120 Series Electric Actuator

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1 SELECTION CHART

The 120 Series Electric Actuator is a rotary-output, proportional servo. This electromechanical actuator is used as an engine fuel control positioning device. An internal spring provides fail-safe operation by forcing the actuator to the fuel shutoff position when the actuator is de-energized.

Provides fast operation, multi-voltage usage, and proven reliability. The actuators can operate directly on 12- or 24- V DC battery supplies. Ideal for fuel systems on engines up to 150 HP.

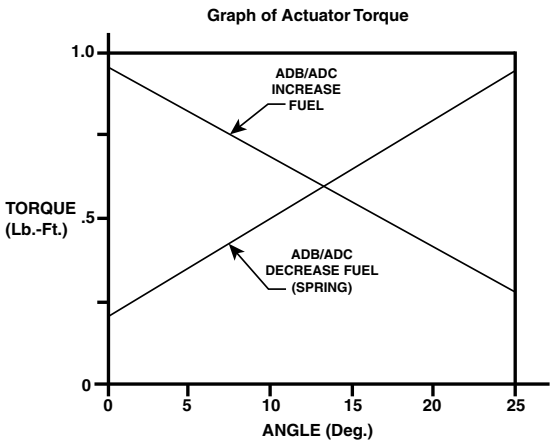
- ◊ Small size
- ◊ Low Cost
- ◊ 1.0 lb-ft of torque
- ◊ Proven Reliability
- ◊ 25° Rotation
- ◊ Low Friction

MODEL	SYSTEM VOLTAGE			CONNECTOR			SHAFT	HOUSING
	12	24	Multi	MIL	Commercial	Packard		
ACB120			●	●			Serrated	Sand cast
ADB120			●	●			Serrated	Die cast
ADC120S-12	●				●		Serrated	Die cast
ADC120S-24		●			●		Serrated	Die cast
ADD120S-12	●					●	Serrated	Die cast
ADD120S-24		●				●	Serrated	Die cast

2 SPECIFICATIONS

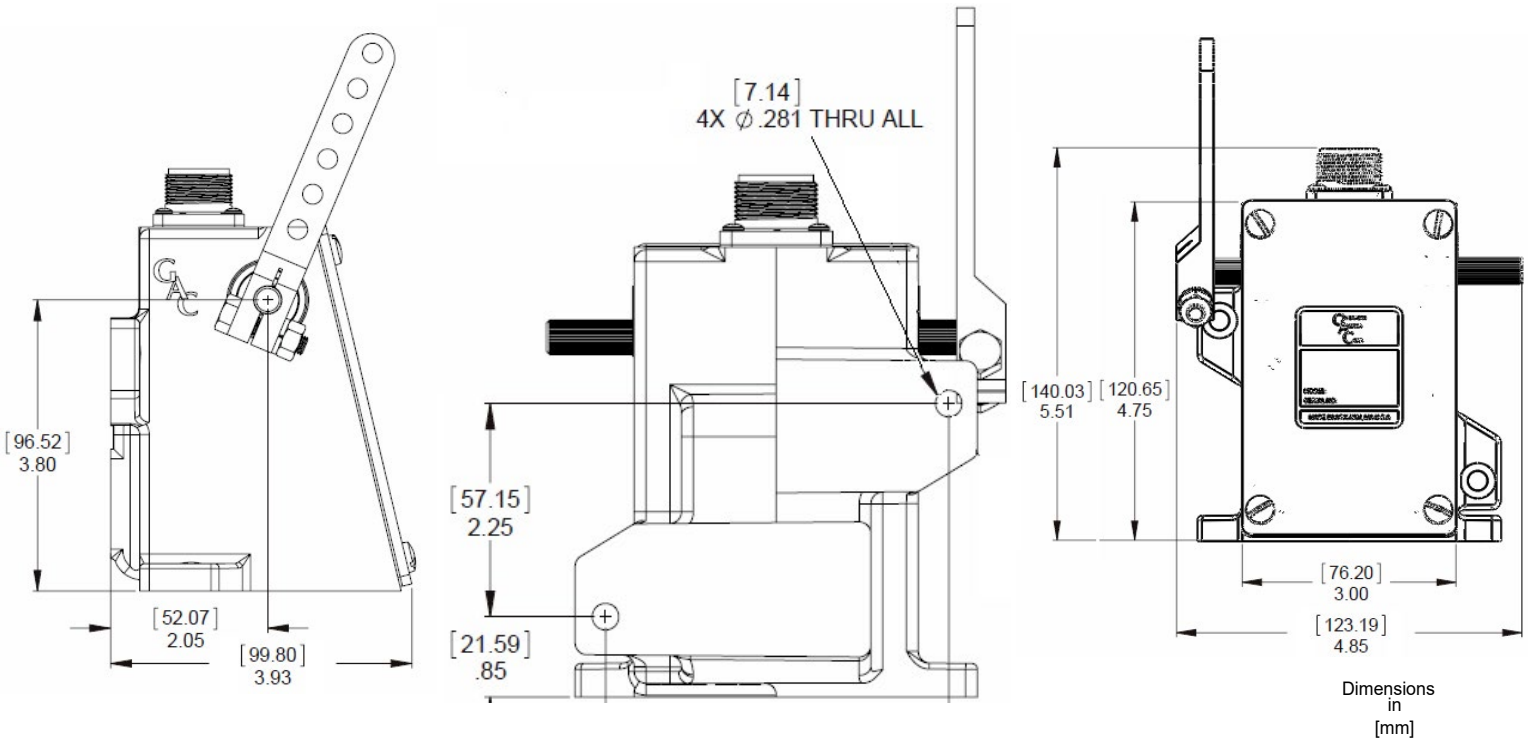
PERFORMANCE	
Available Torque	1.0 ft-lb MAX (1.4 N m)
Max Operating Shaft Travel	25 ° ±1 ° CW/CCW
POWER INPUT	
Operating Voltage	12 or 24 V DC
Normal Operating Current	2.0 A @ 12 V DC 1.0 A @ 24 VDC
Maximum Current Continuously Rated	6.0 A @ 12 V DC 3.0 A@ 24 V DC
ENVIRONMENT	
Operating Temperature Range	-65 °F to +200 °F (-54 °C to +95 °C)
Relative Humidity	up to 100 %
All Surface Finishes	Fungus Proof and Corrosion Resistant
PHYSICAL	
Dimensions	See Section 3, Outline & Dimensions
Weight	4.5 lbf (2.05 kgf)
Mounting	Electrical connector at top preferred
RELIABILITY	
Vibration	Up to 20 g, 50 - 500 Hz
Testing	100% Tested

ACTUATOR AVAILABLE TORQUE



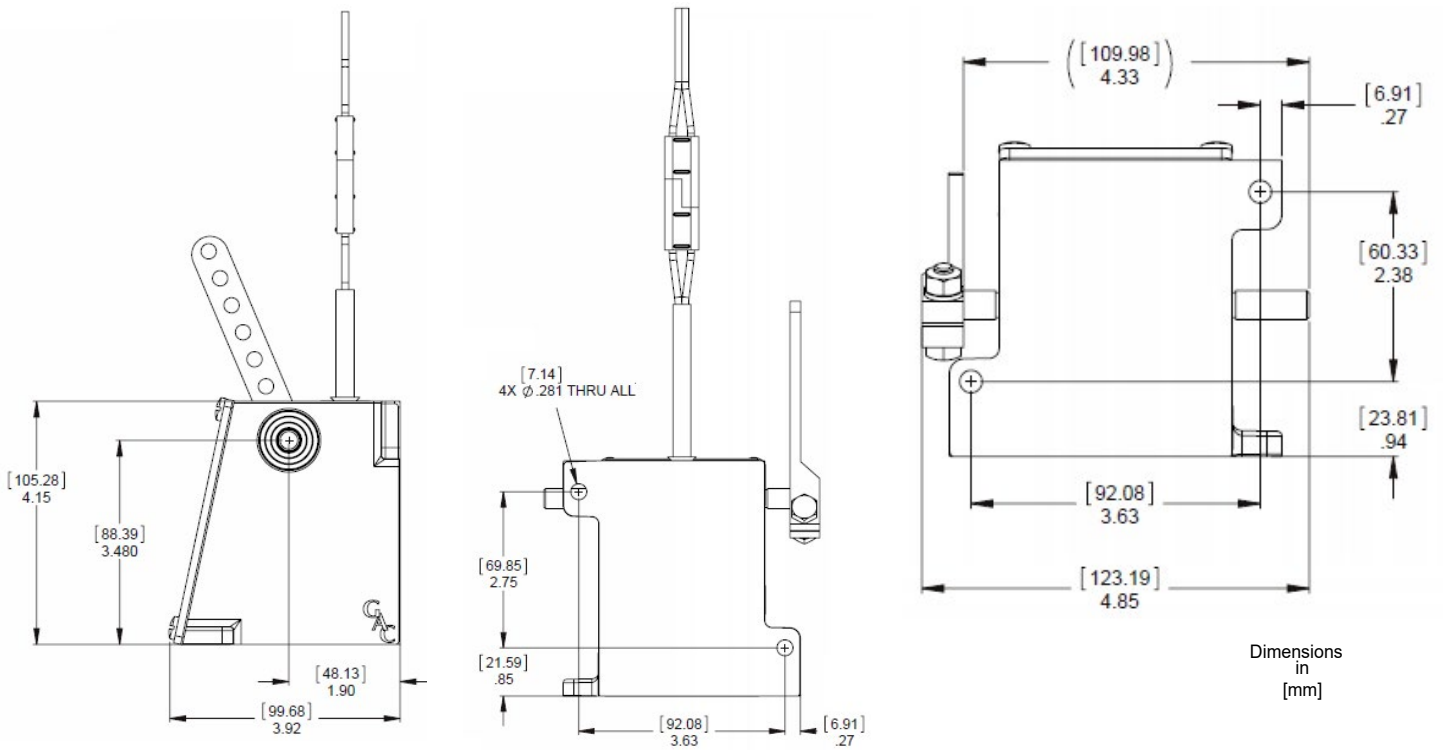
3 OUTLINE & DIMENSIONS

ACB120



Dimensions in [mm]

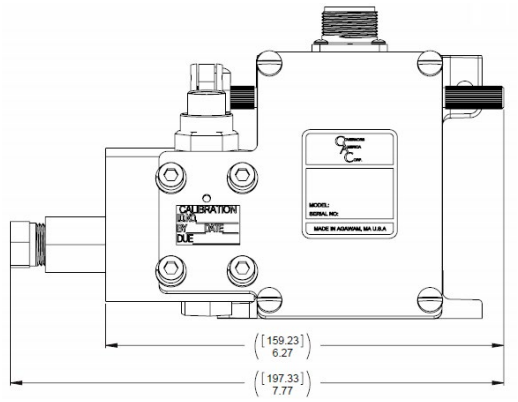
ADC120

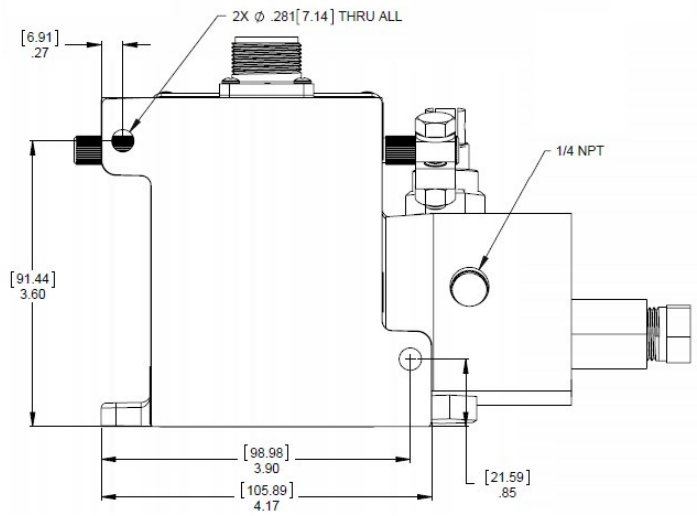


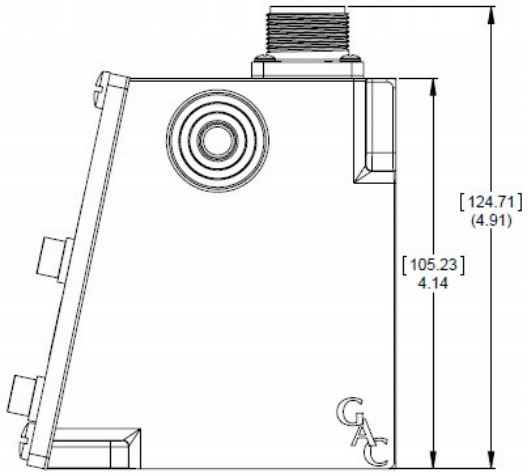
Dimensions in [mm]

3 OUTLINE & DIMENSIONS (CONTINUED)

ADB120

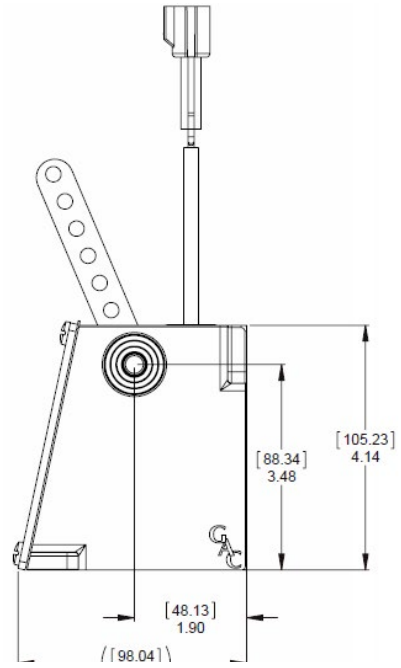


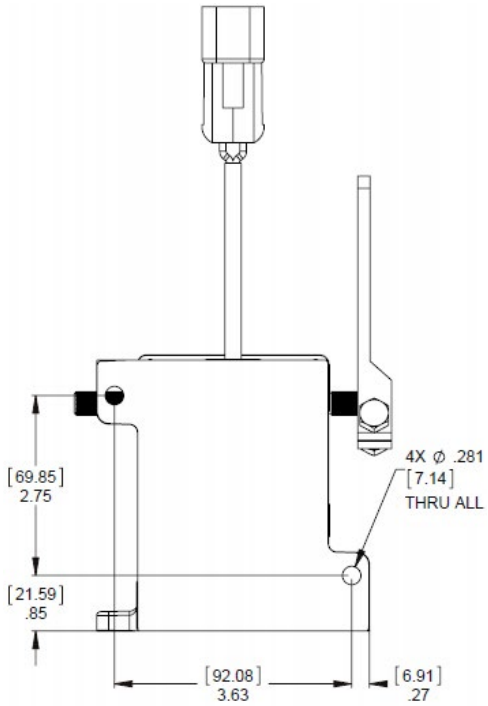


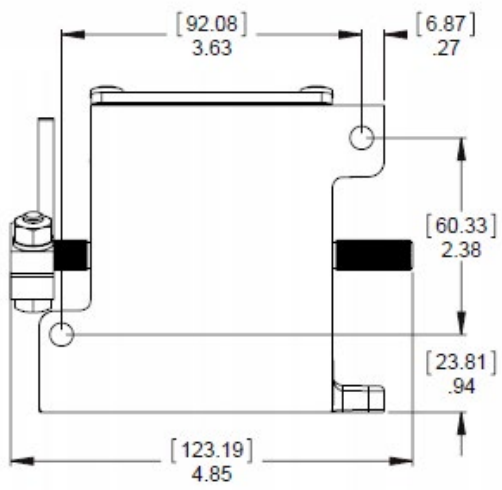


For the ADB120E4 with built-in fuel metering valve for Cummins PT fuel systems, see your GAC representative for more information.

ADD120







Dimensions
in
[mm]

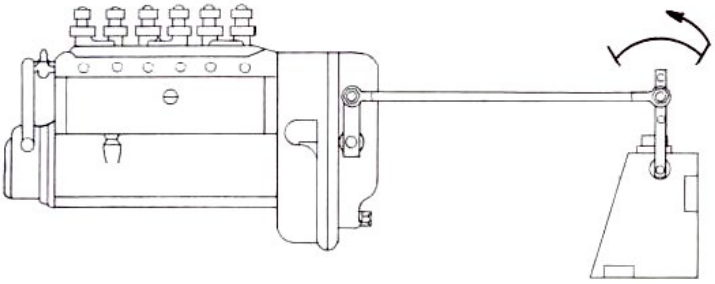
4 INSTALLATION

The following installation rules must be taken into account when mounting the 120-series.

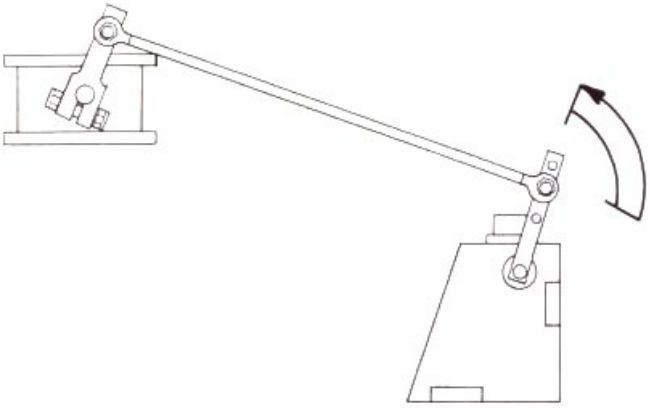
Use an overspeed shutdown device, independent of the governor system, to prevent loss of engine control which may cause personal injury or equipment damage. Do not rely exclusively on the governor system electric actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used.

1. The actuator must be rigidly mounted as close as possible to the fuel control lever of the engine. Vibration from the engine will not affect the operation of the actuator.
2. The preferred mounting is with the electrical connector at the top. Applications with the actuator upside down, on its back, or sideways should be avoided.
3. Linkage arrangement of any actuator system is always important. High quality rod end bearings should be used. Rod end bearings that have high friction can cause instability and require servicing. Levers and linkage should be sturdy yet low in mass for the fastest speed of response.
4. Arrangement of the linkage (linear or non-linear) for actuation of the engine fuel control is an important application consideration.
   a. For proportional actuators operating in linear control systems (See FUEL LEVER AT MID FUEL POSITION DIAGRAM below) it is important to obtain a linear relationship between actuator stroke and fuel delivery. The linkage configuration for diesel fuel systems is typically as shown in MID FUEL. The lever on the actuator should be nearly parallel to the pump lever at the mid fuel position for linear fuel control.
   b. For proportional actuators operating in non-linear systems (See FUEL LEVER AT FULL FUEL POSITION DIAGRAM below), it is important to obtain a non-linear relationship between actuator stroke and fuel delivery. Carbureted, PT Pumps (CUMMINS), or other non-linear fuel systems require a non-linear fuel linkage configuration as shown as FULL FUEL. A non-linear fuel system results when more engine power is developed for a given stroke at positions of low fuel settings rather than at high fuel settings. In this case the levers should be parallel at full load.
5. In general, adjust the linkage so that the fuel control lever minimum and maximum fuel stops are used rather than the actuator internal mechanical stops. The actuator should be adjusted so that it operates over at least one half (12 degrees) of its available travel. For the ADB120E4 with built-in fuel metering valve for Cummins PT fuel systems, see your GAC representative for more information.

FUEL LEVER AT MID FUEL POSITION DIAGRAM



FUEL LEVER AT FULL FUEL POSITION DIAGRAM



5 WIRING

Wiring is dependent on the actuator connector type. For more information see your GAC representative.

ADC	Prewired for 12 or 24 V. Mating hardware included (Commercial).
ADD	CH1215 Packard Cable Harness EC1300 Packard Mating Half
ACB **ADB**	CH1203 - 12’ Military Straight Harness CH1210 - 12’ Military 90° Harness CH1212 - 30’ Military Straight Harness EC1000 Military Straight Connector EC1010 Military 90° Straight Connector

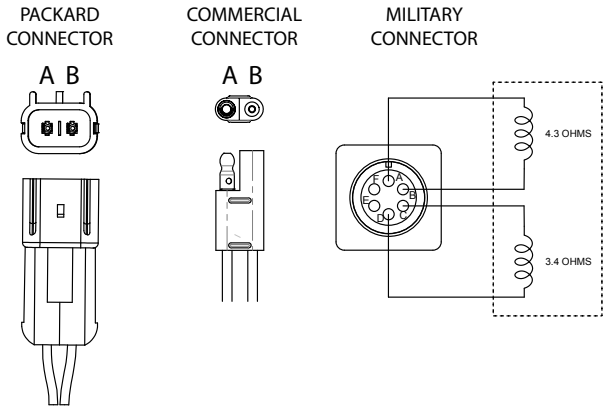
The mating electrical connector must be wired in a configuration dependent on the system voltage supply.

The maximum wire size that will fit into the actuator mating half connector is 16 AWG (1.3 mm sq.).

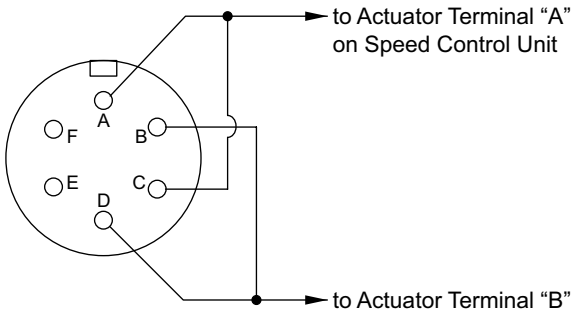
Cable CH1203/1210, a pre-wired actuator cable harness, is 12 ft (4 m) in length and suitable for use on 12 or 24 V systems.

CH1212 is 30 feet (9.1 meters) in length.

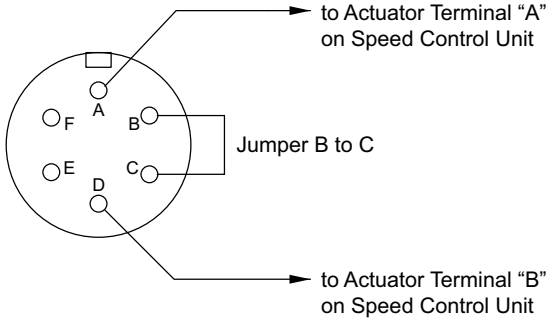
Actuator cable harnesses with lengths greater than 10 ft (3 m) from the actuator to the speed control unit may introduce current losses which can restrict full rotation of the actuator. In this case, use of a larger gauge wire is required. For applications where EMI is of concern, twisted, shielded cable for the actuator is recommended. Twisting of the cable alone will substantially reduce EMI.



FOR 12 V APPLICATIONS It is preferable to connect four wires, one to each of the coils and wire. Maximum current is 8 A. The recommended wire size is at least 16 AWG (1.3 mm sq.).



FOR 24 V APPLICATIONS A simple jumper wire between pins B and C at the mating half connector can be made. The remaining two pins, A and D, can be extended to the required length. Maximum current is 4 A. The recommended wire size is at least 18 AWG (1.0 mm sq.).



6 ADJUSTMENTS

Once installed, reconfirm that the linkage is not binding and that friction is minimal.

Before starting the engine, push the actuator to the full fuel position and release. It should return instantly to the no fuel position without any binding.

Once the engine has been started, the linkage can be optimized by temporarily inserting an ammeter in one of the wires between the speed control unit and the actuator or by measuring the voltage across the actuator.

Measure the actuator current or voltage at no load and full load. The range and the starting current or voltage are important for optimizing the linkage system. Typical values are shown in the following table for 12 V and 24 V systems.

ACTUATOR STARTING CURRENT / VOLTAGE RANGE CHART

	12 VOLTS	24 VOLTS
No Load	1.0 A, 2 V	0.5 A, 4 V
Full Load	2.5 A, 5 V	1.2 A, 10 V

To increase the range of the actuator voltage or current, move the linkage to a lower hole on the actuator lever. A lower range of actuator current than suggested can cause instability or poor performance.

To increase or decrease the no load current or voltage, adjust the length of the link between the actuator and the engine fuel control. Smaller angles of actuator travel may improve transient performance, but will reduce available force at the fuel control lever. Allowing the actuator to operate through at least one half (12°) of its stroke will usually provide near optimum response.

7 TROUBLESHOOTING

If the governor system fails to operate, make the following tests at the actuator mounted connector while moving the actuator through its stroke.

MEASURING RESISTANCE

ACB / ADB120	
TERMINALS	**RESISTANCE**
A to B	4.2 Ω
C to D	3.4 Ω
A to C	∞
A to Housing	∞
C to Housing	∞

ADC / ADD 120	
TERMINALS	**RESISTANCE**
Red to White (12 V)	1.9 Ω
Red to White (24 V)	7.5 Ω
Red to Housing	∞
White to Housing	∞

Energize the actuator to full fuel (follow steps in control unit publication) and manually move the actuator through its range. No binding or sticking should occur.

If the actuator passes the tests, the problem is elsewhere in the system. Refer to your speed control unit's troubleshooting section in the manual.