly

A. Inspect the bushings (24, 29, 33) for binding or looseness.

B. Inspect the linkage (21, 22, 23) and stop pin (25) for excessive wear.

C. Inspect the spring (28) and roll pins (27) for wear or breakage.

D. Check for freely moving stop pin (25) and spring (28). Check that the stop pin and spring do not bind.

E. Inspect the rod ends of the push-pull tubes (16, 17) for binding and excessive play.

F. Inspect the mount bracket (10) for cracks, bends, or scratches.

13-102.4. Repair – Engine Idle Stop Assembly

A. Replace any worn or binding bushings (24, 29, 33).

B. Replace link arm (23) and or stop pin (25) if slotted connection is worn.

C. Torque the link arm attachment bolt (40) to 12-15 in-lb/1.4-1.7N/m.

D. Replace spring (28) or roll pins (26) if damaged or worn.

E. Replace rod ends on push-pull tubes (16, 17) if worn.

F. Replace mount bracket (10) if damaged.

13-102.5. Installation – Engine Idle Stop Assembly

A. Install the idle stop assembly (18) on the bracket (10) and lock wire (6) the bolt (3).

B. Install the rotary solenoid (9) and the set screw (20).

(1) Apply Loctite 222 (purple), Vibra-Tite VC-3, or equivalent, to the set screw.

(2) Install set screw and ensure it engages the detent in the rotary solenoid shaft and tighten the set screw to seat it in the detent.

(3) Back-off the set screw ¼ turn and re-tighten. Repeat this twice and then tighten the set screw firmly against the shaft.

C. Install the relay socket (8) and the idle stop relay (7).

D. Install the idle stop assembly cover (1).

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E. Connect the push-pull tubes (16, 17) to the idle stop bellcrank (36).

F. Connect the battery.

G. Check the rigging of the engine power controls (refer to paragraph 13-93.1).

H. Install the collective torque tube cover.

I. Install the pilot's seat and, as applicable, un-stow the center bench seat or install the 2 + 2 seat.

13-103. Linear Actuator

13-104. Removal – Linear Actuator (Figure 13-8)

A. Disconnect the battery. Disconnect the cannon plug from the linear actuator.

B. Disconnect the linear actuator from the power turbine governor control arm and the droop compensation control rod. Remove the linear actuator.

13-105. Inspection – Linear Actuator

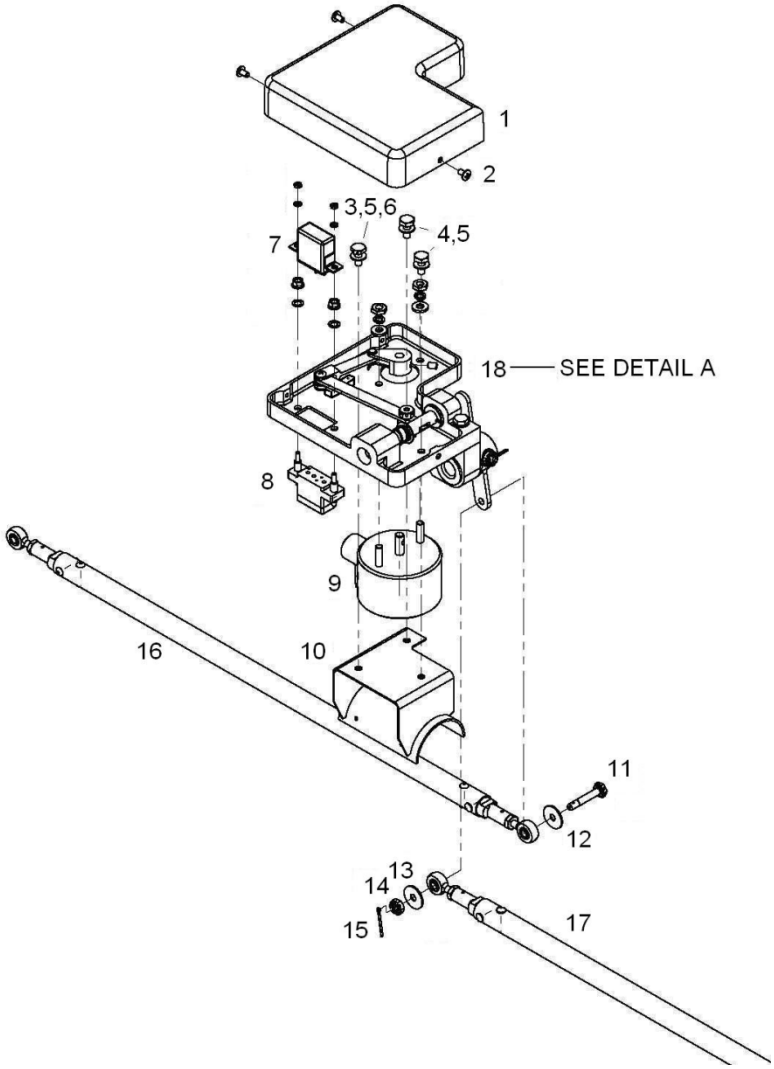
A. Inspect the linear actuator for cracks, corrosion, nicks, scratches, security, and proper operation. Check the attached parts for security.

B. Inspect the rod-end bearing for binding, wear corrosion, cracks, and security.

C. Inspect the electrical connections for cracks, corrosion, and security.

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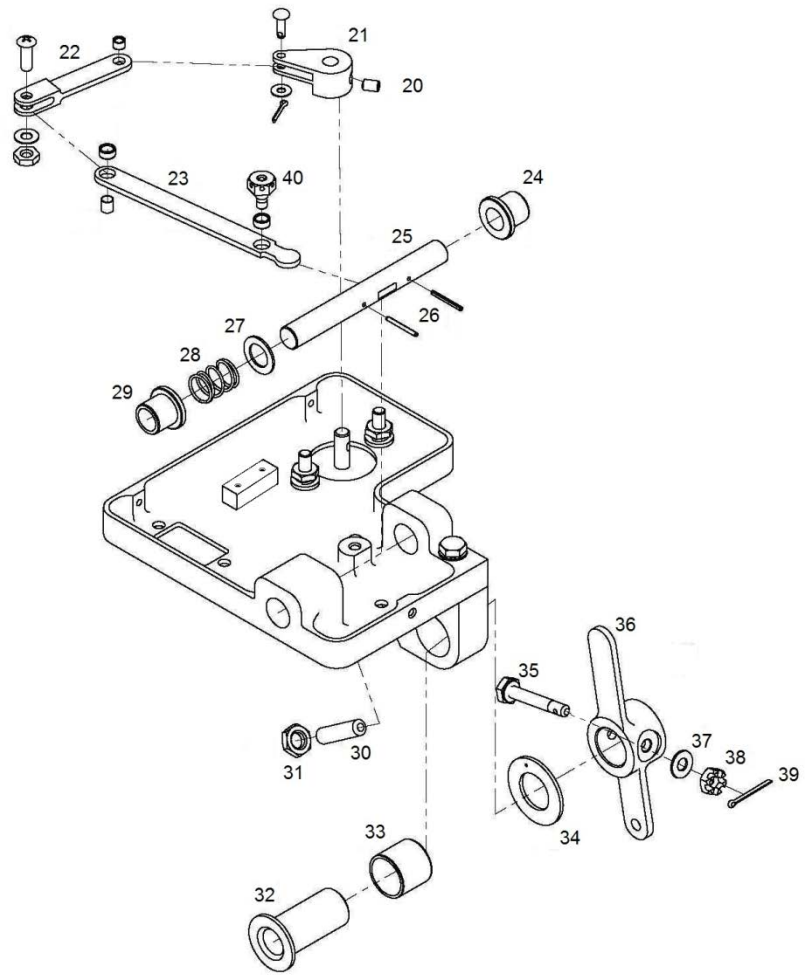


1.	Cover	10.	Bracket
2.	Screw	11.	Bolt
3.	Bolt	12.	Washer
4.	Bolt	13.	Washer
5.	Washer	14.	Nut
6.	Lock Wire	15.	Cotter Pin
7.	Relay	16.	Push-Pull Tube
8.	Relay Socket	17.	Push-Pull Tube
9.	Solenoid	18.	Idle Stop Assembly

Figure 13-7.1. Engine Idle Stop Assembly

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DETAIL A

20.	Set Screw	31.	Nut
21.	Pivot Arm	32.	Sleeve
22.	Link Arm	33.	DU Bushing
23.	Link Arm	34.	DU Washer
24.	Bushing	35.	Bolt
25.	Stop Pin	36.	Bellcrank
26.	Roll Pins	37.	Washer
27.	Washer	38.	Nut
28.	Spring	39.	Cotter Pin
29.	Bushing	40.	Hex Bolt
30.	Set Screw		

Figure 13-7.1. Engine Idle Stop Assembly

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13-106. Repair – Linear Actuator

A. Replace the linear actuator if inoperable or damage interferes with the proper operation of the actuator.

B. Blend out minor cracks, nicks, and corrosion.

C. Replace the rod end bearing if excessively worn, cracked, or binding.

D. Replace the electrical connector if cracked or the pins are bent and cannot be repaired.

13-107. Installation – Linear Actuator (Figure 13-8)

A. Connect the liner actuator to the droop compensation control rod and to the power turbine control arm.

B. Connect the linear actuator cannon plug.

C. Connect the battery. Check the liner actuator for proper operation.

13-108. Droop Compensation System (Figure 13-8, Figure 13-8.1)

13-109. Rigging – Droop Compensation System

NOTE

When the collective is down and the linear actuator is moved to the full decrease position, the kinematics of the system will torsionally load the droop compensator torque rod. When the collective is full up and the linear actuator is moved to the full increase position, the power turbine control arm will hit the max limit stop and torsionally load the droop compensator torque rod. Neither occurrence will occur during normal aircraft operations when the compensator system is properly rigged.

A. Ensure collective is set to flat pitch.

B. (TH-28, early 480 only) Ensure the bracket installed on the collective control bell crank is mounted perpendicular to the bell crank as it is moved through its control arc.

C. Extend the N_2 actuator to full length using the collective switch.

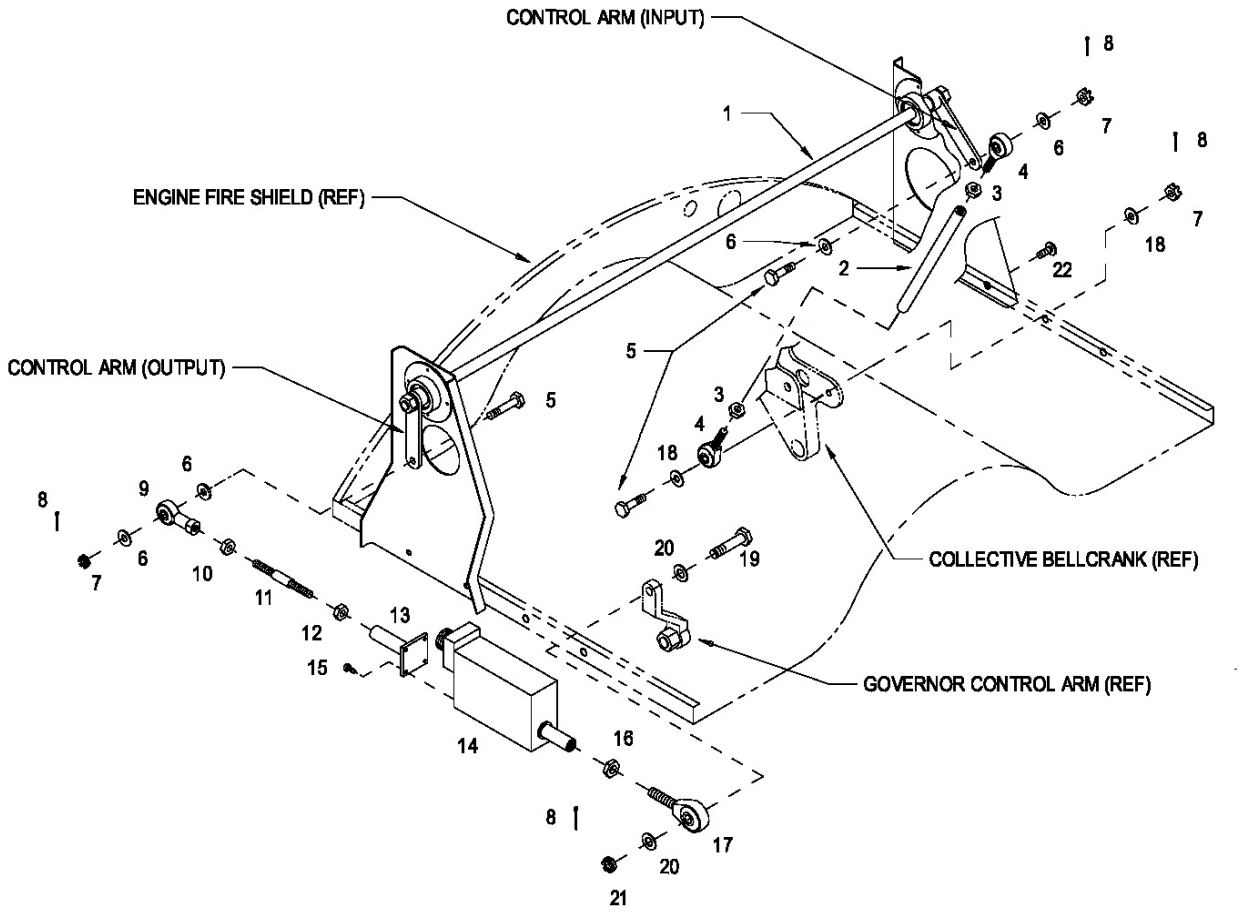
D. Verify the actuator lengths in accordance with Figure 13-8.1.

(1) If the lengths are correct, proceed to step F.

(2) If the lengths are not correct, proceed to step E.

E. Remove the actuator, set proper lengths (Figure 13-8.1), reinstall actuator, and secure.

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1.	Rod and Bearing Assembly	13.	End Fitting
2.	Control Rod	14.	Linear Actuator
3.	Nut	15.	Screw
4.	Rod End Bearing	16.	Nut
5.	Bolt	17.	Rod End Bearing
6.	Washer	18.	Bolt
7.	Nut	19.	Washers
8.	Cotter Pin	20.	Bolt
9.	Rod End Bearing	21.	Washer
10.	Nut	22.	Nut
11.	Control Rod	23.	Screw
12.	Nut		

Figure 13-8. Droop Compensator Installation

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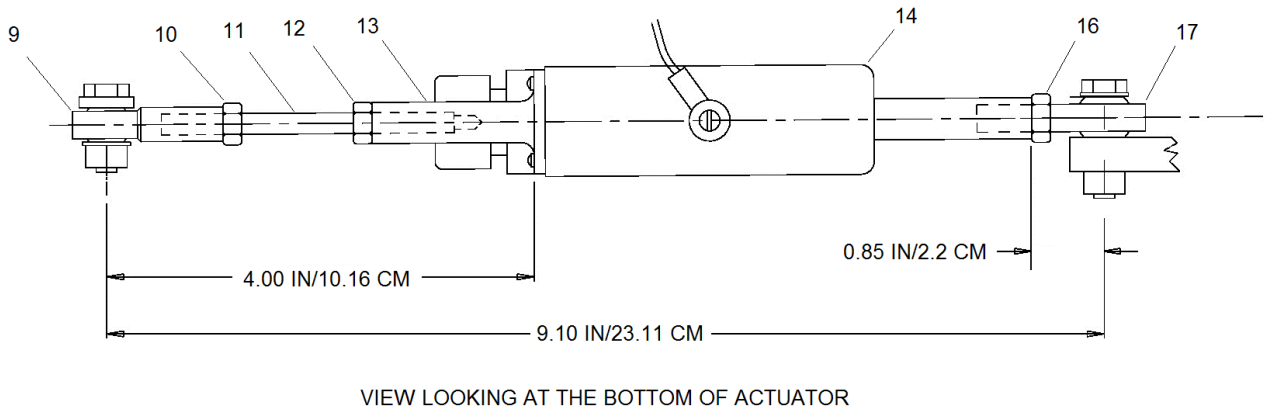


Figure 13-8.1. Droop Compensator Rigging

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F. Disconnect the control rod (2) at the control arm (input) (Figure 13-8).

G. Set the control arm (output) at the 6 o'clock position, parallel to the forward edge of the mounting bracket. Lock in place with a device (block, zip tie, tape, or similar).

H. Verify the pointer of the governor is positioned between 60-65%. If not between 60-65%, recheck lengths required from step D.

(1) If installing to a new engine, position the control arm of the power turbine governor one serration forward of the cotter pin securing the pointer and stop to the power turbine governor shaft. Torque the nut to 40-50 in-lb/4.5-5.7 Nm.

I. Adjust the control rod (2) to provide a slip fit of the bolt at the control arm (input), install bolt (5), and secure (Figure 13-8).

J. Remove the locking device from the control arm (output).

K. Raise the collective, verify the pointer of the governor is positioned at 95%.

(1) If adjustment is required to obtain 95%, adjust the rod end (17) (Figure 13-8.1).

(2) Repeat steps F through K.

WARNING

The following step is to be performed by authorized personnel only.

L. Ground run the aircraft and check for the following conditions:

CAUTION

Adjustments to the control rods and the rod-end bearings can be made while the engine is running if the throttle is against the idle stop.

(1) With the collective down, the throttle full ON, and the linear actuator in the full decrease position, the N_2 RPM should be between 88%-92%. If the N_2 RPM is above 92%, shorten the control rod between the linear actuator and the compensator output arm or move the power turbine control arm one serration aft.

(2) With the collective down, the throttle full ON, and the linear actuator in the full increase position, the N_2 RPM should be between 100%-103%. If the N_2 RPM is above 102%, shorten the control rod between the linear actuator and the compensator output arm or move the power turbine control arm one serration aft. If the N_2 RPM is below 100%, lengthen the control rod between the linear actuator and the compensator output arm or move the power turbine control arm one serration forward. Recheck the full decrease N_2 RPM and adjust as required.

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(3) Set the N_2 RPM to 97% ±1% and pull in enough collective to make the aircraft light on its skids. The N_2 RPM should be 102% ±1%. Hover the aircraft. If the N_2 RPM is 102% ±1%, the droop compensator is properly rigged.

M. Apply Vibra-Tite VC-3, or equivalent, to the threads of the control rod ends (11) and rod-end bearing (17) after making final adjustments.

13-110. Removal/Disassembly – Droop Compensation System

A. Disconnect and remove the droop compensator control rods.

B. Remove the hardware securing the droop compensator to the engine fire pan. Remove the droop compensator from the aircraft.

C. Remove the collective control bell crank bracket.

D. Remove the nuts from the ends of the torque rod.

E. Remove the roll pins securing the input and output arms on the torque rod. Index mark the input and output arms and remove them from the torque rod.

F. Index mark the bearing housing/mounting brackets to the torque rod and remove the torque rod from the bearing housing/mounting brackets.

13-111. Inspection – Droop Compensation System

A. Inspect the control rods for bends, cracks, corrosion, nicks, and scratches.

B. Inspect the rod-end and torque rod bearings for binding, corrosion, roughness, and excessive wear.

C. Inspect the torque rod for cracks, corrosion, nicks, scratches, bends, damaged threads, and security of the end fittings.

D. Inspect the mounting brackets and control arms for bends, cracks, corrosion, nicks, scratches, and security of installation.

13-112. Repair – Droop Compensation System

A. Replace control rods that are bent or cracked. Remove minor corrosion, nicks, and scratches.

B. Replace bearings that are excessively worn, binding, rough, or corroded.

C. Replace the torque rod if cracked, the threads on the end fittings are damaged and cannot be repaired, the end fittings are loose due to elongation of the roll pin holes, or bent to the extent that the bend interferes with the proper operation of the droop compensation system.

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D. Repair cracks in the mounting brackets I/A/W AC 43.13-1B if the repair does not interfere with the installation or operation of the droop compensation system. Remove minor nicks, scratches, or corrosion.

E. Replace the control arms if cracked, bent, or loose on the torque rod due to elongation of the roll pin holes.

13-113. Assembly/Installation – Droop Compensation System

A. Install the torque rod into the input bearing housing/mounting bracket. Install the sleeve and the required amount of washers to align the roll pin holes in the torque rod and the input arm. Aligning the index marks, install the input arm. Install the roll pin and lockwire (.020). Install the nut and the required amount of washers that will allow a cotter pin to be installed when the nut just snug against the washers and cotter pin.

B. Install the required amount of washers on the output end of the torque rod that will allow the roll pin holes in the torque rod and the output arm to be aligned with the bearing housing/mounting bracket installed on the torque rod. Install the bearing housing/mounting bracket. Install the output arm according to the index mark. Install the roll pin and lockwire (.020). Install the nut and the required amount of washers that will allow a cotter pin to be installed when the nut just snug against the washers and cotter pin.

B. Install the required amount of washers on the output end of the torque rod that will allow the roll pin holes in the torque rod and the output arm to be aligned with the bearing housing/mounting bracket installed on the torque rod. Install the bearing housing/mounting bracket. Install the output arm according to the index mark. Install the roll pin and lockwire (.020). Install the nut and the required amount of washers that will allow a cotter pin to be installed when the nut just snug against the washers and cotter pin.

C. Install the droop compensator in the aircraft and secure to the engine fire pan.

D. Install the bracket on the collective control bell crank.

E. Install the control rods.

F. Rig the droop compensation system (para. 13-109).

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13-114. Engine Adapting Assembly

13-115. Description - Engine Adapting Assembly (Figure 13-9)

The engine adapting assembly consists of the components that are required to be removed from the engine being replaced and installed on the replacement engine.

13-116. Removal - Engine Adapting Assembly

NOTE

The following instructions are only for a standard aircraft. Additional steps may be required depending on installed optional equipment.

A. While the engine is still on the dolly, remove the top, left, and right airframe engine mounts. Install the left and right side engine stand mounts.

B. Lift the engine and install in the engine stand.

NOTE

Remove the following parts in any order found practical using the outlined steps as a guide and checklist.

CAUTION

Cover or plug all open pads or ports to prevent contamination of the engine.

C. Remove the starter-generator and mounting bracket (para. 13-119).

D. Remove the N_1 and N_2 tachometer generators (para. 13-129).

NOTE

Observe the orientation of the oil line fittings so they are correctly positioned during reinstallation.

E. Remove the following oil line fittings:

(1) Torque pressure

(2) Engine oil pressure

(3) Oil vent

(4) Oil outlet

(5) Oil inlet

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F. Remove the accessory gearbox vent fitting.

G. Remove the fuel filter differential pressure switch, lines, and fittings (para. 13-139).

H. Remove the fuel pump inlet fitting.

I. Remove the fuel pump seal drain line and the fittings from the fuel pump drain and from the fire pan.

J. Remove the overrunning clutch and power output shaft (para. 11-5 and 11-11).

K. Remove the customer bleed air fittings from the compressor scroll (para. 13-144).

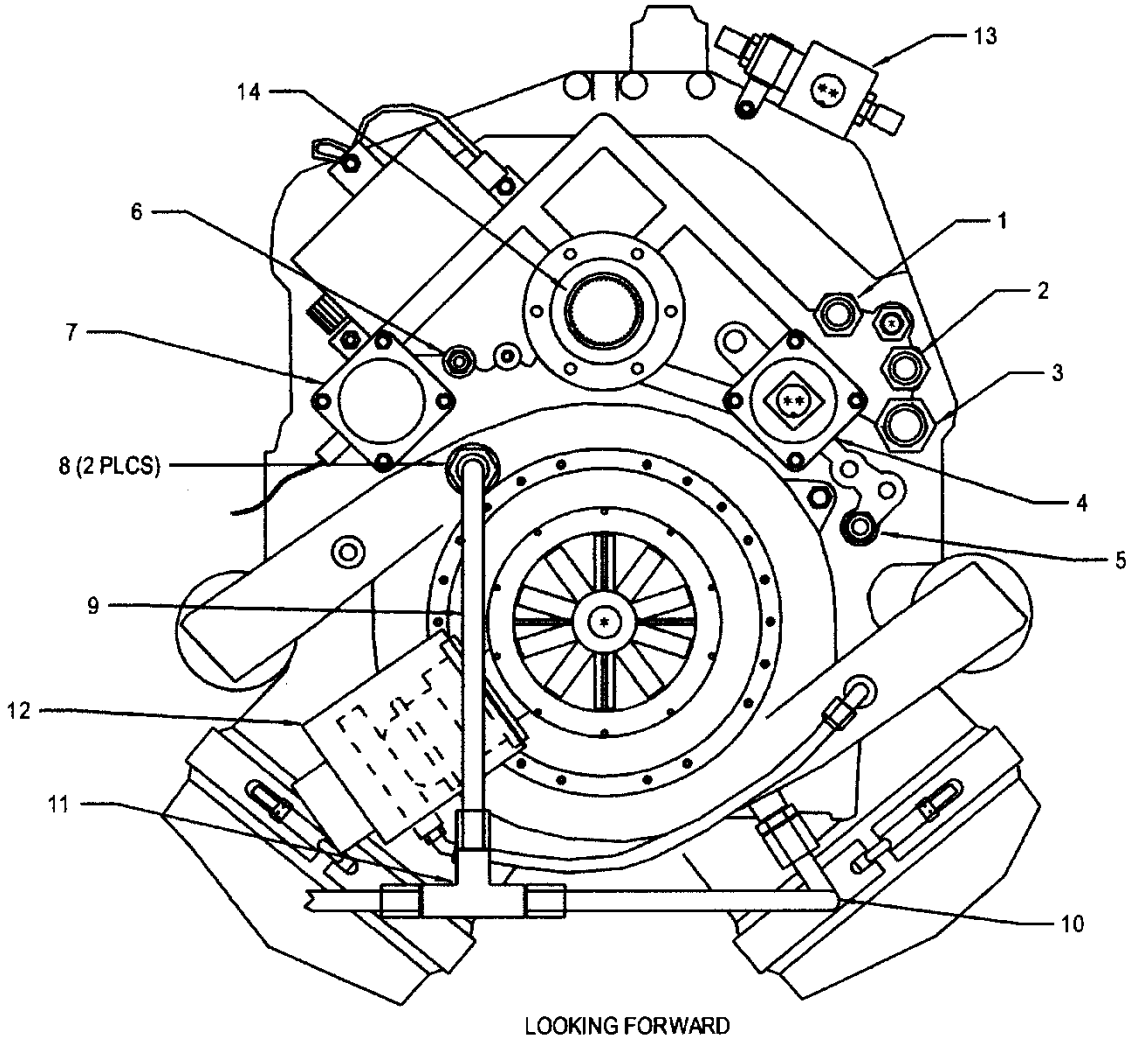
L. Remove the bleed air collector (para. 13-124).

M. Remove the anti-ice cable bracket and the two inserts from the bottom engine mount.

N. Reference the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2) for procedures to prepare the engine for storage and shipment.

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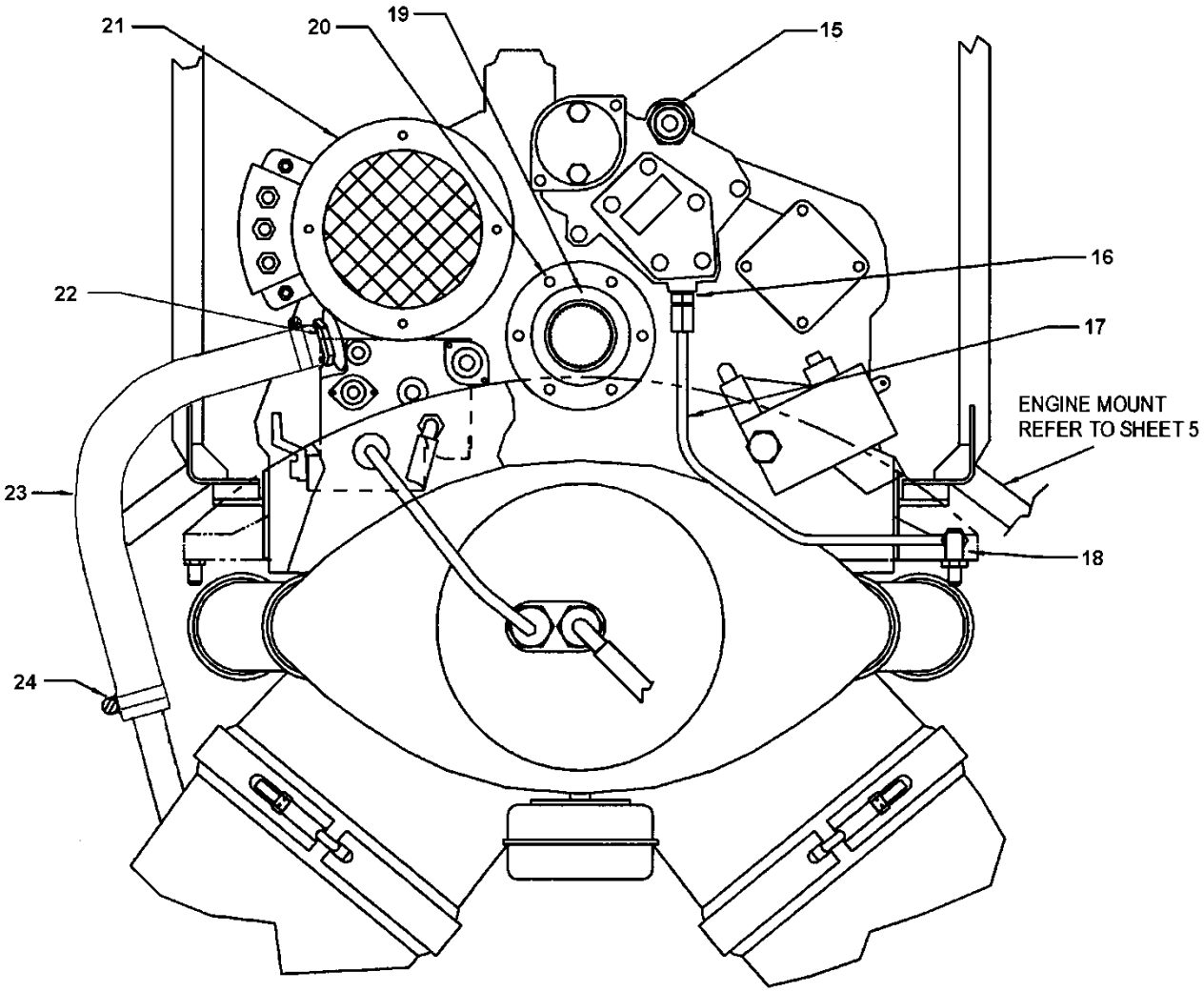


1.	Oil Vent Fitting	8.	Bleed Air Reducer Fitting
2.	Oil Out Fitting	9.	Bleed Air Line
3.	Oil In Fitting	10.	Bleed Air Line
4.	N_1 Tachometer Generator	11.	Bleed Air Union Fitting
5.	Engine Oil Pressure Fitting	12.	Bleed Air Collector
6.	Torque Pressure Fitting	13.	Fuel Pressure Switch
7.	N_2 Tachometer Generator	14.	Double Lip Seal

Figure 13-9. Engine Adapting Assembly

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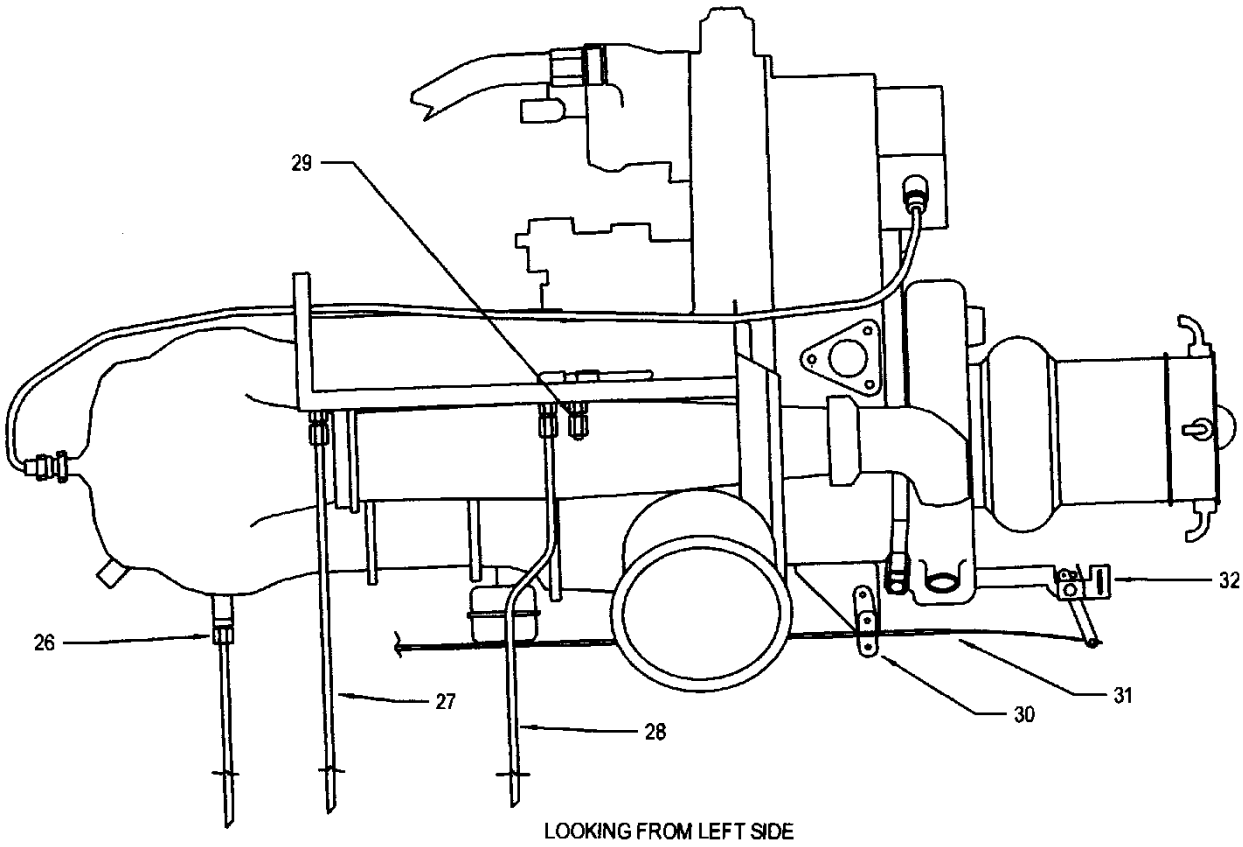


15.	Fuel Inlet Fitting	20.	Stud
16.	Fuel Pump Seal Fitting	21.	Starter/Generator Assembly
17.	Fuel Pump Drain Line	22.	Gearbox Vent Fitting
18.	Bulkhead Fitting	23.	Gearbox Vent Line
19.	Double Lip Seal	24.	Clamp

Sheet 2 of 5

Figure 13-9. Engine Adapting Assembly

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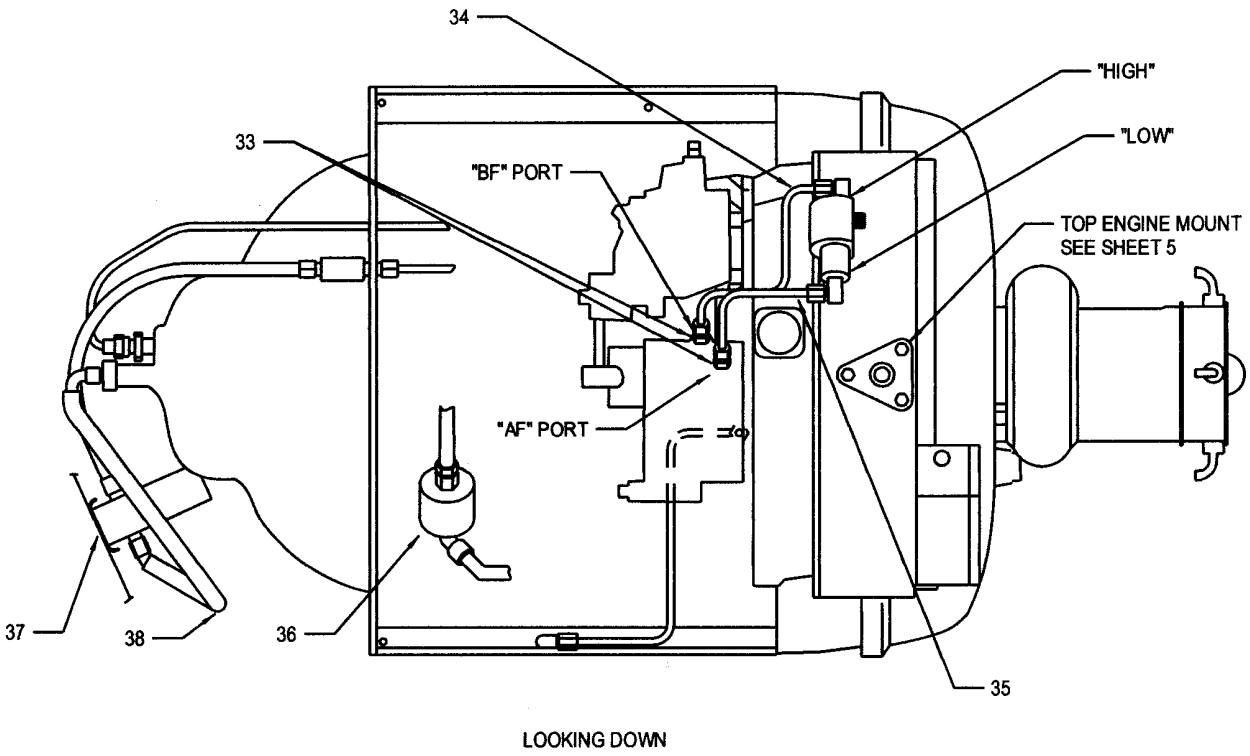
26.	Burner Drain Line	30.	Anti-Ice Cable Bracket Assembly
27.	Fire Shield Drain Line	31.	Anti-Ice Cable
28.	Fuel Pump Drain Line	32.	Anti-Ice Switch Bracket
29.	Cap Assembly		

Sheet 3 of 5

Figure 13-9. Engine Adapting Assembly

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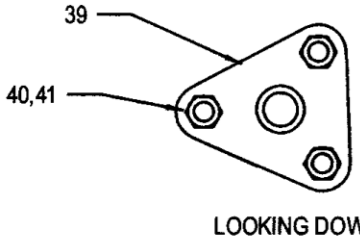


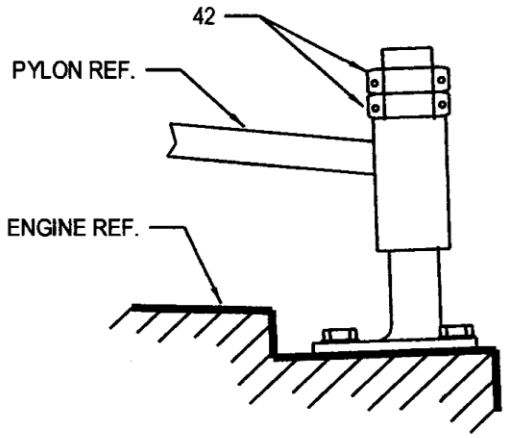
33.	Fuel Pressure Fitting	37.	Fuel Flow Transducer (Optional Equipment)
34.	Fuel Pressure Line		
35.	Fuel Pressure Line	38.	Fuel Line (Optional Equipment)
36.	Three Cubic Inch (3 In^3) Accumulator Kit		

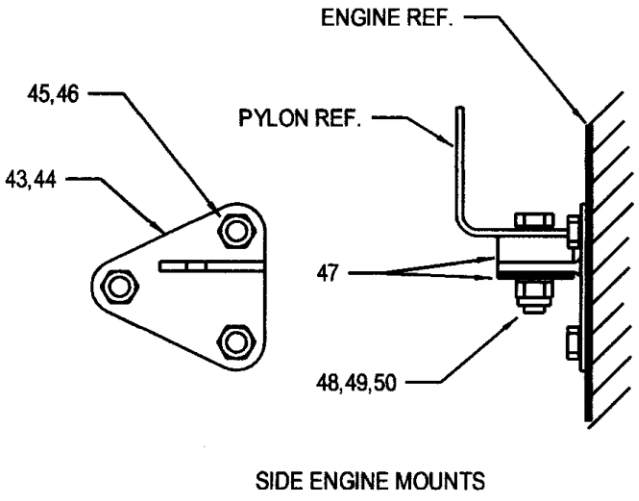
Figure 13-9. Engine Adapting Assembly

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39.	Top Engine Mount	45.	Bolt
40.	Bolt	46.	Washer
41.	Washer	47.	Spacers
42.	Nut	48.	Bolt
43.	Left Engine Mount (Shown)	49.	Washer
44.	Right Engine Mount	50.	Nut

Sheet 5 of 5

Figure 13-9. Engine Adapting Assembly

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13-117. Installation - Engine Adapting Assembly

NOTE

The following instructions are only for a standard aircraft. Additional steps may be required depending on installed optional equipment.

A. Remove the engine from the shipping container I/A/W the Rolls-Royce 250-C20 Series Operation and Maintenance Manual. Install the left and right side engine stand mounts, install the engine in an engine stand.

B. Remove the fuel pump assembly and the Py-Pg pneumatic line from between the fuel control and power turbine governor IAW the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

NOTE

If the engine has been modified for installation in the aircraft, proceed to step F.

NOTE

Replace all used o-rings/packings and gaskets.

NOTE

Ensure reused self-locking nuts meet the minimum torque requirements.

NOTE

Ensure the installed components are in serviceable condition.

C. Using a stud remover tool (CG-500), a 7/8” wrench, and a 1-1/8” wrench, remove the studs from the forward (turbine side) and aft (compressor side) power take-off (PTO) pads.

(1) Screw the stud remover tool onto the stud until no threads are showing.

(2) Tighten nut down onto the stud remover tool using the 1-1/8” wrench. Back out the stud using the 7/8” wrench. Once the stud is loose, spin the stud by hand.

(3) When the stud is removed, tap the end of the stud remover tool with moderate to heavy force to loosen the tool jaws that hold the stud and remove the stud from the stud remover tool.

(4) Clean the stud recesses with Loctite 7649 Primer, or equivalent, using a cotton swab until all residue is removed.

D. Install studs in the forward power output pad as follows:

(1) Inspect the gearbox end for a stamped number. Determine the correct stud part number from the following list:

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Number Stamped on Stud	Enstrom Stud P/N
Blank	4120046-11
3	4120046-13
6	4120046-15
9	4120046-17

(3) Install the stud into tool T-0189. Apply a small amount of Loctite® 277 to the stud threads.

(4) Install the studs in the power output pad until tool T-0189 almost touches the face of the pad (do not let the tool touch the pad).

(5) Back off the special tool on the stud and finish tightening.

(6) Remove excess Loctite® 277 from the studs and power output pad.

NOTE

Allow the Loctite® 277 to cure for 1 hour @ 72°F/22°C. Heating the power output pad area to 200°F/93°C will reduce the curing time to 10-15 minutes.

E. Remove the six cubic inch accumulator (P/N 6875224) and install the three cubic inch accumulator kit (P/N 6851488).

F. Install/Replace double lip seals on both sides of the power output shaft using the following procedure:

(1) Remove single lip seals using the appropriate tool from the Seal Replacement Kit, P/N 6796941 (Rolls-Royce), or equivalent.

I (2) Remove double lips seals using Seal Removal Tool, P/N RBT18560 (Dart Helicopter Services), Seal Puller Assembly T-0203-1, or equivalent.

(3) Install double lip seals using Seal Installation Tool, T-0172-1, or equivalent. Install the double lip seals with the metal side facing outboard/away from the engine gearbox assembly.

NOTE

Install the following parts in any order found practical using the outlined steps as a guide and checklist.

CAUTION

Cap or plug all open fluid/air fittings to prevent contamination of the engine.

G. Install the N_1 and N_2 tachometer generators (para. 13-132).

NOTE

Position the oil line fittings as observed before the fittings were removed from the replaced engine.

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H. Install the following oil line fittings:

(1) Torque pressure

(2) Engine oil pressure

(3) Oil vent

(4) Oil outlet

(5) Oil inlet

CAUTION

Failure to perform the following task could result in premature removal of the ECD4014 and/or ECD4017 Bearings and void any potential warranty.

NOTE

The engine/gearbox assembly power take-off (PTO) shaft bores have been measured on engines installed in 480B serial number 5131 and subsequent. If required, the engines are labeled/tagged and engine log book entries completed for overrunning clutch (ORC) and power output shaft assembly offset bearing housings. 480B serial numbers 5101 and 5114 have been measured and offset bearing housings installed via a FAA Form 337.

I. Measure the engine/gearbox assembly PTO shaft bores with tool kit T-0194-1 (Bore Concentricity Indicator Tool Set). This kit includes P/N 4131001-( ) bore measurement assembly, a dial gauge assembly, clamp assembly, and articulating arm assembly.

(1) Power Output Shaft Assembly (Compressor) side:

a. Assemble, install, and preload the in accordance with the T-0194-1 Installation Instructions included with the tool kit.

b. Move the dial indicator around the bore, clockwise as facing the bore, first to 30°, then in 60° increments (align with the stud hole centers) by hand using the #4 power turbine wheel.

c. At each increment, measure the deviation from .0000” and log the dial indicator readings on the PTO Bore Report Sheet (Figure 13-9.3).

NOTE

Follow the proper sign convention when measuring the bores. A negative (-) number indicates an inward deviation. A positive (+) number indicates an outward deviation.

d. Remove the T-0194-1 tool set from PTO shaft.

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(2) ORC Assembly (Turbine) side:

a. Repeat the procedures for measuring the PTO bore on the ORC side of the engine/gearbox assembly.

(3) Send a copy of the measurements recorded on the PTO Bore Report Sheet to Enstrom Product Support for guidance on the appropriate combination of ORC and engine power output shaft assembly P/N 4131006/4131007 bearing housings.

(4) If required, in accordance with the instructions provided by Enstrom Product Support, perform the following tasks:

a. Mark the location of the notches for the ORC and/or power output shaft offset bearing housings with a white paint stripe (refer to Rolls-Royce 250 Series Operation and Maintenance Manual, Table 303).

b. Apply the Label, P/N 4131001-11, onto the engine/gearbox assembly (refer to Figure 13-9.4). Clean and degrease the general area using isopropyl or denatured alcohol, or saline and thoroughly dry the area prior to attaching the label.

c. Install the appropriate Offset Bearing Housing, P/N 4131006-“XX” or 4131007-“XX”, on the ORC assembly or the power output shaft assembly. Refer to paragraphs 11-7 or 11-13 as applicable.

d. Complete airframe logbook and engine logbook (engine and gearbox white pages) entries listing the part number of the offset bearing housing installed and the orientation of the installation/notches.

NOTE

The offset bearing housings installed as a result of this procedure must be used with the engine/gearbox assembly combination until the gearbox assembly is replaced or the PTO bores in the gearbox assembly are reworked.

CAUTION

Failure to correctly orientate the offset bearing housings during installation could result in premature removal of the ECD4014 and/or ECD4017 bearings and void any warranty potential.

(5) If standard (non-offset) bearing housing(s) are used, complete airframe logbook and engine logbook (engine and gearbox white pages) entries listing the part number of the bearing housing(s) installed.

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J. Install the overrunning clutch and power output shaft in accordance with paragraphs 11-8 and 11-14 and with the instructions provided by Enstrom Product Support if offset bearing housings are installed on the ORC assembly and/or power output shaft assembly.

K. Install the accessory gearbox vent fitting.

L. Install the fuel filter differential pressure switch, lines, and fittings (para. 13-142).

M. Install the fuel pump inlet fitting.

N. Install the fuel pump drain fitting. If not accomplished, punch a hole in the fire pan for the drain line fitting (reference the removed engine for the location). Install the seal drain line.

O. Install the starter-generator and mounting bracket (para. 13-122).

P. Install the customer bleed air fittings into the compressor scroll (para. 13-147).

Q. Install the bleed air collector (para. 13-127).

R. Turn the engine upside down and service the engine oil filter (refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual).

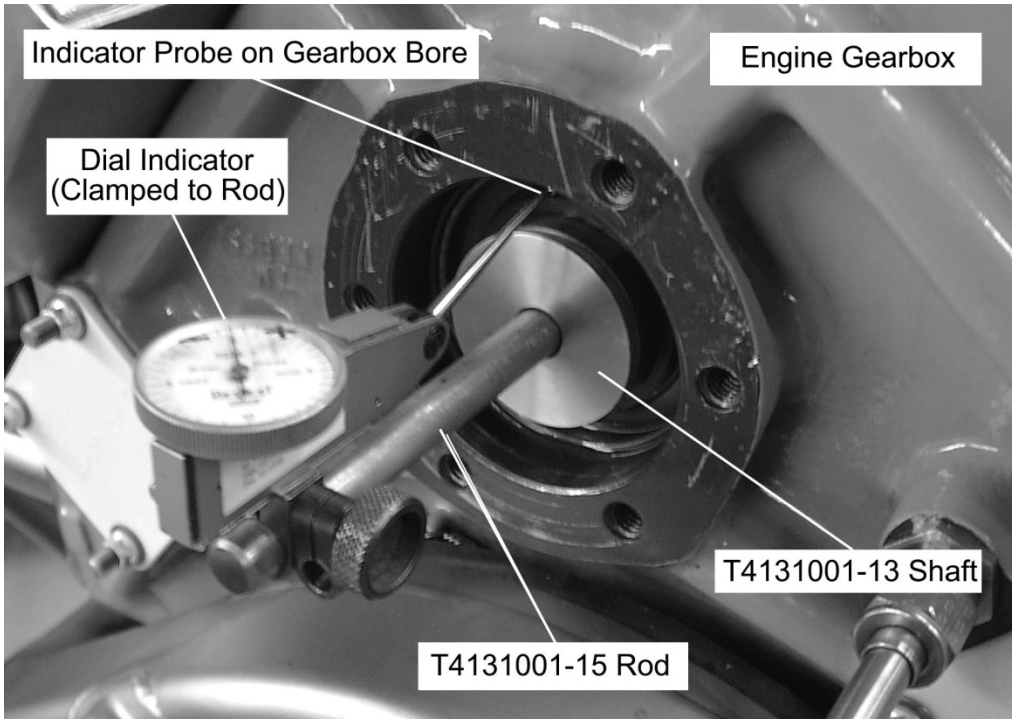


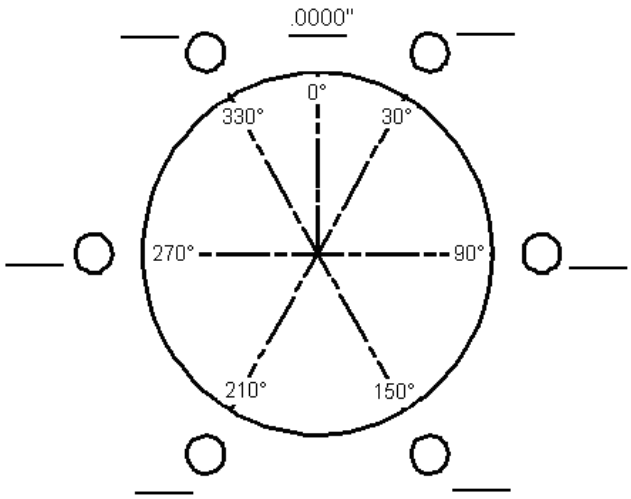
Figure 13-9.2. PTO Bore Inspection Set-up

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Date: _____
Aircraft S/N: _____
Engine S/N: _____
Technician: _____

Power Output Shaft Bore

(Compressor Side)



Overrunning Clutch Bore

(Turbine Side)

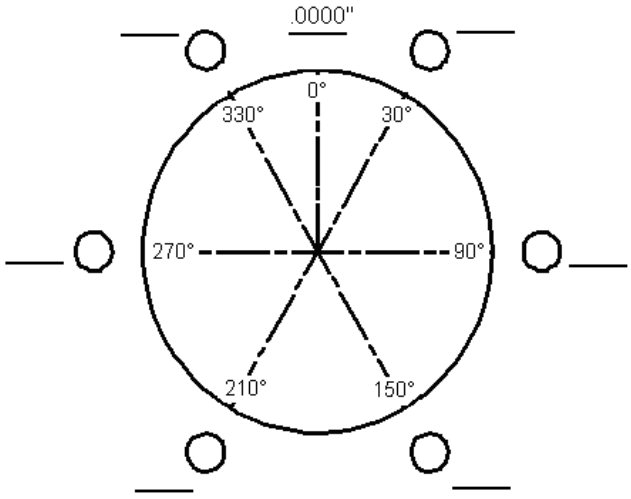


Figure 13-9.3. PTO Bore Report Sheet

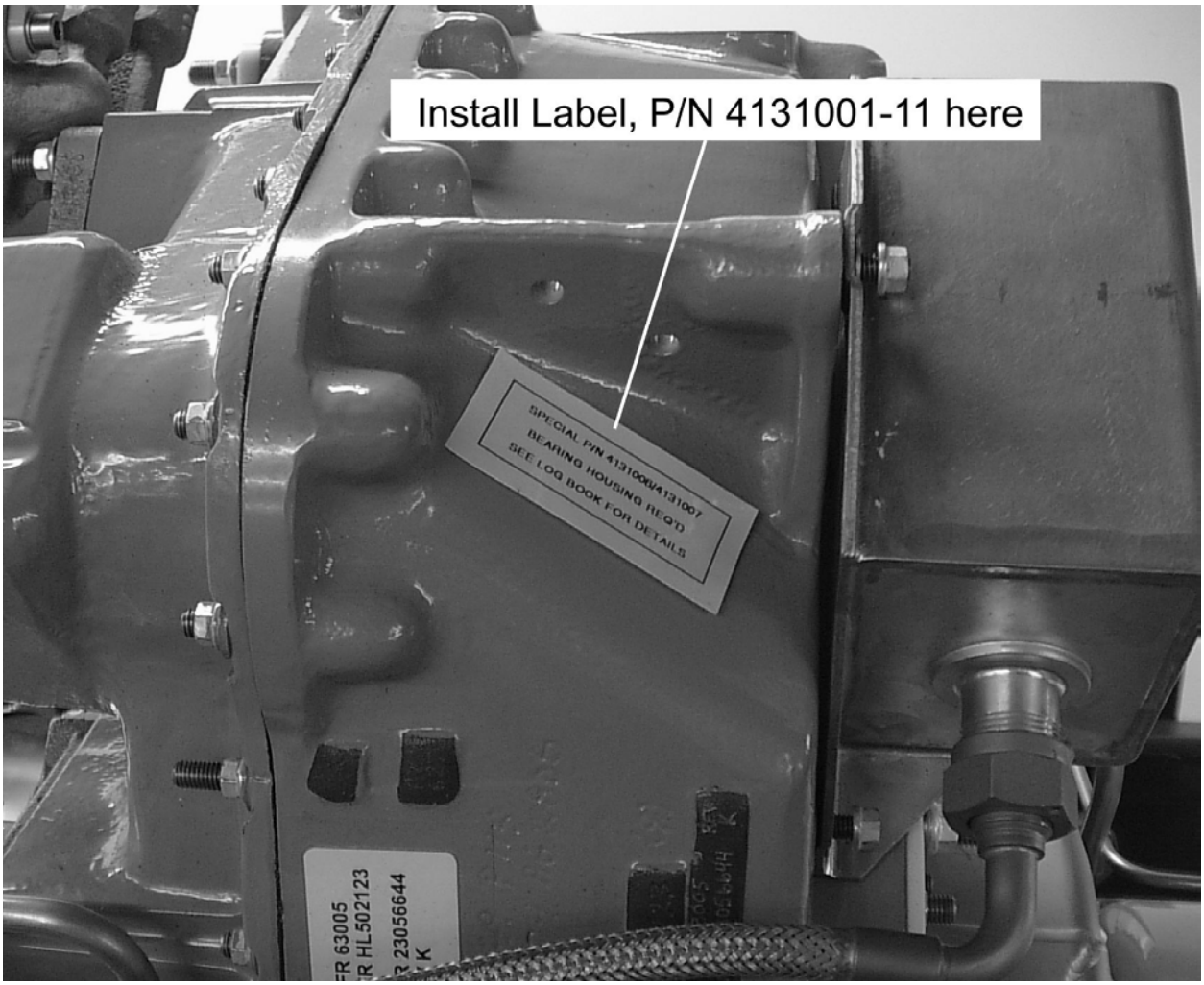


Figure 13-9.4. Label Installation

S. Retain the removed caps, plugs, covers, and fuel line for future use during engine replacement.

T. Check the position of the Max. Fuel Flow Stop on the fuel control. The stop is to be set at the "LO" position. Adjust the stop following the procedures in the Rolls-Royce 250-C20 Series Operation and Maintenance Manual (10W2).

U. Remove the engine from the engine stand and lower it to a suitable dolly. Remove the engine stand mounts and install the airframe engine mounts.

13-118. Starter/Generator

13-119. Removal - Starter/Generator

A. Disconnect the battery.

B. Disconnect the electrical leads from the starter/generator terminal block. Tag the leads for identification.

C. Disconnect the flexible duct from the front of the starter/generator (480B S/N 5114 and subsequent; S/N 5087 - 5113 if equipped with the Increased Cooling Kit, P/N 4230031).

CAUTION

The Starter/Generator must be supported at all times during installation and removal. Do not let the unit hang on the drive shaft without the clamp mounted and fully tightened. Have a second person install/remove the clamp while the unit is being held tight against the mounting bracket. Undue bending loads on the drive shaft shear section can damage the drive shaft.

D. Use the following procedure if with the 3 piece clamp assembly (band and split clamps) is installed on the Thales Avionic/Auxilec Stater/Generator.

1) Loosen the bolt on the retaining band and open the latch on the band. Move the band toward the accessory gearbox.

2) Remove the clamp halves.

3) Remove the starter/generator and the retaining band.

E. Use the following procedure if the one piece clamp assembly is used on the Thales Avionics/Auxilec Starter/Generator.

1) Remove the nut from the clamp.

2) Remove the clamp.

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3. Remove the starter/generator.

F. Use the following procedure if the one piece clamp assembly is used on the APC Starter/Generator.

1. Loosen the nut on the T-bolt and slide the latch from the T-bolt.

2. Remove the clamp.

3. Remove the starter/generator.

G. Remove the starter/generator mounting bracket.

13-120. Inspection – Starter/Generator

A. Inspect the starter/generator for damage, corrosion, oil leakage from the shaft o-ring, and security of installation.

B. Inspect the mounting bracket for cracks, damage, corrosion, and security of installation.

C. Inspect the terminals for evidence of overheating or arcing, and damaged threads.

NOTE

Thales Avionics/Auxilec recommends a visual inspection of starter/generator brushes and commutator every 600 hours and overhaul of the starter/generator every 1,200 hours. APC recommends a visual inspection of starter/generator brushes and commutator every 300 hours and overhaul of the starter/generator every 1,000 hours. Refer to paragraph 2-20 for more information related to vendor components.

D. Inspect the brushes I/A/W the manufacturer's instructions.

E. If the starter/generator is removed, check that the drive shaft is aligned with and concentric to the armature (Refer to Figure 13-10).

13-121. Repair – Starter/Generator

A. Repair the starter/generator I/A/W the manufacturer's instructions.

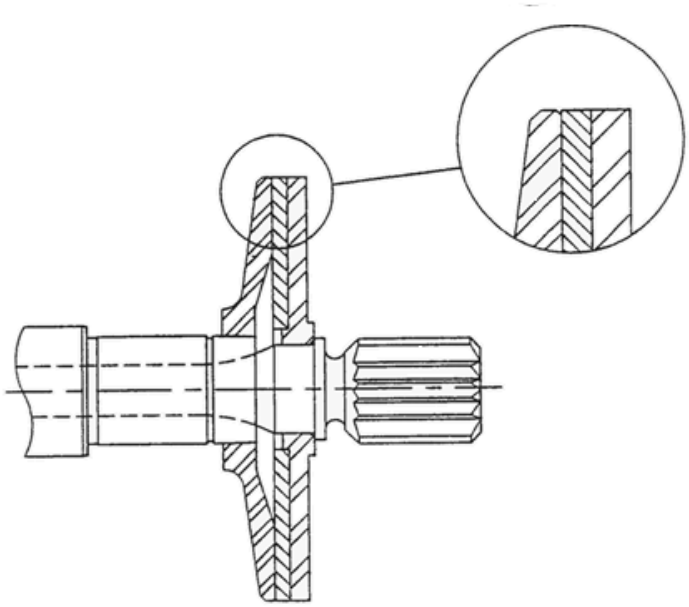
B. Replace the shaft o-ring or the starter/generator pad seal (Rolls-Royce 250-C20 Series Operation and Maintenance Manual) if oil leakage is evident.

C. Replace the mounting clamps if not repairable. Remove minor nicks, scratches, or corrosion.

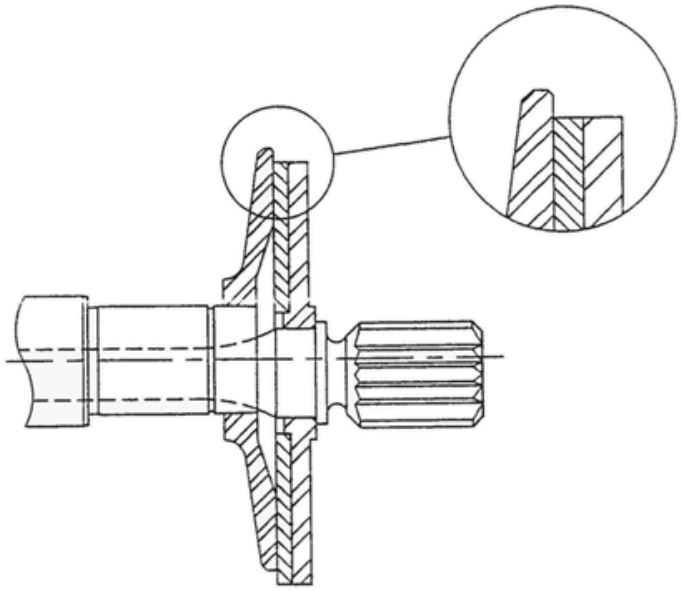
D. Repair damage to the mounting bracket I/A/W AC 43.13-1B.

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DRIVE SHAFT CONCENTRIC WITH ARMATURE SHAFT



DRIVE SHAFT OUT OF POSITION

Figure 13-10. Starter/Generator Drive Shaft Alignment

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E. If the drive shaft is not in alignment and concentric with the armature, lightly tap on the drive shaft spline, using a plastic mallet, to move it back into full concentric position (Refer to Figure 13-10).

13-122. Installation – Starter/Generator

NOTE

Replace all used o-rings/packings and gaskets.

NOTE

Refer to the TH-28/480 Series Illustrated Parts Catalog for the correct mounting bracket and starter/generator clamp combination.

A. Install the mounting bracket and gasket.

CAUTION

The Starter/Generator must be supported at all times during installation and removal. Do not let the unit hang on the drive shaft without the clamp mounted and fully tightened. Have a second person install/remove the clamp while the unit is being held tight against the mounting bracket. Undue bending loads on the drive shaft shear section can damage the drive shaft.

B. Use the following procedure if with the 3 piece clamp assembly (band and split clamps) is installed on the Thales Avionics/Auxilec Starter/Generator.

1. Place the retaining band over the mounting bracket. Move the retaining band toward the accessory gearbox.

2. Install the starter/generator with the terminals toward the right side of the aircraft.

3. Install the clamp halves.

4. Position the retaining band over the clamp halves, close the latch, tighten, and safety wire.

C. Use the following procedure if the one piece clamp assembly is used on the Thales Avionics/Auxilec Starter/Generator.

1. Install the starter/generator with the terminals toward the right side of the aircraft.

2. Install the clamp.

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3. Install the nut on the clamp and torque to 40 in-lbs/4.5 Nm. Tap the clamp with a plastic hammer and retorque the nut.

D. Use the following procedure if the one piece clamp assembly is used on the APC Starter/Generator.

1. Install the starter/generator with the terminals toward the right side of the aircraft.

2. Install the clamp and slide the latch over the T-bolt.

3. Tighten the nut on the T-bot and torque to 50 in-lbs/5.7 Nm. Tap the clamp with a plastic hammer and retorque the nut.

E. Connect the flexible duct to the front of the starter/generator (480B S/N 5114 and subsequent; S/N 5087 - 5113 if equipped with the Increased Cooling Kit, P/N 4230031).

F. Connect the electrical leads to the starter/ generator terminals. Torque the nuts to the following torques:

1. Thales Avionics/Auxilec Starter/Generator: Torque the #10-32 nuts to 26 in-lbs/3.0 Nm and the #3/8-24 nuts to 168 in-lbs/19.1 Nm.

2. APC Starter/Generator: Torque the #10-32 nuts to 20-25 in-lbs/2.3-2.8 Nm and the #3/8-24 nuts to 160-190 in-lbs/18.1-21.5 Nm.

G. Reconnect the battery.

13-122.1 Starter/Generator Cooling System

13-122.2 Description – Starter/Generator Cooling System

480B serial number 5114 and subsequent and 480B serial numbers 5087 - 5113 equipped with the Increased Cooling Kit, P/N 4230031, are equipped with a cooling system for the starter/generator. The system consists of a rigid air duct and a flexible duct. The rigid air duct is installed on the aft side of the cabin back wall with the air intake located at the top of the cabin structure in front of the main rotor gearbox. The flexible duct connects the rigid air duct to the starter/generator. The starter/generator, P/N 150SG117Q-4-1, on these aircraft is equipped with a flanged adaptor for installation of the flexible duct.

13-122.3 Removal – Starter/Generator Cooling System

A. Open the right side engine access panel.

B. Loosen the clamp on the flexible duct at the starter/generator and remove the duct from the starter/generator.

C. Loosen the clamp on the flexible duct at the rigid air duct and remove the flexible duct from the aircraft.

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D. Use the following procedure to remove the rigid air duct:

1. Remove the forward scoop (Fig. 13-1, Item 1) and the upper plenum/air inlet assembly (para. 13-28).

2. Remove the hardware attaching the rigid air duct to the back wall and remove the air duct.

13-122.4 Inspection – Starter Generator Cooling System

A. Inspect the flexible duct and clamps for condition and security of installation.

B. Inspect the rigid air duct for condition and security.

C. Inspect the drain hole in the bottom of the air duct for obstruction.

13-122.5 Repair – Starter Generator Cooling System

A. Replace the flexible duct and/or clamps if damage causes them to be unserviceable.

B. Repair damage to the rigid air duct IAW AC43.13-1B. Replace the air duct if uneconomically repairable.

C. Clean debris from the air duct drain hole as required.

13-122.6 Installation – Starter Generator Cooling System

A. Use the following procedure to install the rigid air duct:

1. Install the air duct into position and install the hardware.

2. Install the forward scoop (Fig. 13-1, Item 1) and the upper plenum/air inlet assembly (para. 13-31).

B. Install the flexible duct onto the rigid air duct and install the clamp.

C. Install the flexible duct onto the starter/generator and install the clamp.

D. Close the right side engine access panel.

13-123. Bleed Air Collector

13-124. Removal – Bleed Air Cooler

A. Disconnect the discharge hose from the collector.

B. Remove the top half of the collector.

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CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

C. Remove the bleed air valve from the engine. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

D. Remove the lower half of the collector from the bleed valve.

13-125. Inspection – Bleed Air Collector

A. Inspect the bleed air collector for cracks, corrosion, dents, and security of installation.

B. Inspect the discharge hose for condition and security.

13-126. Repair – Bleed Air Collector

A. Repair damage to the bleed air collector I/A/W AC 43.13-1B if the damage does not interfere with the operation of the bleed valve.

B. Replace the discharge hose if it has a hole in it or the spring as separated from the hose more than one half of the circumference of the hose.

13-127. Installation – Bleed Air Collector

NOTE

Replace all used o-rings/packings and gaskets.

A. Install the bleed air valve and gasket into the lower half of the collector.

CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

B. Install the bleed air valve on the engine. Refer to the Rolls-Royce 250-C20 Series Operation and Maintenance Manual.

C. Install the top half of the collector.

D. Connect the discharge hose.

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13-128. Tachometer Generator

13-129. Removal – Tachometer Generator

NOTE

The procedures for removal, inspection, and installation are the same for both the N_1 and N_2 tach generators.

A. Disconnect the electrical led from the tach generator.

B. Remove the nuts and washers securing the tach generator. Remove the tach generator and gasket.

13-130. Inspection – Tachometer Generator

A. Inspect the tach generator for cracks, corrosion, seal leakage, dents, and security.

B. Inspect the electrical connector for corrosion and condition.

13-131. Repair – Tachometer Generator

A. Replace the tachometer generator if inoperable or damage effects the proper operation of the tachometer generator.

B. Replace the gasket and the tachometer pad seal (Rolls-Royce 250-C20 Series Operation and Maintenance Manual) if oil leakage is evident.

13-132. Installation – Tachometer Generator

NOTE

Replace all used o-rings/packings and gaskets.

NOTE

Refer to the TH-28/480 Series Illustrated Parts Catalog to determine the correct N_2 tach generator for the dual tachometer (N_2/N_R) installed in the instrument panel.

A. Install the tach generator and gasket.

B. Install the electrical lead and safety wire.

13-133. Engine Mounts

13-134. Removal – Engine Mounts

A. Remove the hardware securing the mount and remove the mount.

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13-135. Inspection – Engine Mounts

A. Inspect the engine mounts for cracks, corrosion, bends, elongated holes, damaged threads, and security of installation. (See also SDB T-038, latest revision.)

13-136. Repair – Engine Mounts

A. Replace engine mounts that are cracked, bent, have elongated bolt holes, or thread damage that cannot be repaired.

B. Remove minor nicks, scratches, corrosion, or thread damage.

13-137. Installation – Engine Mounts

A. Install the mounts.

CAUTION

The top mount torque requirement is applicable to the three bolts (Figure 13-9, Item 40) used to secure the top engine mount to the engine. This torque requirement does not apply to the pylon mount nut and jam nut (Figure 13-9, Item 42) used to secure the engine to the pylon. Refer to paragraph 13-7, C, E, for the correct pylon mount nut and jam nut tightening procedure.

1) Top mount: torque the hardware to 110 in-lbs/12.5 Nm and lockwire (.032).

2) Side mounts: install the self-locking engine mount bolt, torque hardware to 110 in-lb/12.5 Nm, and apply a thin line of white paint (Torque Seal, or equivalent) on the head of the bolt and engine mount.

13-138. Fuel Filter Differential Pressure Switch

13-139. Removal – Fuel Filter Differential Pressure Switch

CAUTION

If the pressure switch is being removed from an engine installed in an aircraft, pull the fuel shutoff valve to the OFF position.

A. Disconnect the electrical lead from the switch.

CAUTION

Cap or plug all open fluid/air fittings to prevent contamination of the engine.

CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

B. Remove the lines connecting the switch to the fuel pump housing.

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C. Remove the nut securing the pressure switch and clamp to the accessory gearbox. Remove the pressure switch.

D. Remove the fittings from the pressure switch and from the fuel pump housing.

13-140. Inspection – Fuel Filter Differential Pressure Switch

A. Inspect the pressure switch for cracks, corrosion, damage, leaks, and security.

B. Inspect the lines and fittings for bends, cracks, corrosion, damaged threads, leaks, nicks, scratches, and security.

C. Inspect the electrical connector for condition and corrosion.

13-141. Repair – Fuel Filter Differential Pressure Switch

A. Replace the pressure switch if cracked, inoperative, damage to the electrical connector cannot be repaired, or fuel leakage is evident from the switch.

B. Replace lines that are bent, cracked, or have damage to the flares that cannot be polished out. Remove minor nicks, scratches, or corrosion.

C. Replace fittings that have damage to the threads that effect the operation and security of installation for the system or damage to the flares that cannot be polished out.

D. Replace o-rings that are leaking.

13-142. Installation – Fuel Filter Differential Pressure Switch

NOTE

Replace all used o-rings/packings and gaskets.

CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

A. Install the fittings in the pressure switch and the BF and AF ports of the fuel pump housing.

B. Install the pressure switch into the mounting clamp and attach to the accessory gearbox. Torque the nut to 35-40 in-lbs/4.0-4.5 Nm.

C. Install the lines between the fuel pump housing and the pressure switch.

D. Connect the electrical lead to the pressure switch.

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13-143. Customer Bleed Air Lines and Fitting

13-144. Removal – Customer Bleed Air Lines and Fittings

CAUTION

Use a backing wrench to prevent damaging fluid/air lines and fittings.

CAUTION

Cap or plug all open fluid/air fittings to prevent contamination of the engine.

A. Remove the lines connected to the customer bleed air fittings on the compressor scroll.

B. Remove the customer bleed air fittings from the compressor scroll.

13-145. Inspection – Customer Bleed Air Lines and Fittings

A. Inspect the lines and fittings for bends, cracks, corrosion, damaged threads, nicks, scratches, and security of installation.

13-146. Repair – Customer Bleed Air Lines and Fittings

A. Replace lines that are bent, cracked, or have damage to the flares that cannot be polished out. Remove minor nicks, scratches, or corrosion.

B. Replace fittings that have damage to the threads that effect the operation and security of installation for the system or damage to the flares that cannot be polished out.

13-147. Installation – Customer Bleed Air Lines and Fittings

NOTE

Replace all used o-ring/packings and gaskets.

A. Apply anti-seize (MIL-PRF-907) to the threads of the customer bleed air fittings and install the customer bleed air fittings in the compressor scroll.

B. Install and connect the customer bleed air lines to the fittings in the compressor scroll.

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13-148. Consumable Materials List

ITEMS	DESCRIPTION	PART NUMBER
Adhesive	Acrylic Adhesive, IPS Corporation	WELD-ON 45
Adhesive	Acrylic Adhesive, Magnacryl Brand[1]	506 with accelerator (#7)
Adhesive	Structural Adhesive, Loctite Brand	EA 9359.3 AERO
Adhesive	Structural Adhesive, Loctite Brand	Loctite H3300
Indicator Paste	Cross-Check™ Torque Seal, Dykem Brand	88314 through 88321 (color options)
Inspection Seal Lacquer	Torque Seal	F-900
Lockwire	Lockwire, .020"	MS20995C20
Lockwire	Lockwire, .032"	MS20995C32
Lubricant	Anti-Seize	MIL-PRF-907
O-ring	O-ring (Oil Reservoir Drain Plug)	MS28778-6
Primer	Loctite 7649	19269
Sealant	Clear Silicone Sealant, Dow Corning Brand	732 RTV
Solvent	Citra-Safe, Inland Technology Incorporated	6850-01-378-( )
Solvent	Extreme Simple Green, Sunshine Makers, Inc.	13440
Thread sealant	Thread sealant, Loctite Brand (222)	21463, 38653
Thread sealant	Thread sealant, Loctite Brand (277)	27731
Thread sealant	Thread sealant, Loctite Brand Threadlocker Blue 242[2]	24200
Thread sealant	Thread sealant, Vibra-Tite Brand	Vibra-Tite VC-3

[1] Trade names Versilok 506 or Hughson 506 are identical to Magnacryl 506.
[2] Acceptable alternate where thread sealant is required.

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SECTION 14

UTILITY SYSTEMS

14-1. Bleed Air Heating and Defrosting System

NOTE

An optional arctic bleed air heater system can be installed on the TH-28, 480, and 480B. The arctic heater system incorporates redesigned bleed air lines that utilize the compressor bleed air more efficiently and 2 additional heater mixing outlets. The maintenance procedures for the arctic bleed air heater system are the same as for the standard bleed air heater and will not be specifically covered in this manual.

14-2. General Description - Bleed Air Heating and Defrosting System

The bleed air heating and defrosting system is optional equipment on the 480/480B and uses engine compressor bleed air to heat the cockpit and defrost the windshields. The system consists of the pneumatic lines and fittings required to supply the bleed air from the engine compressor scroll to the mixing outlets and discharge nozzles, 2 control valves, 2 heater mixing outlets, 2 defroster nozzles, and a drain valve. The heater control valve is located below the cockpit floor. The actuating control for the valve is located on the left side of the center pedestal for TH-28 S/N 3004 and 3006 and 480 S/N 5001 and is labeled HEATER. On all subsequent TH-28, 480, and 480Bs, the actuating control for the valve, labeled HEAT, is located on the slider control panel located on the aft side of the center pedestal. Positioning the control to ON, opens the control valve and allows bleed air to flow to the 2 heater mixing outlets. The heater mixing outlets, located just forward of the center pedestal, have foam insulation installed in them to absorb some of the noise produced by the bleed air. The outlet portions, located near the pilot's and copilot's feet, are adjustable. The defroster control valve is also located below the cockpit floor. The actuating control for the valve is located on the right side of the center pedestal for TH-28 S/N 3004 and 3006 and 480 S/N 5001 and is labeled DEFROSTER. On all subsequent TH-28, 480, and 480Bs, the actuating control for the valve, labeled DEFR, is located on the slider control panel located on the aft side of the center pedestal. Positioning the control to ON, opens the control valve and allows bleed air to flow to the 2 defroster nozzles located just below the windshields. The drain valve, located in the engine compartment, incorporates a spring loaded ball plunger that closes when the engine is operating.

14-3. Pneumatic Lines and Fittings

14-4. Removal - Pneumatic Lines and Fittings

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

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CAUTION

Cap or plug all open lines or fittings to prevent system contamination.

A. Disconnect both ends of the pneumatic line or fitting.

B. If required, disconnect the pneumatic line or fitting from its mounting bracket(s).

C. Remove the pneumatic line or fitting.

14-5. Inspection - Pneumatic Lines and Fittings

A. Inspect the pneumatic lines and fittings for bends, cracks, corrosion, condition of the heat shield, damaged threads, nicks, scratches, and security of installation.

14-6. Repair - Pneumatic Lines and Fittings

A. Repair the lines fittings if the corrosion, nicks, scratches, or bends are not severe and will not compromise the heating and defrosting system or possibly cause a problem with the engine.

B. Replace lines or fittings that are cracked, have damaged threads, or cannot be satisfactorily repaired.

C. Repair or replace the heat shield depending on the severity of the damage.

D. Tighten loose connections or mounting brackets.

E. Repair or replace damaged mounting brackets.

14-7. Installation - Pneumatic Lines and Fittings

A. Place the line or fitting into position and secure to its mounting bracket if utilized.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

NOTE

Apply anti-seize compound to the fittings installed in the engine compressor scroll.

B. Connect the line or fitting and tighten.

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14-8. Control Valves

14-9. Removal - Control Valves

NOTE

The procedures for removal and installation of the control valves are the same for both sides.

A. TH-28, S/N 3004 and 3006, and 480, S/N 5001; Loosen the retaining screws securing the control handle to the control valve operating rod and remove the control handle.

B. All subsequent TH-28, 480, and 480B; Remove the nut securing the control arm to the valve assembly.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

C. Disconnect the pneumatic lines from both ends of the valve.

D. Remove the control valve from the aircraft.

E. TH-28, S/N 3004 and 3006, and 480, S/N 5001; Remove the roll pins securing the operating rod from the valve and remove the operating rod.

NOTE

The heat shield for the control valves is installed depending on the amount of wiring that must be installed do to optional avionic/navigation equipment. If the control valves did not come equipped from the factory with heat shields installed, they are not required.

F. Remove the heat shield from the valve.

14-10. Inspection - Control Valves

A. Inspect the control valves for damage, proper operation, condition of the heat shield, and security of installation.

14-11. Repair - Control Valves

A. Replace the control valves if damaged to the extent that the valve is economically unrepairable.

B. Replace the operating rod if the roll pin holes are elongated.

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C. Replace the heat shield if unserviceable.

D. Tighten loose handle set screws or loose "B" nuts.

14-12. Installation - Control Valves

NOTE

The procedures for removal and installation of the control valves are the same for both sides.

NOTE

The heat shield for the control valves is installed depending on the amount of wiring that must be installed do to optional avionic/navigation equipment. If the control valves did not come equipped from the factory with heat shields installed, they are not required.

A. Install the heat shield onto the valve and secure with cable ties.

B. TH-28, S/N 3004 and 3006, and 480, S/N 5001; Install the operating rod onto the valve and install the roll pins.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

C. Install the valve into position and secure with the mounting hardware. Connect and tighten the pneumatic lines.

D. TH-28, S/N 3004 and 3006, and 480, S/N 5001; Install the control handle onto the operating rod and secure with the set screws.

E. All subsequent TH-28, 480, and 480B; Install the control arm onto the valve and install the securing hardware. Ensure that the position of the valve and the position of the control arm are properly orientated.

14-13. Heater Mixing Outlets

14-14. Removal - Heater Mixing Outlets

NOTE

The procedures for removal and installation of the heater mixing outlets are the same for both sides.

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CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

A. Disconnect the pneumatic line from the outlet.

B. Pull the nozzle portion of the mixing valve from the assembly.

C. Remove the hardware securing the 2 outlet halves to the mounting bracket and remove the outlet halves.

14-15. Inspection - Heater Mixing Outlets

A. Inspect the heater mixing outlet for corrosion, cracks, dents, proper operation, and security of installation.

14-16. Repair - Heater Mixing Outlets

A. Repair minor damage to the nozzle assembly. Replace the assembly if economically unrepairable.

B. Repair minor damage to the outlet halves or replace if economically unrepairable.

C. Replace the foam insulation if deteriorated.

D. Repair or replace the mounting bracket as required.

E. Tighten loose mounting hardware or pneumatic line "B" nuts.

14-17. Installation - Heater Mixing Outlet

NOTE

The procedures for removal and installation of the heater mixing outlets are the same for both sides.

A. Position the 2 outlet halves onto the mounting bracket and secure with the mounting hardware.

B. Insert the nozzle assembly into the outlet portion of the mixing outlet.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

C. Connect the pneumatic line to the nozzle assembly and tighten.

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14-18. Defroster Nozzles

14-19. Removal - Defroster Nozzles

NOTE

The procedures for removal and installation of the defroster nozzles are the same for both sides.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

A. Disconnect the pneumatic line from the defroster nozzles.

B. Remove the hardware securing the defroster nozzle to the cabin shell and remove the nozzle.

14-20. Inspection - Defroster Nozzles

A. Inspect the defroster nozzles for cracks, corrosion, damage, and security of installation.

14-21. Repair - Defroster Nozzles

A. Repair minor damage to the defroster nozzles, replace if economically unrepairable.

B. Tighten loose mounting hardware or "B" nuts.

14-22. Installation - Defroster Nozzles

NOTE

The procedures for removal and installation of the defroster nozzles are the same for both sides.

A. Install the nozzle into position and secure with the mounting hardware.

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

B. Connect the pneumatic line to the nozzle assembly and tighten.

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14-23. Drain Valve

14-24. Removal - Drain Valve

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

A. Disconnect the pneumatic lines from the drain valve and remove the valve.

14-25. Inspection - Drain Valve

A. Inspect the drain valve for damage, proper operation, and security of installation.

14-26. Repair - Drain Valve

A. Replace the drain valve if it does not close while the engine is running or damage effects the operation of the valve.

B. Tighten loose pneumatic line "B" nuts.

14-27. Installation - Drain Valve

CAUTION

Use a backing wrench to prevent from damaging fluid/air lines and fittings during removal or installation.

A. Install the drain valve into position. Connect and tighten the pneumatic lines.

14-28. Control Cables (TH-28/480, S/N 3007/5002 and subsequent and all 480B)

NOTE

The procedures for removing and installing the control cables for the heater and the defroster are the same.

14-29. Removal - Control Cable

NOTE

Note the routing of the control cable before removal.

A. Remove the cable stop and set screw from the end of the cable at the control valve.

B. Remove the clamps securing the cable into position.

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C. Remove control slider panel from the aft end of the center pedestal.

D. Loosen the screws in the cable clamp.

E. Loosen the set screw in the correct cable stop for the cable being removed.

F. Remove the cable.

14-30. Inspection - Control Cable

A. Inspect the control cable for kinks or damage that would affect the proper operation of the valve.

B. Inspect the hardware including the control arm and the slider assembly for damage, missing hardware, and proper installation and operation.

14-31. Repair - Control Cable

A. Replace cables that have damage that effects the operation of the control valve.

B. Replace damaged or missing hardware.

NOTE

The procedures for removing and installing the control cables for the heater and the defroster are the same.

14-32. Installation - Control Cable

A. Install the control cable using the routing noted before removal.

B. Install the cable into the cable clamp on the slider panel and tighten the set screws.

C. Install the cable stop into the correct slider. Install the cable into the cable stop, apply thread sealant (VC-3 Vibra-tite) to the engaging threads of the set screw, and install the set screw.

D. Install the control slider panel onto the aft end of the center pedestal.

E. Secure the cable into position with the clamps.

F. Insert the end of the cable into the stop nut on the control arm and install a cable stop and set screw on the end of the cable.

G. Ensure that the control slider and the control arm are orientated for proper operation and tighten the set screw on the control arm.

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14-33. Ventilation System

14-34. General Description - Ventilation System

The aircraft is equipped with 2 types of ventilation systems. The first is a normal flow through type system and for the TH-28 consists of a sliding vent window on both cabin doors (optional equipment 480/480B) and a pop out vent in each opera window. The 480/480B utilizes two pop out vents in each cabin door and a pop out vent in each opera window. The second system is a ram air ventilation system (optional equipment 480/480B) and an optional bleed air system is available.

14-35. Ram Air Ventilation System

14-36. Description - Ram Air Ventilation System

The ram air ventilation system consists of an inlet/valve assembly, control cable, 2 outlet ducts, and 2 outlets. The inlet/valve assembly is located on the cabin shell just in front of the keel assembly. When the control valve is opened using the control cable, a butterfly valve is opened allowing outside ram air to enter the inlet/valve assembly and is discharged into the cabin via the ducting and outlets. The outlets are located on the sides of the instrument panel.

NOTE

Maintenance procedures for the bleed air ventilation system are the same as the ram air system except for the bleed air line used to supply the system. Use the maintenance procedures for the pneumatic lines in the heater and defroster procedures in this section.

14-37. Inlet/Valve Assembly

14-38. Removal - Inlet/Valve Assembly

A. Disconnect the ducting from the inlet/valve assembly.

B. Disconnect the control cable from the inlet/valve assembly.

C. Remove the hardware securing the inlet/valve assembly to the cabin shell.

14-39. Inspection - Inlet/Valve Assembly

A. Inspect the inlet/valve assembly for cracks, damage, proper operation, and security of installation.

14-40. Repair - Inlet/Valve Assembly

A. Repair minor damage to the inlet/valve assembly. Replace the assembly if economically unrepairable.

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B. Adjust the control cable if the inlet/valve assembly does not fully open or close.

14-41. Installation - Inlet/Valve Assembly

A. Install the inlet/valve assembly and secure with the mounting hardware.

B. Connect the control cable and rig so that the inlet/valve assembly is closed when the cable is in the closed position and open when the cable is in the open position.

C. Connect the ducting to the inlet/valve assembly.

14-42. Ventilation Ducting and Outlets

14-43. Removal - Ventilation Ducting and Outlets

A. Disconnect the ducting from the inlet/valve assembly.

B. Disconnect the ducting from the 2 outlets located on the sides of the instrument panel and remove the ducts.

C. Remove the hardware securing the outlets and remove the outlets.

14-44. Inspection - Ventilation Ducting and Outlets

A. Inspect the ducting for holes and security of attachment to the outlets.

B. Inspect the outlets for damage, proper operation, and security of installation.

14-45. Repair - Ventilation Ducting and Outlets

A. Repair holes in the ducting using reinforced (100 mph) tape. Replace the ducting if damaged beyond repair.

B. Replace the outlets if they are damaged beyond repair or are economically unrepairable.

14-46. Installation - Ventilation Ducting and Outlets

A. Place the outlets into position and install the mounting hardware.

B. Install the outlet ducts and connect to the outlets and the inlet/valve assembly and secure with the retaining screws and tie-rap (PLT4S CO), as required.

14-47. Ventilation Control Cable

14-48. Removal - Ventilation Control Cable

NOTE

Note the routing of the control cable before removal.

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A. Remove the left side keel access panel.

B. Disconnect the cable from the inlet/valve assembly.

C. Detach the cable from the mounting bracket on the cabin shell.

D. TH-28, S/N 3004 and 3006; Remove the retaining nut from the backside of the control mounting bracket located at the bottom of the instrument panel at the right side of the center pedestal. Remove the control cable.

E. 480, S/N 5001; Remove the control cable mounting box from the left side of the center pedestal. Remove the retaining nut from the backside of the cable mounting box and remove the control cable.

G. All subsequent TH-28,480, and 480B; Remove the slider control panel from the aft end of the center pedestal. Loosen the set screws in the cable clamp and the cable stop for the ventilation cable. Remove the cable and the cable stop.

14-49. Inspection - Ventilation Control Cable

A. Inspect the control cable for binding, kinks, proper operation, and security of installation.

14-50. Repair - Ventilation Control Cable

A. Replace the cable if kinked or if the cable is binding and the cause is not from a bend radius being too small.

B. Adjust the cable position in the mounting bracket on the cabin shell if the cable is binding due to the bend radius being too small.

C. Adjust the cable so that the inlet/valve assembly will be opened and closed when the control cable is in the opened and closed position.

D. Tighten loose mounting hardware.

14-51. Installation - Ventilation Control Cable

A. TH-28, S/N 3004 and 3006; Install the control cable through the mounting bracket located at the bottom of the instrument panel at the right side of the center pedestal. Install the retaining onto the control cable and tighten against the mounting bracket.

B. 480, S/N 5001: Install the cable through the mounting box. Install the retaining nut onto the cable and tighten against the backside of the mounting box and install the box onto the center pedestal.

C. All subsequent TH-28,480, and 480B: Install the control cable. Install the cable stop into the correct slider. Install the end of the cable into the cable stop, apply thread sealant (VC-3 Vibra-tite) to the engaging threads of the set screw, and tighten the set screw. Position the cable in the cable clamp and tighten the clamp set screws. Install the slider control panel on the aft end of the center pedestal.

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D. Connect the cable to the mounting bracket located on the cabin shell.

E. Connect the cable to the inlet/valve assembly and rig so that the inlet/valve assembly will be opened and closed when the control cable is in the opened and closed position.

14-52. Sliding Vent Windows

Refer to the window replacement portion of maintenance manual for maintenance procedures for the sliding vent windows.

14-53. Pop Out Vents

14-54. Removal - Pop Out Vents

A. Remove the metal spring retainer from the vent.

B. Compress the sides of the vent and work the vent through the opening in the window.

14-55. Inspection - Pop Out Vents

A. Inspect the vent for cracks, crazing, and security of installation.

14-56. Repair - Pop Out Vents

A. Repair minor cracks by stop drilling. Replace the vent if the structural integrity of the vent is in question.

B. Correctly install the vent if improperly installed.

14-57. Installation - Pop Out Vents

A. Compress the sides of the vent and work the vent into the window.

B. Install the spring retainer into the vent.

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14-58. Passenger Seating Configuration Kit

14-59. Description - Passenger Seating Configuration Kit

The 480/480B Passenger Seating Configuration Kit consists of a removable footrest assembly and covers for the right side cyclic and tail rotor control fittings.

14-60. Footrest Assembly

14-61. Removal - Footrest Assembly

NOTE

Removal of footrest assembly is not required to reconfigure the aircraft for dual controls.

A. Unlock the turn lock fasteners or the latch assembly securing the footrest assembly in place and remove the assembly.

14-62. Inspection - Footrest Assembly

A. Inspect the footrest assembly for cracks, bends, and security of installation.

B. Inspect the mounting brackets for cracks and security of installation.

C. Inspect for damaged or missing hardware.

14-63. Repair - Footrest Assembly

A. Repair damage to the footrest assembly or the mounting brackets I/A/W AC 43.13-1B. Replace the assembly or the mounting brackets if uneconomically repairable.

B. Replace damaged or missing hardware.

14-64. Installation - Footrest Assembly

A. Install the footrest assembly onto the mounting brackets and secure with the turn lock fasteners or the latch assembly.

14-65. Cyclic Fitting Cover

14-66. Removal - Cyclic Fitting Cover

A. Unsnap the fasteners or remove the screws (heavy duty version) and remove the cover.

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14-67. Inspection - Cyclic Fitting Cover

A. Inspect the cover for damage and security of installation.

B. Inspect for damaged or missing fasteners.

14-68. Repair - Cyclic Fitting Cover

A. Repair damage to the cover I/A/W AC 43.13-1B. Replace the cover if uneconomically repairable.

B. Replace damaged or missing fasteners.

14-69. Installation - Cyclic Fitting Cover

A. Place the cover into position and secure the fasteners or install the screws (heavy duty version).

14-70. Tail Rotor Control Cover

14-71. Removal - Tail Rotor Control Cover

A. Unlock the turn lock fasteners or remove the screws (heavy duty version) and remove the cover.

14-72. Inspection - Tail Rotor Control Cover

A. Inspect the cover for damage and security of installation.

B. Inspect for damaged or missing fasteners.

14-73. Repair - Tail Rotor Control Cover

A. Repair damage to the cover I/A/W AC 43.13-1B. Replace the cover if uneconomically repairable.

B. Replace damaged or missing fasteners.

14-74. Installation - Tail Rotor Control Cover

A. Place the cover into position and secure the turn lock fasteners or screws (heavy duty version).

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14-75. Cargo Hook

14-76. Description - Cargo Hook

An optional cargo hook can be installed on the TH-28, 480, and 480B. The cargo hook is suspended below the aircraft using a cable suspension assembly attached to the pylon assembly. The cargo hook is a horizontal loading type and has provisions for both mechanical and electrical release of the cargo load. The cargo hook and the cable suspension assembly are not capable of swiveling and a load connector with swiveling capability or other device is required to relieve the torsion loads caused by load twisting or turning. The cargo load is released electrically by a button located on the pilot's cyclic stick. A cargo hook arming switch is located on the instrument panel and must be placed in the ARM position for the release button on the pilot's cyclic stick to be operational. The cargo load can be released mechanically at any time using the release lever located on the pilot's collective stick. After initial installation of the complete cargo hook assembly, the cargo hook and the cable suspension assembly can be removed from and installed on the aircraft as required for mission configuration.

14-77. Operational Check - Cargo Hook

NOTE

The mechanical release cable is less flexible than the cables in the suspension assembly and will cause the cargo hook to be offset and restrict its pivot movement under Ano load@ conditions. Do not adjust the release cable unless the results of the operational check require the cable to be adjusted.

A. Pivot the cargo hook on its attachment points and check that there is enough slack in the electrical wiring and the mechanical release cable assembly to allow the hook to pivot and that the cargo hook does not release. Adjust the release cable and/or the electrical wiring as required.

B. Check the operation of the mechanical release system as follows:

1. Ensure that the release lever is approximately parallel to the hand guard on the pilot's collective stick.

2. Attach a 10 pound/4.5 kg test load to the cargo hook.

3. Operate the release lever by pulling up on it and check that the test load released.

4. Move the lever back to approximately parallel to the collective stick hand guard and check that the cargo hook latches.

5. Adjust the mechanical release system if it fails any of the preceding checks.

C. Check the operation of the electrical release system as follows:

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1. Attach a 10 pound/4.5 kg test load to the cargo hook.

2. Turn the battery switch to ON. Ensure that the cargo hook arming switch is in the OFF position. Operate the release button on the pilot's cyclic stick. The cargo hook should not release.

NOTE

The cargo hook will not latch while the release button is activated.

3. Turn the cargo hook arming switch to the ARM position. Operate the release button on the pilot's cyclic stick. Check that the load released and that the cargo hook latched.

4. Turn the cargo hook arming switch and the battery switch OFF.

5. Repair the electrical release system if it fails any of the preceding checks using standard electrical troubleshooting and repair procedures.

14-78. Adjustment - Cargo Hook

A. Adjust the mechanical release system for the cargo hook as follows:

1. Ensure the release cable assembly connected to the cargo hook is properly routed and not kinked. Check that the coupling at the end of the cable is properly connected to the release cable assembly connected to the release lever.

2. Loosen the thumb screw that secures the cable assembly connected to the cargo hook.

3. Reposition the cable assembly in the clamp until the release lever is approximately parallel to the hand guard on the collective stick. Tighten the thumb screw.

4. Perform an operational check of the mechanical release system.

14-79. Removal - Cargo Hook

NOTE

The mechanical release system can remain installed in the aircraft allowing the configuration of the aircraft to quickly be changed.

WARNING

Use extreme caution when removing the cargo hook and cable suspension assembly immediately after the engine has been running do to the close proximity of the engine exhaust stacks to the cable suspension assembly.

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A. Open the left and right side engine access panels.

B. Remove the thumb screw securing the release cable assembly that is connected to the cargo hook. Disconnect the coupling from the release cable assembly that is connected to the release lever. Reinstall the thumb screw.

C. Disconnect the electrical connector for the cargo hook.

CAUTION

Use caution when removing the ends of the cable suspension assembly through the cowling to prevent damage to the cowling, the electrical connector, or to the suspension assembly.

D. Remove the safety pins from the clevis pins that connect the cable suspension assembly to the pylon assembly. Remove the clevis pins and remove the cargo hook and cable suspension assembly from the aircraft.

E. Loosen the screws securing the release lever cable assembly to the quick disconnect bracket.

NOTE

Note the location of the quick disconnect bracket and the routing of the release cable assembly.

F. Remove the quick disconnect bracket.

G. Remove the clamps securing the release cable assembly, disconnect the cable assembly from the release lever and remove the cable assembly.

NOTE

Reinstall the collective friction stop and the collective stick if the mechanical release system is not going to be immediately reinstalled.

H. Remove the pilot's collective stick.

I. Remove the collective friction stop from the collective stick.

J. Remove the bolt securing the release lever assembly and remove the assembly from the collective stick.

L. Close the left and right side engine access panels.

M. Revise the aircraft's weight and balance as required.

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14-80. Disassembly - Cargo Hook

A. Disconnect the electrical connector from the cargo hook and remove the wiring harness from the cable suspension assembly.

B. Remove the B-nut from the cargo hook. Remove the access plate from the cargo hook and remove the set screw from the cable stop. Remove the cable stop.

C. Remove the cable assembly from the cargo hook and from the suspension assembly. Reinstall the access plate onto the cargo hook.

D. Remove the cotter pin and clevis pin securing the cargo hook to the suspension assembly and remove the cargo hook.

E. Remove the cotter pins and clevis pins securing the shackles to the suspension assembly coupling and remove the coupling.

F. Remove the shackles from the cables.

G. Remove the set screws from the cable stops and remove the cable stops from the cable assemblies.

H. Remove the shoulder bolt securing the release lever to the mounting clamp and remove the lever.

I. Remove the hardware securing the extension links to the pylon assembly at the aft attachment points.

14-81. Inspection - Cargo Hook

A. Inspect the cargo hook for cracks and damage that would affect the proper operation or the safety of the cargo hook.

B. Inspect the moving parts of the cargo hook for corrosion, deterioration, and wear.

C. Inspect the cable suspension assembly for condition of the cables and the coupling, proper installation and security to the pylon and the cargo hook, and the condition of the hardware.

D. Inspect the electrical harness for damage, proper installation, and security.

E. Inspect the mechanical release system for kinked or damaged cable assemblies, condition of the quick disconnect coupling and mounting bracket, condition of the release lever assembly, and proper installation and security of the entire mechanical release system.

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14-82. Repair - Cargo Hook

A. Replace the cargo hook if cracks are evident or if the moving parts are worn enough to effect the proper operation of the hook. Repair small nicks and scratches by honing. Repair areas that show evidence of corrosion.

B. Replace any component of the cable suspension assembly including the attaching hardware installed in the pylon assembly that has damage that affects the serviceability of the component. Repair small nicks and scratches in the cable assembly ends and the coupling by honing. Repair areas that have corrosion.

C. Replace the cable assemblies if damage effects the proper operation of the mechanical release system. Replace all damaged or missing hardware. Repair small nicks and scratches to the release lever assembly by honing. Replace the lever assembly if cracks are evident.

D. Repair or replace the wiring harness if damaged.

14-83. Assembly - Cargo Hook

A. Install the extension links onto the aft attachment points on the pylon and install the securing hardware. Do not torque the hardware at this time.

B. Install the release lever onto the mounting clamp and secure with the shoulder bolt that has Loctite 277 applied to the threads.

C. Install the cable stops onto the release cable assemblies. Install the set screws. Allow approximately .25 in./6.4 mm of cable to extend from the cable stop. Install the quick disconnect coupling onto the cargo hook release cable. Do not install the cable stop on the end of the release cable attached to the cargo hook at this time.

D. Match the cable assemblies for the suspension assembly and install a shackle in the end that attaches to the coupling.

E. Install the cable assemblies onto the coupling and secure with clevis pins and cotter pins. Ensure the long axis of the coupling is connected to the aft cable assemblies.

F. Install the cargo hook onto the coupling and secure with a clevis pin and cotter pin. Ensure the cargo hook is facing forward.

G. Remove the access plate from the cargo hook. Insert the release cable through the access hole and install the cable stop and set screw. Ensure the cable stop properly engages the release lever in the cargo hook and that approximately .25 in./6.4 mm of the cable extend past the cable stop.

H. Install the B-nut and tighten. Check for proper engagement of the cable stop in the cargo hook and install the access plate onto the cargo hook.

I. Connect the wiring harness connector to the cargo hook.

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NOTE

Secure the release cable and the wiring harness to the aft left suspension cable with tie wraps after the cargo hook and suspension assembly have been installed in the aircraft.

14-84. Installation - Cargo Hook

WARNING

Use extreme caution when installing the cargo hook and cable suspension assembly immediately after the engine has been running do to the close proximity of the engine exhaust stacks to the cable suspension assembly.

A. Remove the pilot's collective stick and the friction stop from the collective stick.

B. Install the release lever assembly onto the collective stick with the recess in the mounting clamp towards the twist grip. Position the mounting clamp against the hand guard and tighten the clamp bolt. Ensure the release lever is in plane with the hand guard.

C. Reinstall the friction stop and the collective stick.

D. Reinstall the release cable following the same routing as noted prior to removal. Connect the cable to the release lever and secure the cable assembly in place with the clamps.

E. Install the quick disconnect bracket into position as noted prior to removal.

F. Install the release lever cable assembly onto the quick disconnect bracket. Tighten the cable clamp hardware to secure the cable assembly. Ensure that approximately .5 in./12.7 mm of the cable sheath extend past the clamp.

G. Place the cargo hook and suspension assembly under the aircraft and route the ends of the suspension assembly through the cowling.

H. Install the ends of the suspension assembly onto the pylon attachments and secure with the clevis pins and safety pin. Torque the extension link hardware at this time. Ensure the links remain in line with the suspension cable.

I. Route the release cable and wiring harness along the aft left cable at this time and secure in place using tie wraps.

J. Connect the electrical release connector to the electrical connector at the pylon.

K. Remove the thumb screw from the quick disconnect bracket. Attach the quick disconnect coupling to the release lever cable assemble. Install the cable into position and secure with the thumb screw.

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L. Adjust the mechanical release and perform an operational check of the cargo hook.

M. Revise the aircraft's weight and balance as required.

14-85. Snowshoes

NOTE

The optional snowshoes are currently not available for the 480B.

14-86. Description - Snowshoes

The optional snowshoe kit consists of four snowshoe pads, two on each skid tube. These pads increase the footprint of the landing gear, allowing landings in various snow conditions.

14-87. Removal - Snowshoes

A. Install the ground handling wheels and raise the skid assembly on the side that the snowshoes are being removed.

NOTE

Disregard the instructions for removing the forward snowshoes if they are not installed.

B. Remove the hardware securing the mounting straps to the forward snowshoe and remove the mounting straps and the snowshoe.

C. Remove the hardware securing the stop for the forward snowshoe stop and remove the stop. Reinstall the hardware.

D. Remove the hardware securing the 3 forward mounting straps to the aft snowshoe and remove the mounting straps.

E. Remove the bolt, washers, nut, and spacers from the aft mounting clamp and remove the aft snowshoe.

F. Remove the hardware from the forward location of the skid tube extension and sleeve and remove the extension and sleeve.

G. Lower the skid assembly.

H. Remove the snowshoes from the opposite side.

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NOTE

If the snowshoes are not being reinstalled, install the skid shoes that were removed for the snowshoe installation, install the end cap in the end of the skid tube, and reinstall the hardware in the location for the skid tube extension and sleeve. Revise the aircraft's weight and balance as required.

14-88. Inspection - Snowshoes

A. Inspect the snowshoes for bends, cracks, damage, and security of installation.

B. Inspect the mounting straps and hardware for damage and security of installation. Check the condition of the teflon anti-chaffing tape on the mounting straps.

C. Inspect the wear plates for excessive wear.

14-89. Repair - Snowshoes

A. Repair damage to the fiberglass pads I/A/W standard fiberglass repair procedures. Replace the pads if uneconomically repairable.

B. Stop drill small cracks in the pad doublers. Replace the pad doublers if uneconomically repairable.

C. Replace the mounting straps and brackets if bent or cracked.

D. Replace damaged or missing hardware.

E. Replace the wear plates if excessively worn.

F. Replace the teflon anti-chaffing tape on the mounting straps if worn or missing.

14-90. Installation - Snowshoes

NOTE

The installation of the snowshoes is certified with the option of installing the aft snowshoes only. Disregard the instructions for the forward snowshoes if they are not being installed.

NOTE

Omit the following steps that have already been accomplished.

A. Install the ground handling wheels and raise the skid assembly on the side that the snowshoes are being installed.

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B. Remove the end cap from the end of the skid tube and the hardware for the skid tube extension and sleeve.

C. Remove the aft skid shoe and reinstall the mounting hardware.

D. Install the skid tube extension and sleeve, install the mounting hardware and torque.

E. Install the aft snowshoe into position, install the bolt, washers, spacers, and nut through the aft mounting clamp and torque.

F. Install the 3 forward mounting straps into position and install the mounting hardware.

G. Remove the middle skid shoe.

H. Reinstall the mounting hardware for the skid shoe.

I. Install the snowshoe stop on the gear leg bolt forward of the aft position.

J. Install the forward snow shoe into position and secure with the mounting straps and hardware.

K. Lower the skid assembly.

L. Install the snowshoes on the opposite side.

M. Revise the aircraft's weight and balance as required.

14-91. Extended Baggage Compartment

14-92. Description - Extended Baggage Compartment

An optional extended baggage compartment can be installed in the TH-28,480, and 480B. The compartment is comprised of a sheet metal floor which extends from the aft end of the standard baggage compartment to the second bulkhead former in the tailcone, a fabric bulkhead at the aft end of the extension, and a fabric bulkhead at the forward end of the extension which also is the access location for the compartment. The extended baggage compartment was designed to contain bulky, relatively lightweight items that normally are not removed or stowed each flight (i.e. survival gear).

14-93. Removal - Extended Baggage Compartment

A. Open the baggage compartment access door.

B. Remove the fabric bulkhead from the aft end of the standard baggage compartment.

C. Remove the fabric bulkhead from the aft end of the extended baggage compartment.

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D. Remove the screws securing the extension floor and remove the floor.

NOTE

If the extended baggage compartment is not going to be reinstalled, install the fabric bulkhead at the aft end of the standard baggage compartment. Revise the aircraft's weight and balance as required.

E. Close the baggage compartment access door.

14-94. Inspection - Extended Baggage Compartment

A. Inspect the sheet metal floor for dents, kinks, cracks, holes, missing or damaged fasteners, and proper installation.

B. Inspect the fabric bulkheads for tears, condition of the grommets, missing or damaged fasteners, and proper installation.

14-95. Repair - Extended Baggage Compartment

A. Repair damage to the sheet metal floor I/A/W AC 43.13-1B. Replace the floor if uneconomically repairable.

B. Replace damaged or missing hardware.

C. Repair damage to the fabric bulkheads. Replace the bulkheads if uneconomically repairable.

14-96. Installation - Extended Baggage Compartment

A. Open the baggage compartment access door.

B. Remove the bulkhead from the aft end of the standard baggage compartment.

C. Install the extended baggage compartment floor into position and secure with screws.

D. Install the extended baggage compartment aft bulkhead and secure with screws.

E. Install the bulkhead at the aft end of the standard baggage compartment.

F. Close the baggage compartment access door.

NOTE

Revise the aircraft's weight and balance as required.

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14-97. Engine Flush Kit

14-98. Description – Engine Flush Kit

An optional engine flush kit is available for the TH-28, 480, and 480B. The kit consists of a nozzle installed in the lower plenum assembly, a bulkhead connector for attachment of the flush can, and the line that connects the nozzle to the bulkhead. Refer to the Rolls-Royce 250-C20 Operation and Maintenance Manual for the proper maintenance procedures for flushing the engine.

14-99. Removal – Engine Flush Kit

A. Open the left side engine access panel and remove the aft bottom cowling.

B. Disconnect the line from the bulkhead fitting located on the cowl ring and from the nozzle located in the aft side of the lower plenum assembly.

C. Remove the bulkhead fitting from the cowl ring.

NOTE

The nozzle is installed in the lower plenum with adhesive and rivets and is not normally removed.

D. Install a cap on the nozzle.

14-100. Inspection – Engine Flush Kit

A. Inspect the flush kit for damage and security of installation.

14-101. Repair – Engine Flush Kit

A. Replace the flush kit line if damage causes the line to be unserviceable.

B. Replace the bulkhead fitting if damaged.

C. Tighten loose connections.

14-102. Installation – Engine Flush Kit

A. Install the bulkhead fitting into the cowl ring.

B. Remove the cap from the flush nozzle and install the flush kit line. Tighten the connections.

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14-103. Nose Positioned Camera Mount

14-104. Description – Nose Positioned Camera Mount

NOTE

Installation of the Nose Positioned Camera Mount Kit does not authorize installation of a camera system. Installation of specific equipment on the mount may require additional authorization from an appropriate certification authority.

An optional nose positioned camera mount is available for 480/B. It provides provisions for mounting a ball/turret type camera under the nose of the aircraft and for mounting a monitor off of the right side of the instrument panel.

The nose mounted camera mount installation consists of an aluminum sheet metal box structure and an external steel sheet metal mount. The aft end of the box structure is attached to the vertical panels that support the instrument panel. The lower portion of the box structure is attached to the cabin between the chin windows. The external steel mount is located on the outside of the cabin at the forward end of the box structure. It is fastened to the box structure through the fiberglass cabin.

The camera mount has been certified, both structurally and in flight test, with equipment weighing 100 lbs/45.5 kg. The frontal area of the equipment was 1.756 ft^2/.163 m^2 with a center of gravity (CG) located 12.0 inches/30.5 cm below the center line of the external mount. Refer to Figure 14-1 for the external mount foot print.

The monitor mount consists of an aluminum angle with gusset supports which is attached to the honeycomb panel on the right side of the instrument panel and was structurally certified with equipment weighing 4.86 lbs/2.21 kg (monitor and articulating arm). The vertical moment arm limit is 7.4 inches/18.8 cm and the horizontal moment arm limit is 10.4 inches/26.4 cm. Refer to Figure 14-2 for the monitor mount foot print.

14-105. Removal – Nose Positioned Camera Mount

A. Remove the external mount using the following procedure:

(1) Remove the hardware securing the external mount to the aircraft and remove the mount.

B. Remove the camera mount internal box structure using the following procedure:

(1) Remove the external mount.

(2) Remove the external mount doubler.

(3) Remove the instrument panel shroud and the center pedestal trim panels.

(4) Remove the chin windows as applicable (para. 8-47,C).

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(5) Remove the forward trim panel from the cabin nose area.

(6) Disconnect and remove the ram air ventilation ducting as required.

(7) Remove the hardware securing the box structure side panels and remove the side panels.

(8) Remove the fuel shut off valve control cable (para. 10-31).

(9) Remove the hardware securing the box structure to the center pedestal.

(10) Remove the three bolts securing the instrument panel assembly on the left side of the center pedestal and loosen the three bolts securing the instrument panel assembly on the right side of the center pedestal. Loosen the bolts securing the monitor mount to the instrument panel mounting deck.

(11) Partially lift up the instrument panel assembly and remove the box structure from the aircraft.

C. Remove the monitor mount using the following procedure:

(1) Remove the instrument panel shroud.

(2) Remove the hardware securing the monitor mount to the instrument panel mounting deck and right side of the center pedestal. Remove the mount.

14-106. Inspection – Nose Positioned Camera Mount

A. Inspect the external mount for cracks, corrosion, condition of mount nut plates, and security of installation.

B. Inspect the box structure for cracks, bends, corrosion, condition of hardware, and security of installation.

C. Inspect the monitor mount for cracks, bends, corrosion, condition of hardware, and security of installation.

14-107. Repair – Nose Positioned Camera Mount

A. Repair the external mount as follows:

(1) Replace damaged or corroded installation hardware as applicable. Replace damaged or corroded mount nut plates as applicable.

(2) Repair damage to the mount IAW AC43.13-1B.

(3) Replace the mount if damaged beyond repair or economically unrepairable.

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B. Repair the box structure as follow:

(1) Replace damaged or corroded installation hardware as applicable.

(2) Repair damage to the box structure IAW AC43.13-1B.

(3) Replace the box structure or applicable parts if damaged beyond repair or are economically unrepairable.

C. Repair the monitor mount as follows:

(1) Replace damaged or corroded installation hardware as applicable.

(2) Replace the mount if any of threads in the mount holes are damaged beyond repair.

(3) Repair damage to the mount IAW AC43.13-1B.

(4) Replace the mount if damaged beyond repair or economically unrepairable.

14-108. Installation – Nose Positioned Camera Mount

NOTE

The following procedures are based on the assumption that the nose positioned camera mount is being reinstalled in the aircraft and the aircraft has not been operated without the mount kit prior to the reinstallation. Refer to paragraph 14-105 for the procedures to prep the aircraft for the camera mount installation if the aircraft has been operated with the mount removed.

A. Installed the monitor mount using the following procedure:

(1) Position the monitor mount on the instrument panel mounting deck and install the mounting hardware into the instrument panel mounting deck and the center pedestal assembly.

(2) Install the instrument panel shroud.

B. Install the camera mount box structure using the following procedure:

(1) Partially lift up the instrument panel assembly and install the box structure into the aircraft.

(2) Tighten the hardware attaching the instrument panel assembly to the right side of the center pedestal and the hardware attaching the monitor mount to the instrument panel mounting deck. Install the hardware attaching the instrument panel assembly to the left side of the center pedestal.

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(3) Install the hardware attaching the box structure to the center pedestal.

(4) Install the fuel shutoff valve control cable (para. 10-34).

(5) Position the external mount doubler on the aircraft and install the hardware.

(6) Install the box structure side panels into position and install the hardware.

(7) Connect the ram air ventilation ducting as applicable.

(8) Install the instrument panel shroud and center pedestal trim panels.

(9) Install the external mount.

(10) Install the forward trim panel in the cabin nose area.

(11) Install the chin windows as applicable (para. 8-47,C).

C. Install the external mount using the following procedure:

(1) Position the external mount on the aircraft and install the mounting hardware.

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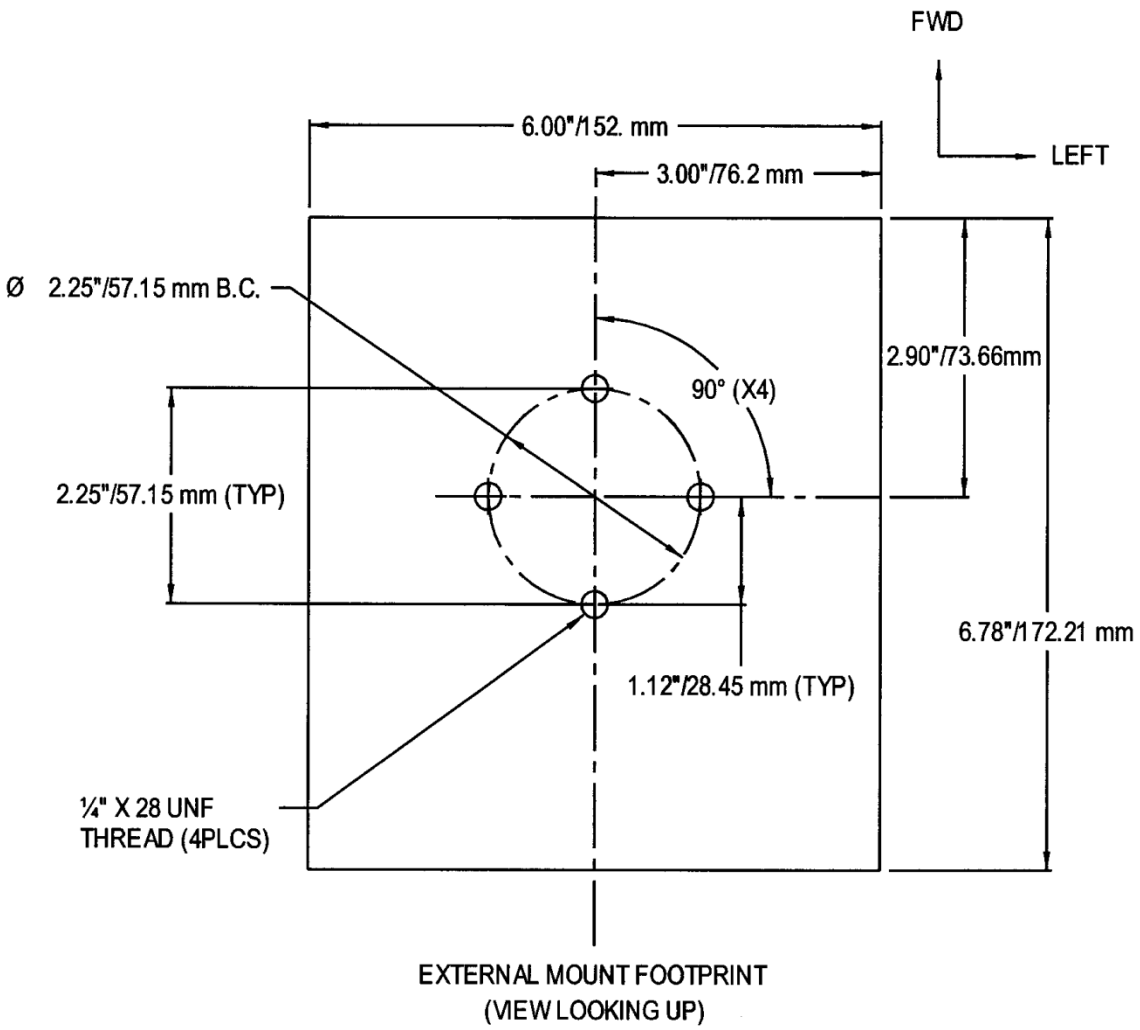


Figure 14-1. External Mount Footprint

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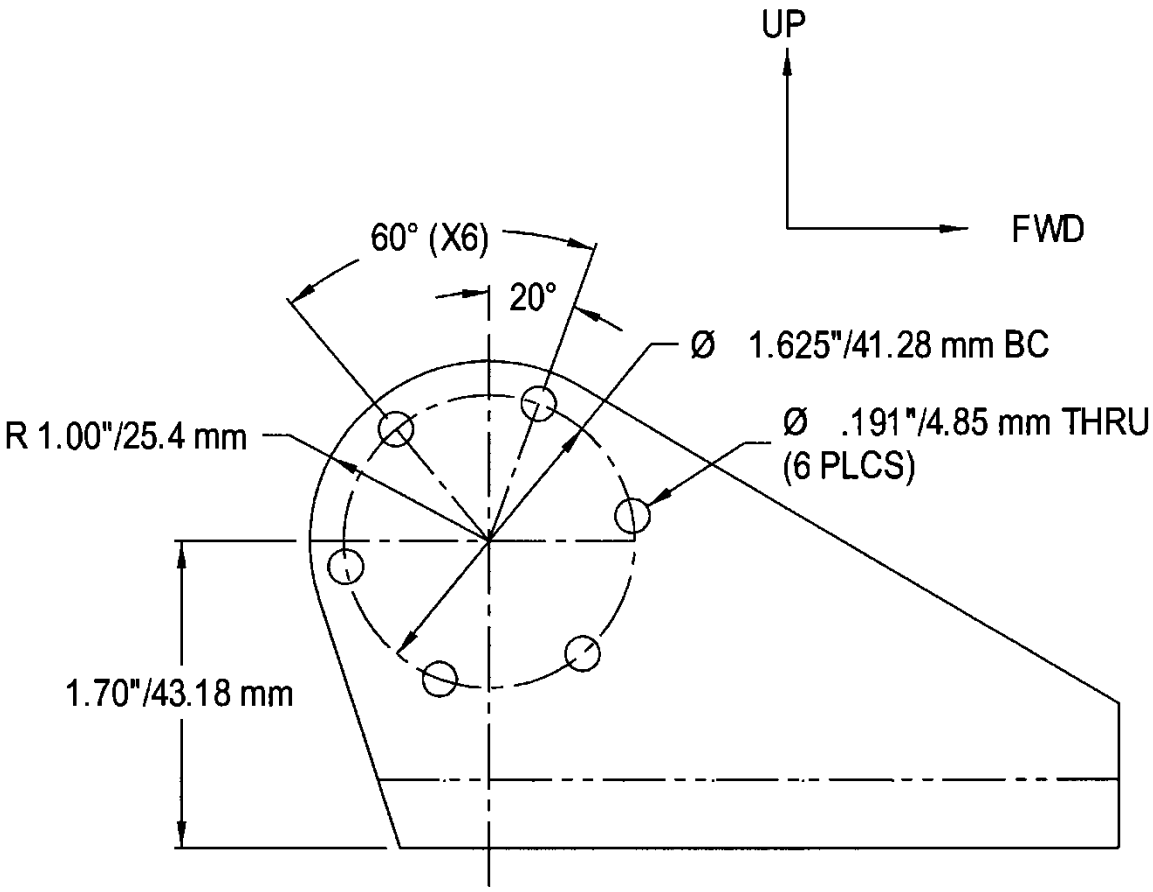


Figure 14-2. Monitor Mount Footprint

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14-109. Searchlight Kit

14-110. Description – Searchlight Kit

The Searchlight Kit, P/N 4220056-( ), provides for installation of a SpectroLab, Inc. SX-5 Starburst® Searchlight (SX-5). The airframe portion of the kit consists of a tubular mount that attaches to the right side of the landing gear assembly aft crosstube, an interface mount installed on the searchlight/gimbal assembly, the mounting structure for the junction box (located in the extended baggage compartment), and the associated airframe wiring installation. The SX-5 system consists of the searchlight and gimbal assembly, junction box assembly, control box assembly, and associated 110 amp wiring harnesses (4220056-1/-7) or 150 amp wiring harnesses (4220056-9/-101). The electrical power circuit for the searchlight is protected by a 40 amp voltage limiter (fuse) located in the keel assembly under the cabin floor or in the right side engine compartment mounted to the cabin backwall. Refer to Diagram 6-29 for the SX-5 interface with the aircraft electrical system. Refer to the appropriate aircraft rotorcraft flight manual and the latest revision of the SX-5 Starburst® Searchlight User's Manual (Doc# 031718) for specific operating procedures.

NOTE

The Searchlight Kit, P/N 4220056-7/-9 with elevated mount, must be used if the aircraft is equipped with the Emergency Floats Kit, P/N 4220091-3.

14-111. Removal – Searchlight Kit

A. Remove the SX-5 searchlight/gimbal assembly from the aircraft using the following procedure:

(1) Disconnect the electrical connectors from the searchlight and the gimbal assembly.

(2) Disconnect the safety pin and lanyard from the aircraft mount.

CAUTION

The searchlight/gimbal assembly weighs approximately 21.5 lbs/9.8 kg.

(3) Support the searchlight/gimbal assembly and remove the quick release pin from the aircraft.

(4) Remove the searchlight/gimbal assembly from the aircraft searchlight mount.

(5) Secure the electrical harness to the aircraft mount.

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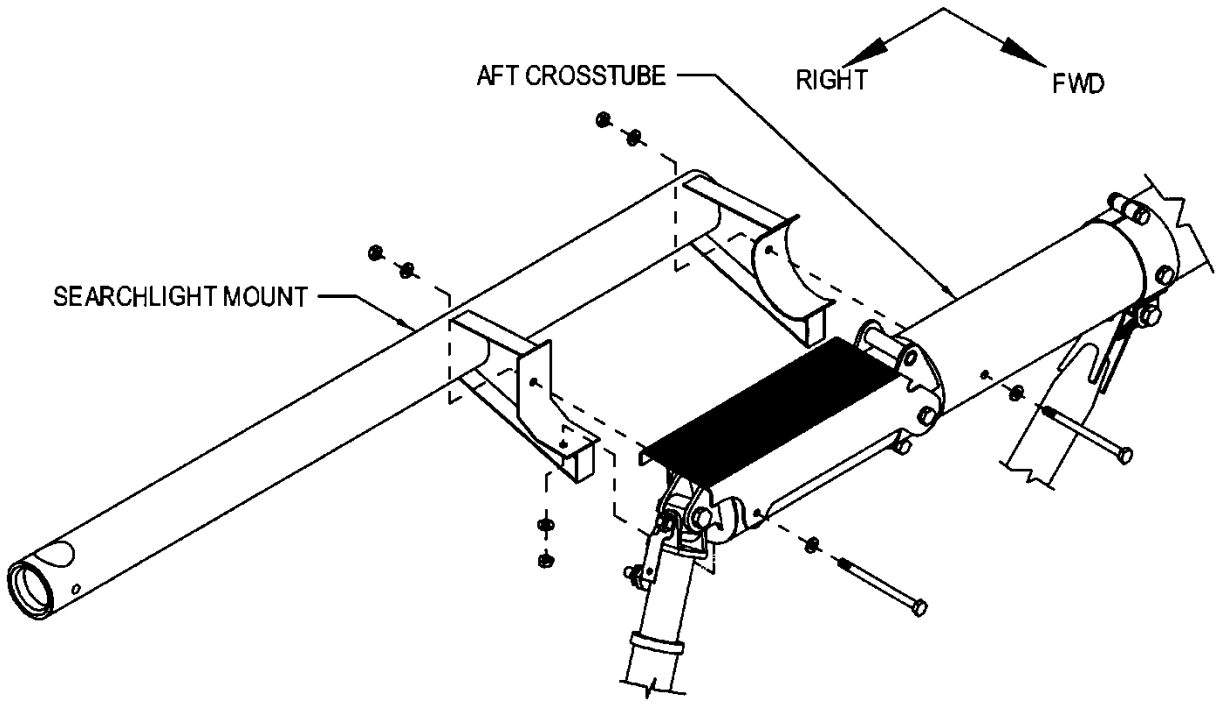
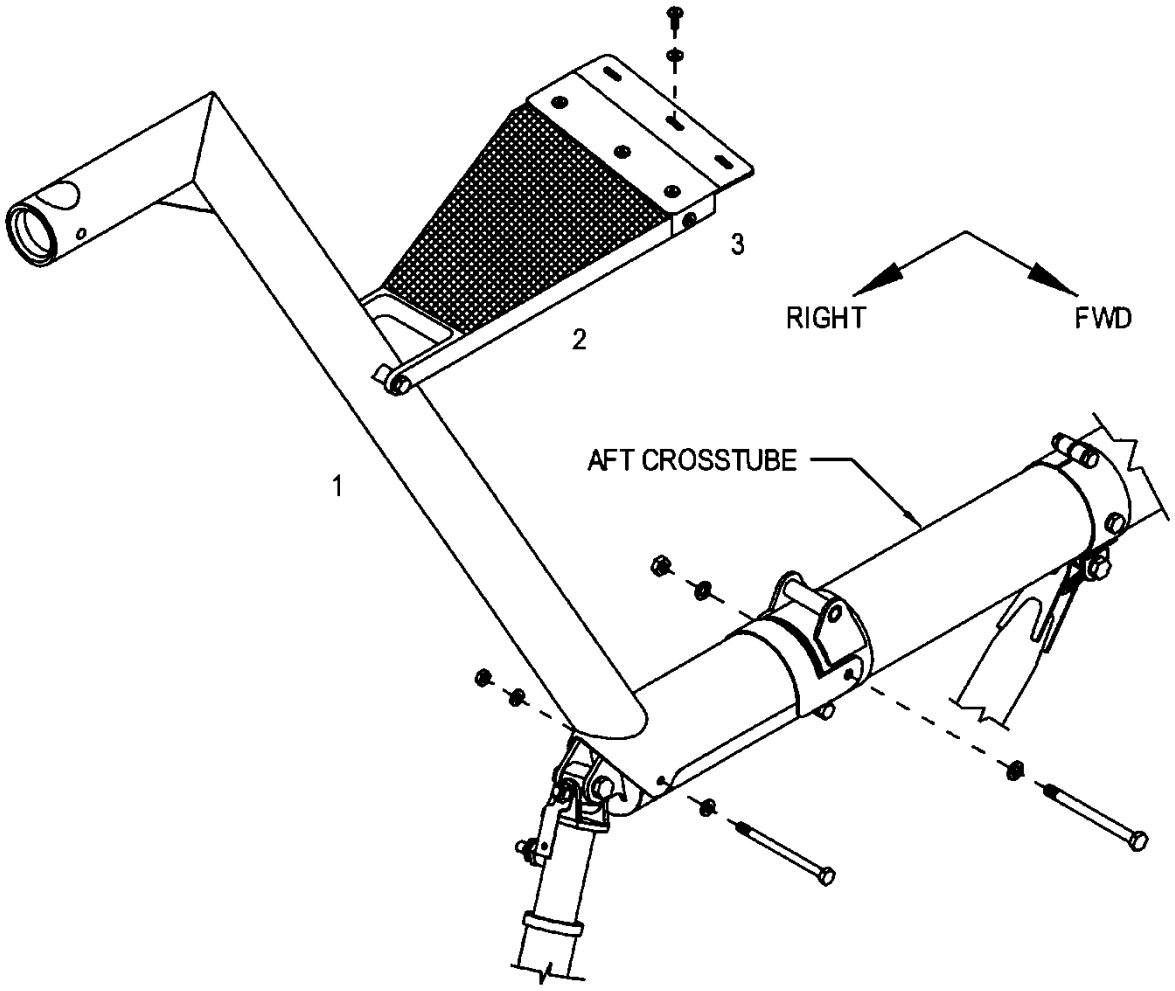


Figure 14-3. Searchlight Mount (Straight)

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NOTE: LOOSEN STEP ADAPTER AND ATTACH STEP ADAPTER TO AIRFRAME STEPS. ADJUST ADAPTER POSITION AS REQUIRED AND TIGHTEN HARDWARE.



1. Elevated Searchlight Mount
2. Mount Step
3. Step Adapter

Figure 14-4. Searchlight Mount (Elevated)

B. Remove the SX-5 control box from the aircraft using the following procedure:

(1) Disconnect the control box electrical connector from the copilot's connector box located on the right aft side of the cabin floor and remove the control box. Install the dust cap on the airframe mounted connector.

C. Remove the SX-5 junction box from the aircraft using the following procedures:

(1) Gain access to the extended baggage compartment.

NOTE

The extended baggage compartment is the standard location for the junction box. The junction box may be installed in an alternate location dependent upon other optional equipment installations.

(2) Disconnect the electrical connectors from the junction box.

(3) Remove the hardware securing the junction box and remove the junction box.

D. Remove the searchlight mount (straight mount, P/N 4220060-1 or -3) from the aircraft using the following procedure (Refer to Figure 14-3):

(1) Remove the searchlight/gimbal assembly from the aircraft.

(2) Disconnect the searchlight mount electrical harness from the aircraft. Install the dust cap on the airframe mounted connector.

(3) Remove the inboard bolt from the searchlight mount and the crosstube.

(4) Remove the outboard horizontal bolt from the mount and the crosstube.

(5) Lift up the crosstube step (if installed) and remove the nut and washer(s) from the outboard vertical bolt.

(6) Remove the searchlight mount and reinstall the bolts and hardware. Adjust the amount of washers as required to compensate for removing the searchlight mount.

E. Remove the searchlight mount (elevated mount, P/N 4220067-1 or -9) as follows (Refer to Figure 14-4):

(1) Remove the searchlight/gimbal assembly from the aircraft.

(2) Disconnect the searchlight mount electrical harness from the aircraft. Install the dust cap on the airframe mounted connector.

(3) Remove the hardware attaching the searchlight mount step to the airframe step.

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(4) Remove the inboard and outboard bolts from the searchlight mount and the crosstube.

(5) Remove the searchlight mount and reinstall the bolts and hardware in the crosstube. Adjust the amount of washers as required to compensate for removing the searchlight mount.

NOTE

The aft crosstube cover (step), P/N 4174032-12, may be installed after the searchlight mount is removed. Refer to the TH-28/480 Illustrated Parts Catalog (IPC) for the correct hardware configuration.

14-112. Inspection – Searchlight Kit

A. Inspect the airframe searchlight mount for corrosion, nicks, scratches, dents, cracks, and security of installation.

B. Inspect the searchlight/gimbal assembly interface mount and airframe mount interface for damage and/or excessive wear.

C. Inspect the junction box installation for damage to the mounting structure and loose or missing hardware.

D. Inspect the searchlight kit electrical harnesses and connectors IAW paragraph 6-13.

E. Inspect the SX-5 system components IAW with the latest revision of the SX-5 Starburst® Searchlight User's Manual (Doc# 031718).

14-113. Repair – Searchlight Kit

A. Repair the airframe searchlight mount as follows:

(1) Replace damaged or corroded installation hardware as applicable.

(2) Corrosion, nicks, and scratches less than .020"/.51 mm deep can be polished out and a protective coating applied. Replace the mount if damage exceeds .020"/.51 mm deep.

(3) Replace the mount if smooth dents exceed .030"/.76 mm.

(4) Cracks may be repaired IAW the procedures in AC43.13-1B.

(5) Replace the mount if damaged beyond repair or economically unrepairable.

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B. Replace the searchlight/gimbal assembly interface mount and/or the airframe mount if there is excessive wear in the interface or the quick release pin will not stay securely installed.

C. Replace the junction box mounting hardware as required. Repair the mounting structures IAW the procedures in AC43.13-1B.

D. Repair the searchlight kit electrical harnesses and connectors IAW the procedures in paragraph 6-14.

E. Repair the components of the SX5 system IAW with the latest revision of the SX-5 Starburst® Searchlight User's Manual (Doc# 031718).

14-114. Installation – Searchlight Kit

A. Install the searchlight mount (straight mount, P/N 4220060-1 or -3) onto the aircraft using the following procedure (Refer to Figure 14-3):

(1) Remove the inboard searchlight mount bolt from the crosstube and the outboard horizontal bolt from the crosstube.

(2) Lift up the crosstube step (if installed) and remove the nut and washer(s) from the outboard vertical bolt.

(3) Install the searchlight mount onto the crosstube.

(4) Install and tighten the inboard searchlight mount bolt, washers, and nut. Adjust the number of washers as required to correct for bolt grip length.

(5) Install and tighten the washer and nut on the vertical outboard crosstube bolt.

(6) Lower the crosstube step into position (if installed) and install and tighten the outboard horizontal bolt, washers, and nut into the crosstube. As adjust the number of washers as required to correct for bolt grip length.

(7) Remove the dust cap from the airframe mounted connector. Connect the searchlight mount electrical harness to the aircraft.

B. Install the searchlight mount (elevated mount, P/N 4220067-1 or -9) as follows (Refer to Figure 14-4):

(1) Remove the crosstube step.

(2) Install the searchlight mount onto the crosstube. Install and tighten the bolts, washers, and nuts in the crosstube. Adjust the amount of washers as required to compensate for removing the crosstube step.

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(3) Install the hardware attaching the searchlight mount step to the airframe step. Adjust the position of the mount step as required.

(4) Remove the dust cap from the airframe mounted connector. Connect the searchlight mount electrical harness from the aircraft.

C. Install the SX-5 junction box into the aircraft using the following procedures:

(1) Gain access to the extended baggage compartment.

NOTE

The extended baggage compartment is the standard location for the junction box. The junction box may be installed in an alternate location dependent upon other optional equipment installations.

(2) Position the junction box onto the mounting brackets and install the mounting hardware.

(3) Connect the electrical connectors to the junction box.

D. Install the SX-5 control box into the aircraft using the following procedure:

(1) Remove the dust cap from the airframe mounted connector on the copilot's connector box located on the right aft side of the cabin floor. Connect the control box electrical connector to the airframe mounted connector.

E. Install the SX-5 searchlight/gimbal assembly onto the aircraft using the following procedure:

(1) Install the searchlight/gimbal assembly into the aircraft searchlight mount.

NOTE

Install the searchlight/gimbal assembly with the horizontal servo motor oriented outboard away from the aircraft.

(2) Install the quick release pin into the aircraft mount.

(3) Connect the safety pin and lanyard to the aircraft mount.

(4) Connect the electrical connectors to the searchlight and the gimbal assembly.

(5) Set the rotational limit at 45° right of centerline for searchlight use.

(6) Set the rotational limit at 180° right of centerline when the searchlight is stowed and secured.

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SECTION 15

EMERGENCY EQUIPMENT

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SECTION 15

EMERGENCY EQUIPMENT

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SECTION 15

EMERGENCY EQUIPMENT

15-1. Fire Extinguisher

15-2. Description – Fire Extinguisher

The fire extinguisher is a hand operated hydrochlorofluorocarbon (HCFC) type and is located on the left side of the pilot's seat in a bracket mounted to the cockpit floor.

15-3. Removal – Fire Extinguisher

A. Loosen the retaining clamp from around the upper section of the extinguisher by pulling the hinged lever. Tension on the extinguisher will be released so that the catch on the hinged lever will be disengaged from the attaching ring.

B. Grasp the fire extinguisher by the handle and remove the extinguisher from the mounting bracket.

C. Remove the hardware attaching the mounting bracket to the cockpit floor and remove the bracket.

15-4. Inspection – Fire Extinguisher

A. Inspect the fire extinguisher I/A/W the instructions on the extinguisher.

B. Inspect the mounting bracket for a damaged retaining clamp and loose or missing hardware.

15-5. Repair – Fire Extinguisher

A. Replace the fire extinguisher if it fails to meet the inspection requirements.

B. Replace the mounting bracket if damaged beyond repair.

C. Tighten loose mounting hardware or install missing hardware.

15-6. Installation – Fire Extinguisher

A. Place the mounting bracket into position and secure with the mounting hardware.

B. Place the fire extinguisher into the mounting bracket with the pressure gauge up and towards the front of the aircraft.

C. Hook the latch of the retaining clamp through the ring on the other retaining clamp. Pull the free end of the latch back toward its retaining clamp until it is against the clamp. This will close the clamp and secure the fire extinguisher.

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15-7. First Aid Kit

15-8. Description – First Aid Kit

A. The first aid kit is a general purpose kit. The storage location for the first aid kit is determined by the owner/operator of the aircraft.

15-9. Inspection – First Aid Kit

A. Inspect and maintain the kit I/A/W the manufacturer's instructions.

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