



SERVICE DIRECTIVE BULLETIN

SERVICE DIRECTIVE BULLETIN NO. T-039

Revision 3

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DATE: July 6, 2011

1. SUBJECT: Cyclic Trim System – Cyclic Trim Assembly Kit for the Lateral and Longitudinal Trim Actuator Assemblies
2. MODEL: TH-28, 480, 480B
3. EFFECTIVITY: S/N 5138 and prior
4. REFERENCE: Enstrom TH-28/480 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 4199059-3 Trim Switch Module Assembly containing a M83536/10-024M Trim Relay (Figure 1). Aircraft equipped with P/N 4199059-1, 4192102-4 or 4192102-903 Trim Switch Module Assembly containing a solid state relay (Figure 2) are not at risk because those switches do not have a failure mode that could cause a runaway.

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 4230045-1, containing the upgraded bracket is available and to provide instructions to perform the modification.

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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 M83536/10-024M trim relays.

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 trim circuit breaker pulled, but this SDB should be complied with before further flight.

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

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 TH-28/480 Series Maintenance Manual.

6.1 MODIFICATION:

- A. Determine if the trim actuator assembly has shims between the switch plate and the housing (Figure 3 and Figure 6). If the assembly contains shims complete the following:
 - 1. Using the cyclic control, fully extend the motor.
 - 2. Measure the distance from the motor housing to the bottom of the spring capsule (Figure 6). Record this distance ('Max') in Table 1.
 - 3. Repeat for the second trim actuator assembly, if necessary.
- B. Set the lateral and longitudinal trim actuator assemblies to a neutral position (mid-travel).
- C. Disconnect the battery.

NOTE

Remove the battery, if required, to facilitate removal of the longitudinal trim actuator assembly.

- D. Remove the lateral and longitudinal trim actuator assemblies from the aircraft in accordance with Paragraph 12-69 of the maintenance manual.
 - 1. Remove the mounting hardware as shown on Sheet 3, Zones A-1 and B-1.

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- E. 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. Retain the washers. The screws may be discarded.
 2. Mark the wires at the connector locations of the P/N 28-16636 trim switch assembly so they can be reinstalled correctly.
 3. Retain shims P/N 4166031-11, if installed.
- F. Disassemble the trim switch assembly.
1. Remove P/N 28-16624-3 shield from the trim switch assembly by removing four AN515-4R12 or AN515-4R10 screws, AN960-4L washers, AN935-4 lock washers, and AN340-4 nuts.
 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.
- G. 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 E.2.
 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 F.1. NOTE: AN515-4R10 screws must be replaced by MS35206-219 screws provided in the kit.
- H. Disassemble the spring housing assembly from the actuator assembly.
1. Unscrew P/N 4166031-()¹ spring housing assembly (counter clockwise) from the actuator assembly.
 2. Remove NK500-8-5 screw and AN960-8L washer from P/N 4166031-() spring housing assembly as shown on Sheet 3, Zone B-4.
 3. Discard screw and washer.

¹ Dash number of spring housing assembly varies based on configuration.

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- I. Disassemble the P/N 28-16613-1 actuator from the spring housing assembly.
 1. Remove the safety wire and two AN503-8-6 screws as shown on Sheet 3, Zone B-4.
 2. Retain the screws.
 3. Discard the actuator.
- J. 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. Reinstall two AN503-8-6 screws and one kit-supplied AN503-8-6 screw.
3. Safety wire with MS20995C25 as shown on Sheet3, 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.

4. Lubricate the threaded shaft with Aeroshell 22 grease.
- K. Screw the spring housing assembly back onto the threaded shaft.
 - L. Re-assemble the trim actuator assembly.
 1. Assemble the new switch assembly and the trim actuator assembly with the two kit-supplied AN502-10-10 screws and the retained washers from step E.1. NOTE: Re-assemble using the same shims, P/N 4166031-11, installed between the switch assembly and the motor housing, if used in the original installation. Substitute the kit-supplied AN502-10-12 screws for AN502-10-10, if necessary.
 2. Safety wire with MS20995C32 as shown on Sheet3, 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.

- M. Apply power to the trim actuator assembly to check and adjust the travel of the spring housing.
 1. Install the electrical connectors.

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2. Install and reconnect the battery.
 3. 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.
- 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 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 5).

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

If no shims are installed, the retracted travel or minimum stroke limit is 0.125" +0.05"/-0.00". The extended travel or maximum stroke limit is 1.95" +0.00"/-0.05". If shims are installed, the extended travel or maximum travel limit is the 'Max' dimension measured in Step A.2 +0.00"/-0.05". The minimum travel limit 'Min' is the difference between this dimension and 1.825" +0.05"/-0.00" (Figure 6).

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 3).
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. Disconnect the battery.
 5. Remove the battery if it was re-installed in Step M.
- O. Install the lateral and longitudinal trim actuator assemblies in the aircraft in accordance with Paragraph 12-74 of the maintenance manual.
- P. Install and reconnect the battery.
- Q. Check the clearance of the spring housing with the cyclic bellcranks:

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1. Extend the actuator to full travel. (Trim full forward or full left).
2. Move the cyclic full Aft/Right.
3. Verify there is clearance between the end of the spring capsule and the bellcrank (Figure 4).
4. If the spring capsule contacts the bellcrank, remove the P/N 4166031-11 shims from between the switch assembly and the actuator and re-install and re-safety the switch assembly.
5. Repeat steps 1-4 as required.
6. If the bellcrank contacts the spring capsule and there are no shims, re-check the travel in accordance with step N.
7. If the travel is correct and the spring capsule still contacts the bellcrank, contact Enstrom Customer Service.

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.

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.

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6.4 PARTS:

A. Kit P/N 4230045-1 includes the following parts unless otherwise noted.

Part Number	Description	Quantity
4230045 Drawing	Cyclic Trim Assembly Kit Drawing, Sheet 2 and Sheet 3	1
28-16614-5	Bracket	2
28-16624-11	Shield	2
28-16613-3	Actuator	2
AN502-10-10	Screw	4
AN502-10-12	Screw	2
AN503-8-6	Screw	2
MS35206-219	Screw	8
FIT-221V-1/4	Shrink Tubing	2 inches
NOTE The following parts are not supplied with the kit and must be furnished by the installer.		
Aeroshell 22	Grease	A/R
MS20995C25	Safety Wire (See Note below)	A/R
MS20995C32	Safety Wire (See Note below)	A/R
MS24665-151	Cotter Pin	2
MS24665-153	Cotter Pin	2
VC-3 Vibra-Tite	Thread Locker	A/R

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

8. MAN-HOURS: 4 hours (2 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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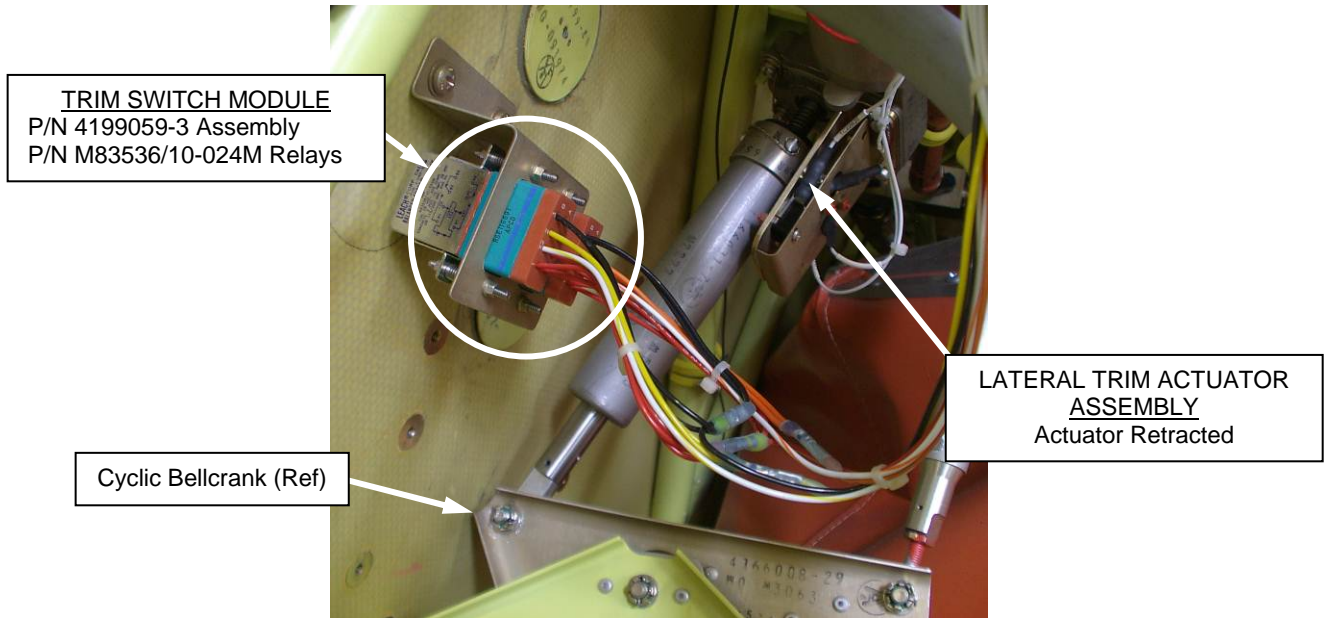


Figure 1: Lateral Cyclic Trim Switch Module and Trim Actuator Assembly

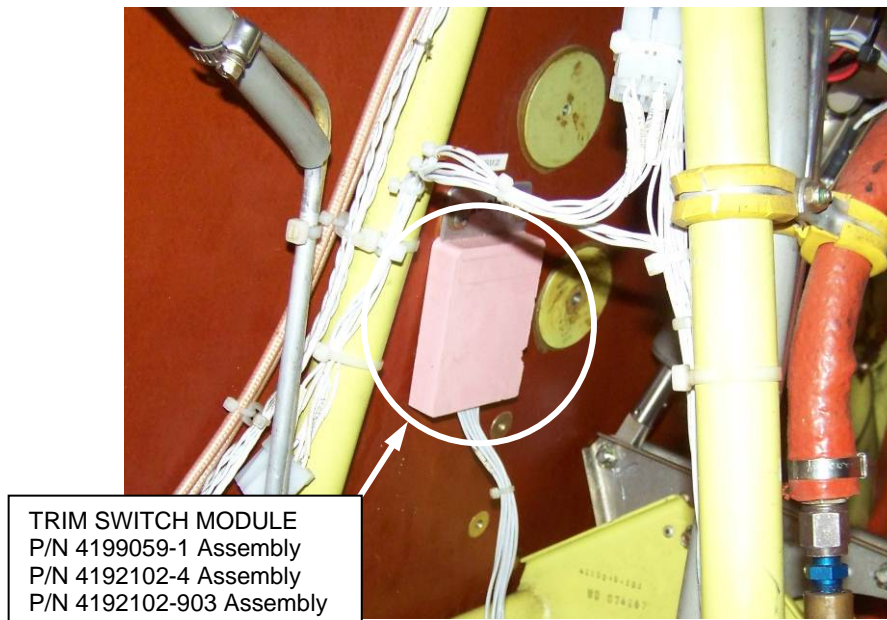


Figure 2: Solid State Trim Switch Module (Lateral Trim Actuator)

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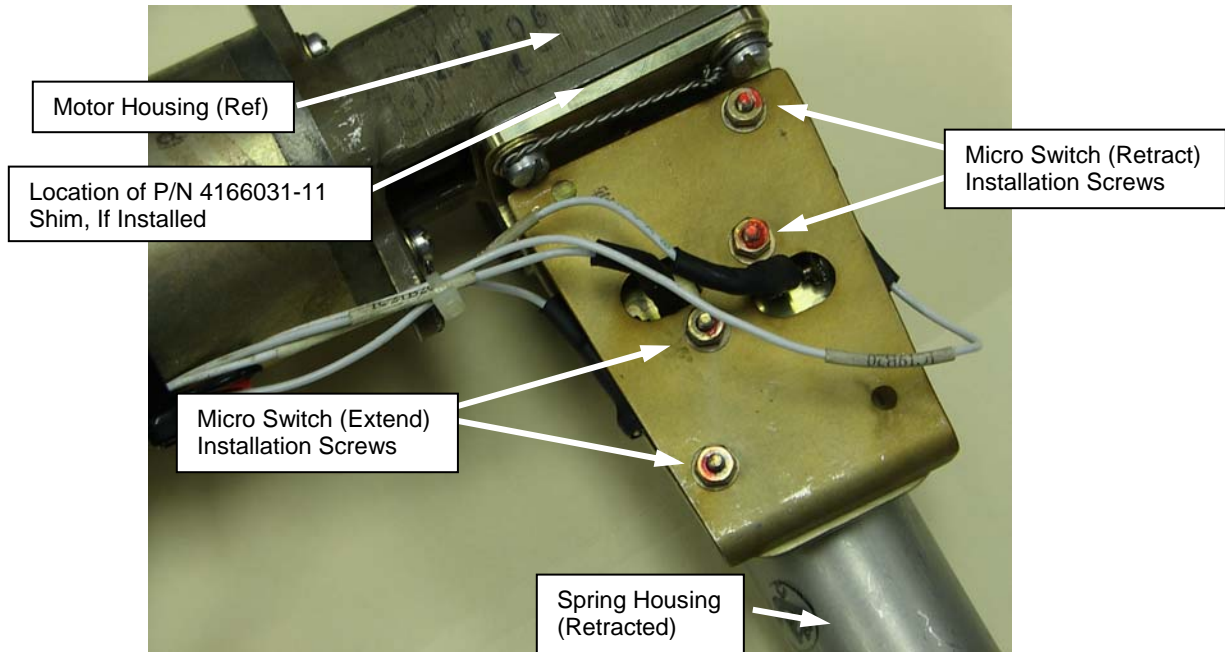


Figure 3: Trim Actuator Assembly (Lateral Trim Actuator Retracted)

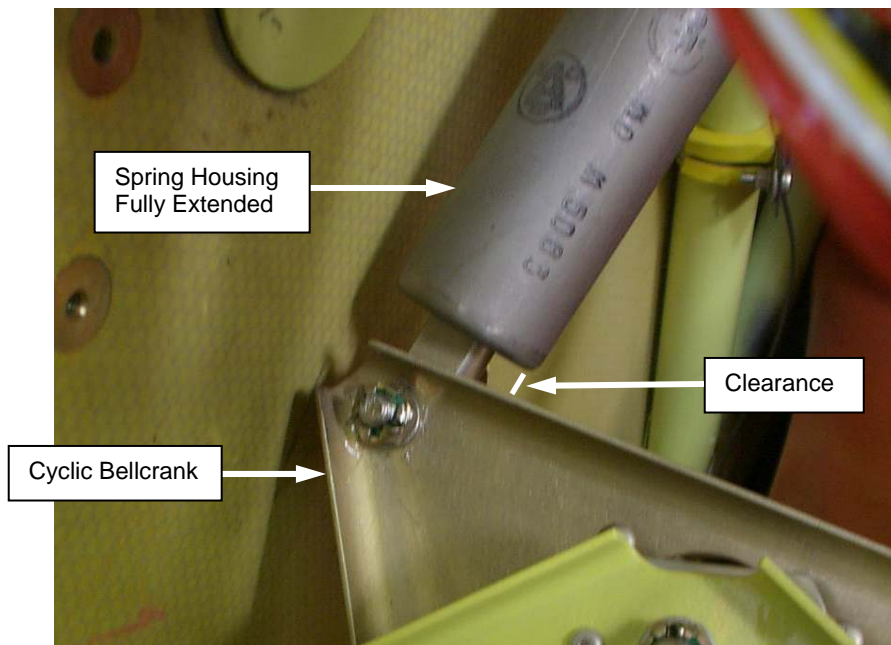


Figure 4: Spring Housing and Cyclic Bellcrank Clearance

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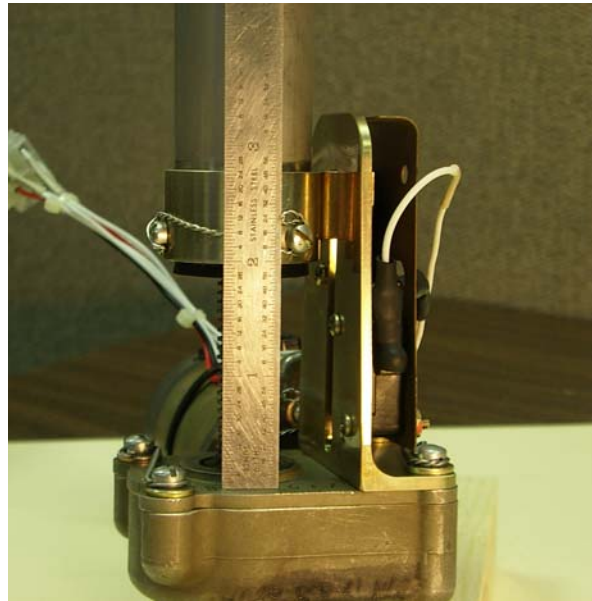


Figure 5: Maximum Travel Limit at 1.95"

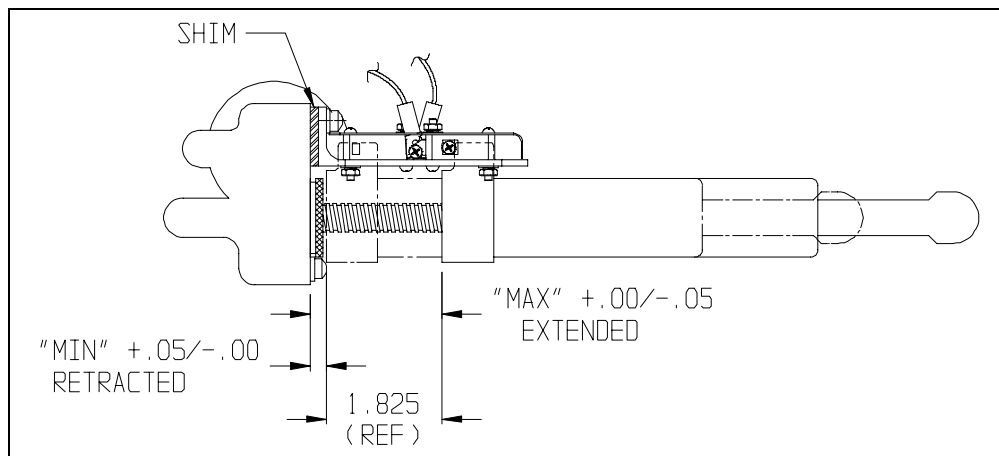


Figure 6: Actuator Travel Limits with a Shim

Table 1. Actuator Travel Limits for Trim Actuator Assemblies with a Shim

S/N	Extended Travel Limit 'Max' (+ 0.00"/-0.05") (inch)	Retracted Travel Limit 'Min' (+ 0.05"/-0.00") (inch) (Note 1)

Note 1: Subtract 1.825 from 'Max' to calculate the 'Min' travel limit.

**SPECIAL ADDENDUM TO FLIGHT MANUAL EMERGENCY PROCEDURES PER:
SERVICE BULLETIN DIRECTIVE T-039 REV 3**

Trim Failure/Trim Runaway

Locate the TRIM circuit breaker so it can be found quickly in an emergency.

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 if the circuit breaker trips. If these or other unusual conditions are noted, the operator should:

- A. Immediately stop using the trim and pull the TRIM circuit breaker 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 a shallow approach and a run on landing can be made.
 - b. If there is a significant reduction in the lateral cyclic control, it may be difficult or impossible to make turns to the right.
 - i. The pilot should plan a landing to an area where there is ample room to maneuver. The aircraft will fly in a left crab, and maintaining a straight course may be difficult.
 - ii. Perform an approach to a low hover; forward speed can be stopped, but there may be some sideward drift.
 - iii. 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.
 - iv. If the pilot is having difficulty maintaining the approach course, the pilot should consider making a 360° turn to the left to line up on the final approach.
 - v. 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.