



ENGINE GOVERNING SYSTEMS

PRODUCT INFORMATION BULLETIN

PIB2051

MAY 2000
MPC

176 SERIES ELECTRIC ACTUATOR

INTRODUCTION

The 176 SERIES electric actuator is designed to mount directly on a Bosch "A" size fuel injection pump, with a left hand rack, in place of the mechanical governor. When the 176 actuator is installed on the fuel pump, an optimum performance, long life fuel control system results. An external fuel shut off lever is available to manually override the actuator's control. Also provided is an adjustable internal maximum fuel limit.

The 176 Series Electric Actuator can control fuel pumps of up to 6 cylinders. The actuator was designed with two isolated chambers. The upper chamber is wet with oil and contains the connection to the fuel rack and an optional manual shut off mechanism. The sealed lower chamber contains the electromagnetic components.

This design eliminates the possibility of magnetic particles or other oil contaminants interfering with the operation of the electric actuator. Unreliable devices such as bellows and sliding

seals are not used so that no maintenance is required. The designed life of the actuator is typically longer than that of the engine.

CHART A

	12V	24V	w/ Shutoff	w/o Shutoff	w/ Mating Conn	w/o Mating Conn
ACD176-12	*			*		*
ACD176-24		*		*		*
ACD176A-12	*		*			*
ACD176A-24		*	*			*
ACE176-12	*			*	*	
ACE176-24		*		*	*	
ACE176A-12	*		*		*	
ACE176A-24		*	*		*	

The 176 SERIES actuator can also be supplied with a position sensor that allows the actuator to be used in a fuel management system. Contact GAC for assistance.

SPECIFICATIONS

PERFORMANCE

Force(see Figure 1)	6.2 lb. (27.5 N)
Operating Stroke	0.80 in. (21 mm)
Response Time (10 - 90%, 2 - 19 mm)	35 msec.

ELECTRICAL POWER INPUT

Operating Voltage	12 or 24V DC
Nominal Operating Current	12V DC version4.0 A 24V DC version2.0 A
Maximum Current	12V DC version5.8 A 24V DC version3.1 A

ENVIRONMENTAL

Operating Temperature	-40 to +95°C (-40 to +200°F)
Relative Humidity	up to 100%
Vibration	20g, 20 - 500 Hz
Shock	20g @ 11 msec.

PHYSICAL

Dimensions	See Figure 2
Weight	4.75 lb. (1.9 kg.)
Mounting	Requires camshaft bearing retainer kit BOSCH P/N 1415522036
Mating Connector	EC1300
Mating Cable Harness	CH1215
Available Models	See Chart A

INSTALLATION

Preparing the fuel injection pump

If the fuel injection pump is equipped with a mechanical governor, it must be removed. GAC recommends that this modification be performed by a qualified fuel injection service facility. The following procedure lists the general steps required to remove the mechanical governor.

NOTE: Be prepared to collect the oil that will be released from the mechanical governor.

1. Remove the rear housing from the mechanical governor and disconnect the governor linkage from the fuel rack. Remove the flyweight assembly. A special tool is required.

2. Remove the intermediate governor housing. This leaves only the rack and camshaft protruding from the pump.

3. Install the camshaft bearing retainer plate to provide support to the bearing formerly held by the governor housing. This plate must have countersunk holes for the mounting screws.

Installing the actuator

All hardware needed to attach the actuator to the pump is located in kit KT288 supplied with the actuator.

1. The mounting surface of the pump must be clean. Attach the link (1) to the left-hand side of the fuel rack with a M5 x 10mm screw (2) that includes a patch of locking adhesive. Tighten the screw to 3 - 4 NM so that the link is aligned axially on the rack.

2. Remove the two lower screws of the bearing retainer plate and replace them with the retainers (3). Attach the retainers with their shorter end threaded into the pump and torque to 5 - 6 NM.

3. Temporarily place the actuator over the rack and retainers and onto the pump face. Check that the actuator contacts both the pump face and shoulders of the retainers. If necessary, use M6 spring washers to shim the retainers. The upper and lower mounting points of the actuator must be equally supported. Remove the actuator from the pump.

4. Remove both the actuator covers. DO NOT remove or loosen the lever (16) from the actuator shaft. Place the o-ring seal (4) into the groove on the mounting face of the actuator. Apply a small amount of grease to the o-ring to hold it in place.

5. Swing the armature out of the actuator so that the lever (16) is out of the way. Guide the actuator over the rack and onto the lower mounting retainer studs. Attach the top of the actuator to the pump with the M8 x 16mm socket head screw

(5), lock washer (6), and flat washer (7). Use M6 hex nuts (8) and spring washers (9) to secure the lower position of the actuator. Torque the screw to 6 - 8 NM and nuts to 5 - 6 NM.

6. Pull on the rack so that it is as far out of the pump as possible. Check that it moves freely. Place the return spring (10) over the rack. Place the spring retainer / shut off plate assembly (11, 12) and the M10 locking nut (13) over the threads on the rack link (1). The flats on the shut off plate (12) must engage the flats on the link (1). Tighten the nut to 6 - 8 NM and insure that the shut off plate is vertical and secure.

7. Test the engagement of the shut off mechanism with the rack linkage. Swing the lever back into the actuator. Push on the armature to insure that the rack linkage operates smoothly and returns immediately when released. Reattach the lower actuator cover (23) and tighten the screws (20) to 4 - 6 NM.

8. Loosen the fixation screw (17) so that the bearing (18) can be adjusted in its slot. Adjust the bearing so that it pushes the rack 0.5 - 0.7 mm away from its stop position. Hold the bearing in this position and tighten the screw (17) to 4 - 6 NM. The rack is now adjusted so that premature wear of the gear segments is avoided. Confirm that the operating lever screw (19) is tightened to 12 - 13 NM. Inspect the assembly to make sure all screws are tight.

9. The lever has a maximum fuel adjustment set screw (14). This screw is used to restrict the fuel rack from 1 to 14.5 mm

**Setting high fuel levels may cause the maximum fuel adjusting screw to hit the top cover, which can change the minimum fuel position.
This could lead to a dangerous condition.
When setting fuel levels above 17 mm, insure that the adjusting screw does not contact the top cover at minimum fuel.**

With the fuel pump operating on the engine, the maximum fuel setting can be set to provide specific horsepower. Once this setting is made tighten the lock nut (15) on the stop screw to 5 - 6 NM.

10. Move the manual shut off lever to the stop position and insure that the fuel is completely shutoff and the engine stops.

11. With the engine shut down, install the upper chamber cover with the four screws (20,21) and lock washers. Note that when installed, the cover must not hit the internal lever or its stop screw. Tighten the screws to 2 - 3 NM. Check for any oil leaks. Lock wire the screws for tamper resistance.

CAUTION

The engine should be equipped with an independent shut down device to prevent overspeed which can cause equipment damage or personal injury.

WIRING

The 176 actuator is pre-wired for 12 or 24V DC operation. Use the included cable harness or make up a cable harness to connect the actuator to the speed control unit. DO NOT use 176 actuator on a 32V system, contact the factory for assistance.

COIL RESISTANCE	
12VDC	24VDC
1.7 ± 0.2 OHMS	7.2 ± 0.5 OHMS

Figure 2 ACTUATOR OUTLINE

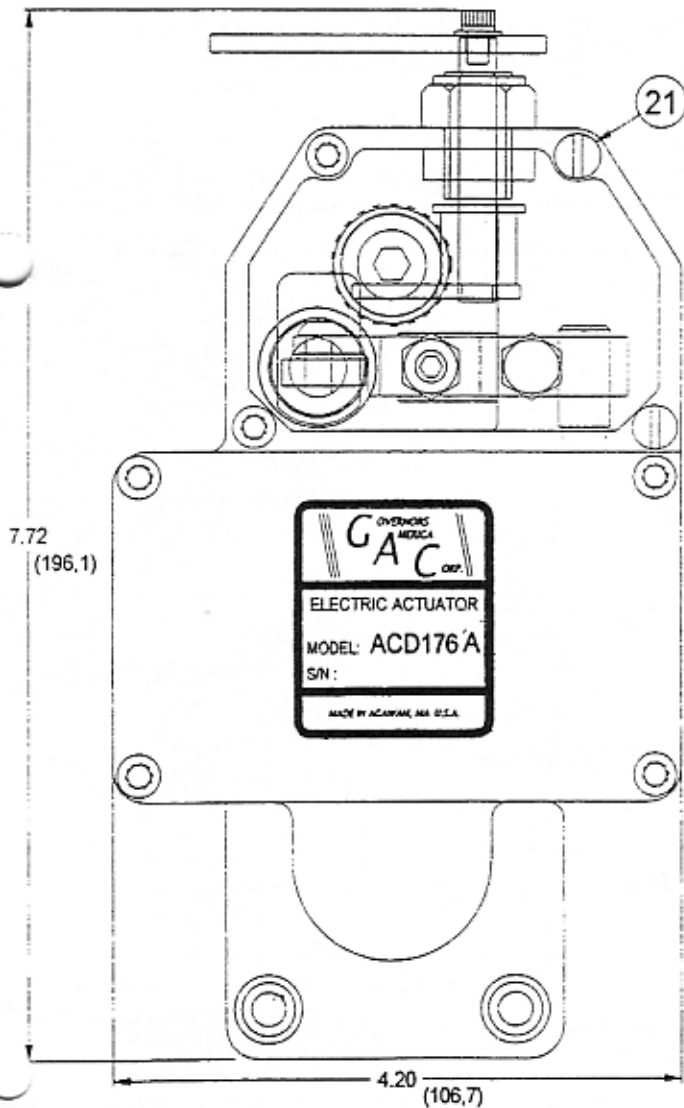
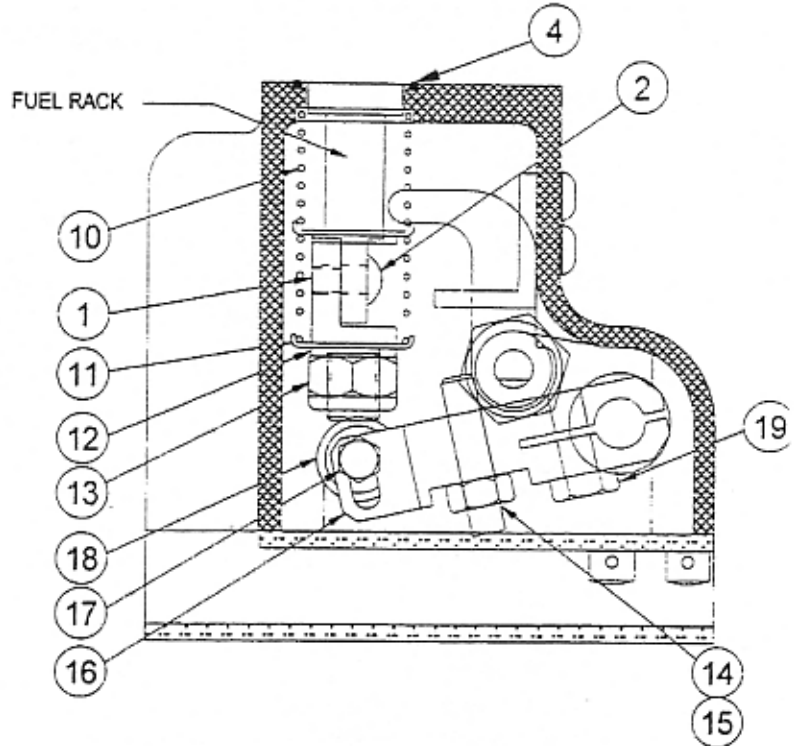
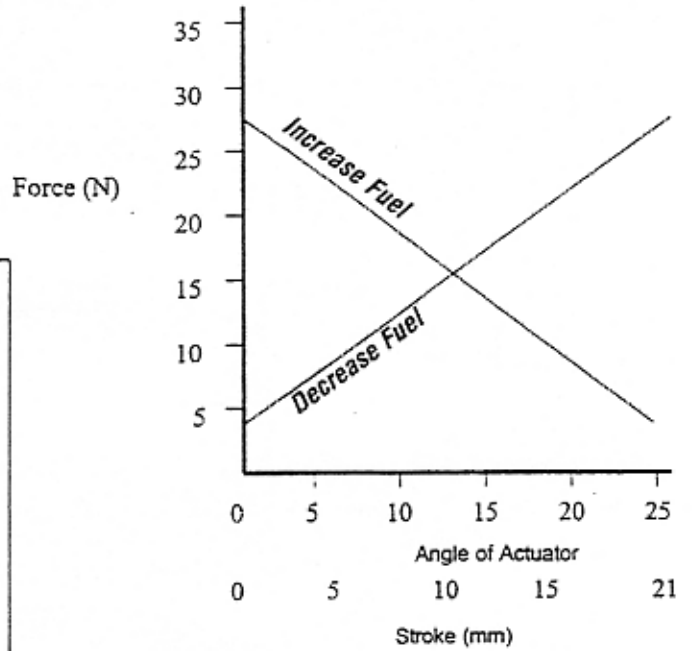
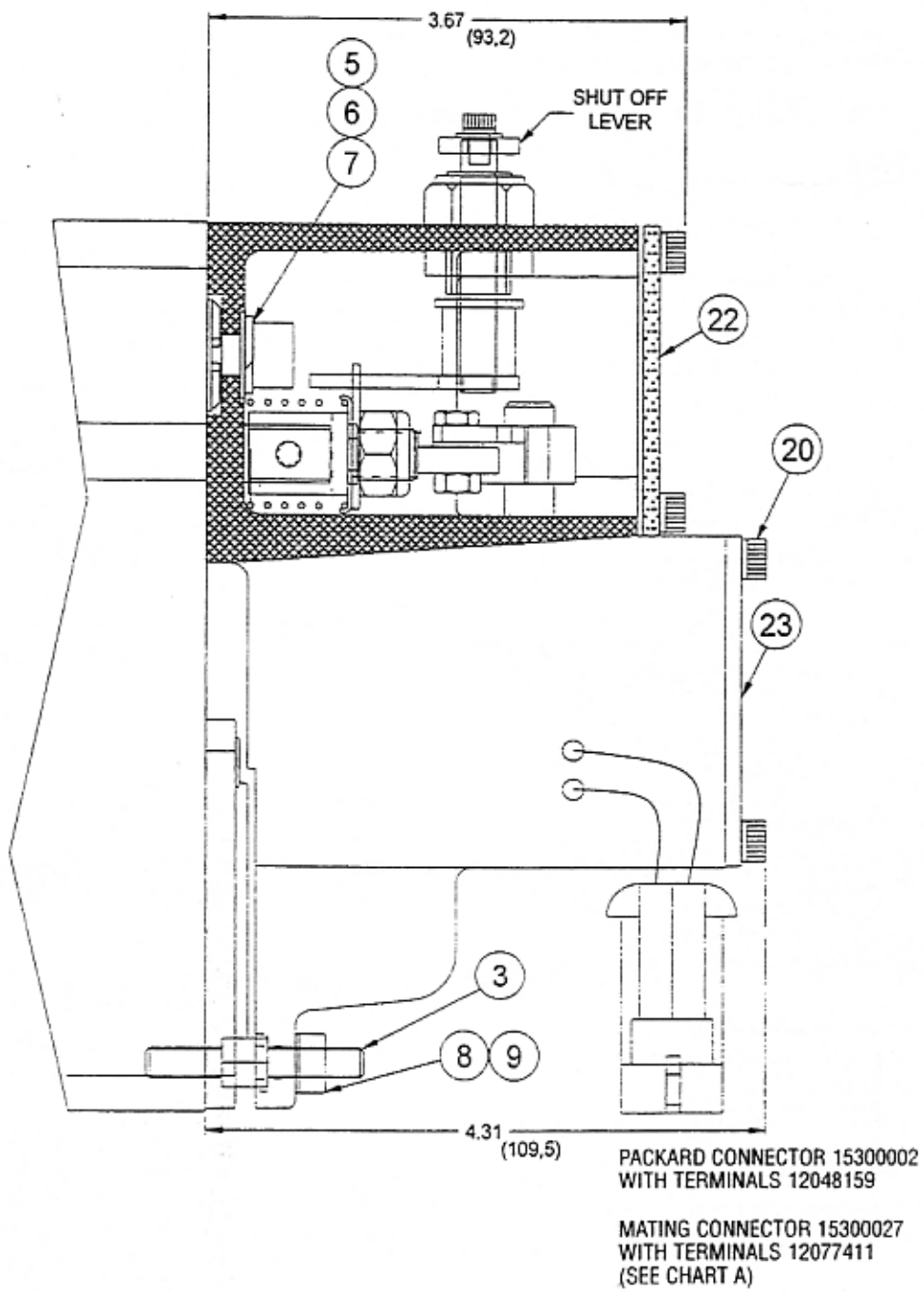


Figure 1 ACD176 Fuel Rack Force vs. Stroke





ELECTRONIC - HYDRAULIC - SYSTEMS

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