

**SERVICE DIRECTIVE BULLETIN**

SERVICE DIRECTIVE BULLETIN NO. 0110

Revision 4

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DATE: January 23, 2012

1. SUBJECT: Cyclic Trim System – Cyclic Trim Assembly Kit for the Lateral and Longitudinal Trim Actuator Assemblies
2. MODEL: All F-28F, 280F, and 280FX models equipped with 24 volt D.C. system;  
Any F-28F model equipped with a 12 volt D.C. system with trim relays (S/N 815 only);  
Any F-28C, F-28C-2, or 280C models that have been converted to a 24 volt D.C. system+
3. EFFECTIVITY: F-28F Series: Serial Numbers 828 and prior  
280FX Series: Serial Numbers 2133 and prior
4. REFERENCE: Enstrom F-28A/F-28C Series Maintenance Manual, Latest Revision  
Enstrom 280/280C Series Maintenance Manual, Latest Revision  
Enstrom F-28F/280FX Series Maintenance Manual, Latest Revision

## 5. BACKGROUND:

Enstrom has received two reports of failure in the cyclic trim system in the field. A failed trim relay has reportedly caused the trim actuator to runaway and bottom out against the motor housing. Such an event will cause the circuit breaker to trip, leaving the trim fixed. If the trim runaway occurs in the aft or right direction, the actuator will bottom out and no loss of control authority will occur, although the cyclic control forces will be higher than normal. On further analysis of the condition, it was determined that if the trim runaway occurs in the forward or left directions, the actuator will run until it fouls the limit switch bracket and the circuit breaker trips. In this case, there may be a significant loss of control authority in addition to the higher control forces which could result in an unsafe condition.

This condition can only occur on aircraft equipped with P/N KUP14D55-24, KUP14D55-472, M83536/10-015M, or M83536/10-024M trim relays (Figure 1). Aircraft equipped with solid state trim switch units P/N 4199059-1 or 4192102-( ) (Figure 2) are not at risk because those units do not have a failure mode that could cause a runaway. Aircraft equipped with a reversible trim motor, P/N 28-16621 (Ford Motor Co. C1AZ-14553A) or P/N AD1R-10 (Signal Electric), are not at risk because the trim system does not use relays or solid state trim switch units. NOTE: If the electric motor on the trim actuator has three wires, it is not affected. All motors in systems with relays or solid state trim switch units have only two wires.

Enstrom has developed a replacement limit switch bracket to provide a positive stop for the trim actuator. In the event of a trim actuator runaway, the new bracket will stop the actuator, causing the circuit breaker to trip, before any significant loss of control authority occurs. The cyclic forces may be high, but the aircraft will be controllable.

This Service Directive Bulletin (SDB) is intended to make operators aware that the cyclic trim assembly modification kit, P/N 28-01063, containing the upgraded bracket is available and to provide instructions to perform the modification.

6. COMPLIANCE:

Before further flight, insert the attached page into the Emergency Section of the flight Manual.

Compliance with this SDB must be completed within the next 5 hours or at the next annual or 100 hour inspection, whichever occurs first, for aircraft equipped with P/N KUP14D55-24, KUP14D55-472, M83536/10-015M, or M83536/10-024M trim relays. See Figure 1 for a pictorial example of a relay. Note: This includes aircraft modified per SIL 0164.

If the aircraft is ever converted from the solid state trim switch units to relays, this bulletin must be accomplished at the same time.

Compliance with this SDB is not required for aircraft equipped with a reversible trim motor, P/N 28-16621 (Ford Motor Co. C1AZ-14553A) or P/N AD1R-10 (Signal Electric).

Until the new bracket is installed, operators are cautioned to be aware of anomalies in the trim system that might indicate an impending issue with the relay. This may include trim not operating when the switch is engaged, the trim not stopping when the switch is released, or the circuit breaker trips. If these or other unusual conditions are noted, the operator should pull the trim circuit breaker. The flight may be completed with the circuit breaker pulled, but this SDB should be complied with before further flight.

Modify the lateral and longitudinal trim actuator assemblies in accordance with the procedure provided in paragraph 6.1. Upon completion, perform an operational check and flight test as specified in paragraphs 6.2 and 6.3.

**NOTE**

**Perform all maintenance in accordance with the F-28F/280F Series Maintenance Manual or in accordance with the F-28C/ 280C Maintenance Manual, as appropriate.**

6.1 MODIFICATION:

- A. Set the lateral and longitudinal trim actuator assemblies to a neutral position (mid-travel).
- B. Remove the seat deck and the copilot side floor panel for access to the trim actuator assemblies.

- C. Remove the lateral and longitudinal trim actuator assemblies from the aircraft in accordance with the applicable maintenance manual (F-28F/280F: Paragraph 12-7.B and 12-7.C; F-28A/F-28C/280/280C: Section 11, page MM-11-9).
1. Lateral trim actuator only: Remove the spring assembly to facilitate removal of the trim actuator assembly as shown on Sheet 2, Zone A-4. Mark the hole locations on the spring bracket used for the springs before disassembly.
  2. Remove the mounting hardware as shown on Sheet 2.

#### NOTE

**When removing the actuator assemblies, note the orientation of hardware and location of spacers, etc. Retain the hardware and re-install in the original configuration.**

- D. Disassemble the trim actuator assembly.
1. Remove P/N 28-16636-3 trim switch assembly from the actuator assembly by removing the safety wire and two AN502-10-8 and AN960-10 washers.
  2. Retain the washers.
  3. Discard the screws.
  4. Mark the wires at the connector locations of the P/N 28-16636 trim switch assembly so they can be reinstalled correctly.
- E. Disassemble the trim switch assembly.
1. Remove P/N 28-16624-3 shield from the trim switch assembly by removing four AN515-4R12 screws or AN515-4R10 screws, AN960-4L washers, AN935-4 lock washers, and AN340-4 nuts as shown on Sheet 1, Zone A-3.
  2. Retain all removed hardware except the AN515-4R10 screws.
  3. Disconnect the two wires from the V3-1 micro-switches that pass through the shield.
  4. Remove and discard P/N 28-16614-3 switch bracket and P/N 28-16624-3 shield.
- F. Re-assemble the switch assembly.
1. Route wires through new P/N 28-16624-11 shield.
  2. Slide new shrink tubing onto the wires, as required.
  3. Reconnect wires to the switches per the locations marked in step D.4.
  4. Position the shrink tubing over the connections, and shrink.
  5. Assemble new P/N 28-16614-5 bracket, new P/N 28-16624-11 shield, and micro switches using hardware retained in step E.1. NOTE: AN515-4R10 screws must be replaced by MS35206-219 screws provided in the kit.

- G. Unscrew P/N 28-16618 spring housing assembly (counter clockwise) from the trim motor assembly.
- H. Disassemble the P/N 28-16613-1 actuator and P/N 28-162043-1 bracket from the spring housing assembly. (P/N 28-162043-1 bracket is used for the lateral trim actuator only.)

**NOTE**

**On aircraft manufactured prior to 1993, the actuator was installed to the spring housing assembly with NK5008 screws. The NK5008 screws do not have provisions for safety wire. Replace the NK5008 screws with kit-supplied AN503-8-6 or AN503-8-8 screws, as applicable.**

- 1. Lateral Assembly: Remove safety wire, AN503-8-6 screw, AN503-8-8 screws, and AN960-8L washers from the spring housing assembly as shown on Sheet 1, Zone B-3.
    - a. Retain the washers and AN503-8-8 screws.
    - b. Discard the AN503-8-6 screw, actuator, and bracket.
  - 2. Longitudinal Assembly: Remove NK5008-5 screw, AN503-8-6 screws, and AN960-8L washers from the spring housing assembly as shown on Sheet 1, Zone B-3.
    - a. Retain the washers and AN503-8-6 screws.
    - b. Discard the NK5008-5 screw and actuator.
- I. Install new P/N 28-16613-3 actuator onto the spring housing assembly.
- 1. Heat the actuator, if necessary, to facilitate installation over the housing.

**NOTE**

**It may be necessary to chamfer the I.D. of the actuator to get it to slide onto the housing.**

**NOTE**

**Ensure that the trim actuator, P/N 28-16613-3, is installed properly over the spring housing assembly.**

- 2. Lateral Assembly: Install new P/N 28-162043-3 bracket (lateral trim actuator only).
  - a. Reinstall two AN503-8-8 screws and one kit-supplied AN503-8-8 screw and AN960-8L washers. Use retained hardware from step H.1.a.
- 3. Longitudinal Assembly: Reinstall two AN503-8-6 screws and one kit-supplied AN503-8-6 screw and AN960-8L washers. Use retained hardware from step H.2.a.

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4. Safety wire with MS20995C25 as shown on Sheet 1, Zone B-4.

**NOTE**

**Cotter pins, Safety wire, and VC-3 Vibra-Tite Thread Locker are not supplied with the kit and must be furnished by the installer.**

5. Lubricate the threaded shaft with Aeroshell 22 grease.
- J. Screw the spring housing assembly back onto the threaded shaft.
  - K. Re-assemble the trim actuator assembly.
    1. Install the new switch assembly onto the trim actuator assembly with the two kit-supplied AN502-10-10 screws and the retained washers from step D.1.
    2. Safety wire with MS20995C32 as shown on Sheet1, Zone B-1.

**NOTE**

**Cotter pins, Safety wire, and VC-3 Vibra-Tite Thread Locker are not supplied with the kit and must be furnished by the installer.**

- L. Apply power to the trim actuator assembly to check and adjust the travel of the spring housing.
  1. Install the electrical connectors.
  2. Both trim actuator assemblies can be electrically tested from either the left or right hand side of the aircraft, whichever location is more convenient. Set the trim actuator assembly on a portable bench or suitable stable surface to perform the check and adjustments.
- M. 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 on the drawing or as determined in the note below. Enlist a second person to assist with the cyclic operation while conducting measurements and adjustments (Figure 3).

**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.**

**NOTE**

**The retracted travel or minimum stroke limit is 0.125" +0.075"/-0.00". The extended travel or maximum stroke limit is 1.95" +0.00"/-0.05".**

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1. 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 4).
2. Check spring housing travel to verify that proper adjustment was made.

#### 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”.**

3. When the switch adjustments are complete, apply VC-3 Vibra-Tite to the exposed screw threads and nut face.
  4. Verify there is no interference between the P/N 28-162043-3 bracket and the switch assembly hardware.
- N. Install the lateral and longitudinal trim actuator assemblies in reverse procedure as removed.
1. Lateral trim actuator assembly only: Install the spring assembly. Install the spring ends in the holes marked on the bracket in Step C.1.

#### 6.2 OPERATIONAL CHECK:

- A. Conduct an operational check of the trim limits.
1. Verify the trim operates in the correct direction.
  2. Cycle each time actuator full travel each direction to verify the limit switches work properly.
  3. Trim the cyclic full forward and verify the travel is not restricted in any direction.
  4. Repeat Step 2 for the other three directions.
  5. Return the trim to neutral (center the cyclic).

#### 6.3 FLIGHT TEST

- A. Perform a flight test to verify trim authority.
1. Verify the aircraft can be trimmed in a hover.
  2. Verify the aircraft can be trimmed at  $V_{NE}$  or  $V_H$ , whichever is lower.

#### NOTE

**$V_H$  is the speed in level flight at maximum continuous power. Do not exceed any engine, transmission or  $V_{NE}$  limits.**

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**CAUTION**

**$V_{NE}$  and  $V_H$  vary depending on aircraft gross weight, center of gravity, pressure altitude, and temperature. Do not exceed  $V_{NE}$  for the flight conditions. See the appropriate Rotorcraft Flight Manual.**

## 6.4 PARTS:

A. Kit P/N 28-01063-1 includes the following parts unless otherwise noted.

Part Number	Description	Quantity
28-01063 Drawing	Sheet 1 and Sheet 2	1
28-162043-3	Bracket (Lateral trim actuator assembly only)	1
28-16613-3	Actuator	2
28-16614-5	Bracket	2
28-16624-11	Shield	2
AN502-10-10	Screw	4
AN503-8-6	Screw	3
AN503-8-8	Screw	3
MS35206-219	Screw	8
FIT-221V-1/4	Shrink Tubing	2 inches
<b>NOTE</b> <b>The following parts are not supplied with the kit and must be furnished by the installer.</b>		
Aeroshell 22	Grease	A/R
MS20995C25	Safety Wire (See Note below)	A/R
MS20995C32	Safety Wire (See Note below)	A/R
VC-3 Vibra-Tite	Thread Locker	A/R

7. SPECIAL TOOLS: Heat gun and precision ruler, or equivalent measuring device

8. MAN-HOURS: 8 hours (4 hours per trim actuator assembly)

9. WARRANTY: Per Enstrom Warranty Policy

10. WEIGHT CHANGE: None

11. LOG BOOK ENTRY:

Record this modification in detail as required for maintenance actions.

12. REPETITIVE ACTION: None

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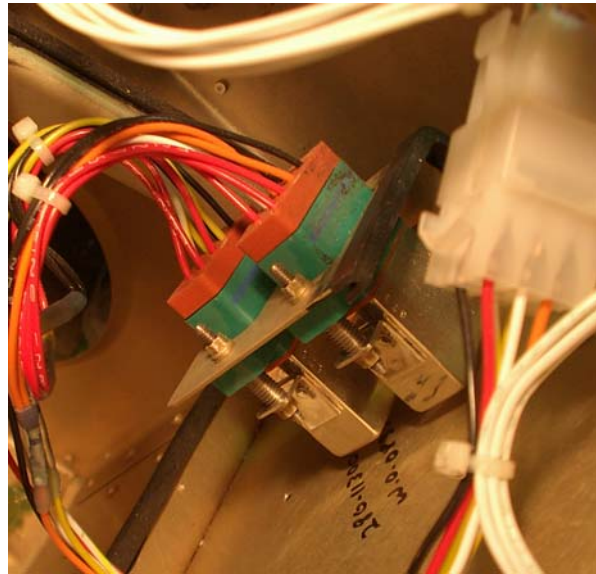


Figure 1: Trim Relay (M83536/10-024M Relay Shown)



Figure 2: Solid State Trim Switch Unit  
(NOTE: Color, size, location of the solid state trim switch unit may vary.)



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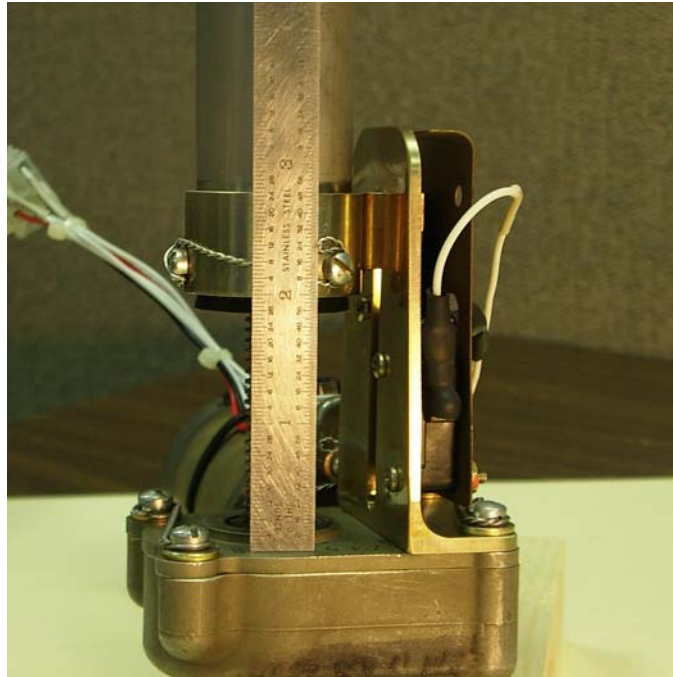


Figure 3: Maximum Stroke Limit at 1.95"

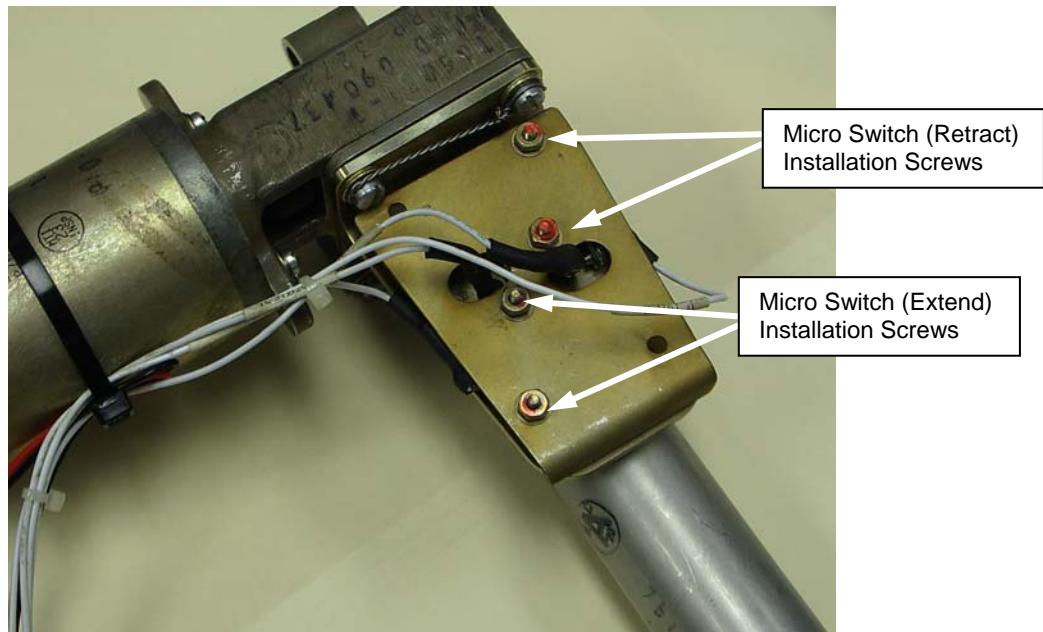


Figure 4: Trim Actuator Assembly (Lateral Trim Actuator Retracted)

**SPECIAL ADDENDUM TO FLIGHT MANUAL EMERGENCY PROCEDURES PER:  
SERVICE BULLETIN DIRECTIVE 0110 REV 4**

**Trim Failure/Trim Runaway**

Operators must observe the following:

They should locate the TRIM circuit breaker or circuit breaker switch so they can find it quickly in an emergency.

Until the new bracket is available and installed, operators are cautioned to be aware of anomalies in the trim system that might indicate an impending issue with the relay. This may include trim not operating when the switch is engaged or the trim not stopping when the switch is released. If these or other unusual conditions are noted, the operator should:

- A. Immediately stop using the trim and pull the TRIM circuit breaker or select the trim switch to OFF to deactivate the circuit. Leave the circuit breaker out for the remainder of the flight.
- B. If the pilot determines the flight can be continued safely, without use of the trim, flight may be continued to the next destination.
- C. If the pilot has any safety concerns, a landing should be made as soon as practical.
  - a. If there is a significant reduction in the longitudinal control, the pilot should plan a landing where a shallow approach and a run on landing can be made.
    - i. Avoid any maneuvers, such as rapid decelerations, which may require forward cyclic for recovery.
    - ii. Perform a run-on landing as there may not be enough forward cyclic to level the aircraft and stop rearward motion if it is allowed to start drifting rearward from a hover.
  - b. If there is a significant reduction in the lateral cyclic control, it may be difficult or impossible to make turns to the left.
    - i. The pilot should plan a landing to an area where there is ample room to maneuver. The aircraft will fly in a right crab, and maintaining a straight course may be difficult.
    - ii. Lateral course corrections can be made using pedal and longitudinal cyclic, but the aircraft may not be aligned with the ground course.
    - iii. Perform an approach to a low hover; forward speed can be stopped, but there may be some sideward drift.

**SPECIAL ADDENDUM TO FLIGHT MANUAL EMERGENCY PROCEDURES PER:  
SERVICE BULLETIN DIRECTIVE 0110 REV 4**

- iv. Once forward speed is reduced in a low hover, the pilot can roll off the throttle and align the aircraft with the direction of motion using the pedals prior to touching down.
  - v. If the pilot is having difficulty maintaining the approach course, the pilot should consider making a 360° turn to the right to line up on the final approach.
  - vi. Directional control is easier to maintain at airspeeds above 60 knots, but the pilot must plan to reduce forward speed prior to touchdown.
- D. Ground the aircraft at the end of the flight. The aircraft should be grounded until the relays are replaced.