PED 5000
ELECTRIC ACTUATOR

INTRODUCTION

The PED 5000 electric actuator is a rotatory output, linear torque, proportional servo. This electromechanical actuator is typically used as an engine fuel control positioning device. An internal spring provides fails safe operation by forcing the actuator to the fuel shut off position when the actuator is de-energized. This design combines fast operation, multi voltage, wider rotation angles and proven reliability. The actuator can operate directly from 24 volt battery supplies.

The speed of operation of the PED 5000 is typically faster than competitive actuators, thus it provides more stable and rapid response to transient conditions.

Applications include most block pumps, with or without mechanical governors, distributor type pumps, and medium sized carbureted engines. The 25 degrees of rotation expands the application to a wider variety of engines.

DESCRPITION

The PED 5000 is an electromagnetic servo device which can be intergrated into a closed loop control system. An engine control system can be described as follows. An electrical signal is generated by a magnetic speed sensor which is proportional to engine speed. This signal is sent into the electronic speed control unit which compares it to the preset engine speed setting. If the magnetic speed sensor signal and the preset engine speed settings are not equal, a change in current from the speed control unit to the actuator will change the magnetic force in the actuator. The rotation of the actuator shaft will then adjust the fuel to the engine and cause the engine speed to be equal to the preset engine speed setting. Shaft rotation is proportional to the amount of actuator current and counterbalanced by the internal spring.

Since the design has no sliding parts and is totally sealed, outstanding realiability results. A single compression spring is used to improve reliability. No maintenance is necessary.

INSTALLATION

The actuator must be rigidly mounted as close as possible to the fuel control lever of the engine. Vibration from the engine will not effect the operation of the actuator. The preferred mounting is with the electrical connector at the top. Applicaitons with the actuator upside down, on its back, or sideways should be avoided. Linkage arrangement of any actuator system is always important. High quality rod end bearings should be used. Rod and bearings that have high friction can cause instability and require servicing.

Levers and linkage should be sturdy yet low in mass for the best speed of response conditions.

Drill the actuator mounting holes in a pre-fabricated mounting bracket. Mounting hole configuration is illustrated in Diagram 4. The position of the actuator on the mounting bracket should insure minimal mis-alignment between each end of the governor system linkage. The linkage ball bearing rod ends can tolerate a maximum misalignment of 10 degrees.

Affix the bracket to the selected location or engine. Affix the actuator securely to the mounting bracket. Adjust and secure the linkage rod and rod bearings. Arrangement to the linkage for actuation of the engine fuel control is an important application consideration. For proportional actuators to operate with linear control systems, it is important to obtain a linear relationship between actuator stroke and fuel delivery. The linkage configuration for diesel fuel systems is typically as illustrated in Diagram 1. The lever of the actuator should be nearly parallel to the pump lever at the mid fuel position for linear fuel control.

For proportional actuators to operate with linear control systems, it is important to obtain a linear relationship between actuator stroke and fuel delivery system.

Diesel Fuel Systems

For diesel fuel systems, the linkage configuration is typically linear. The actuator lever should be nearly parallel to the fuel control lever and perpendicular to the linkage rod at the mid fuel position. See Diagram 1.

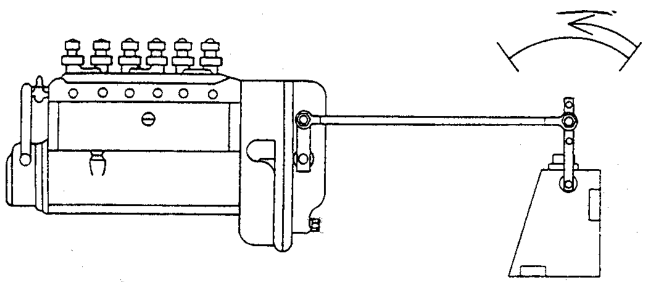


DIAGRAM 1
Fuel Control Lever at Mid Fuel Position

Carbureted Fuel Systems

For carbureted fuel systems, the linkage is typically non-linear. The ideal linkage relationship is for the carburetor butterfly valve lever to be parallel with the actuator leverl and the linkage rod to be perpendicular to the actuator lever at maximum position. See Diagram 2.

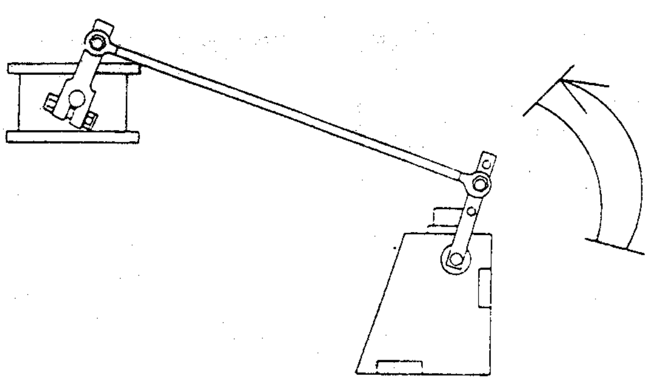


DIAGRAM 2
Carburetor Fuel Valve at Full Fuel Position

WIRING

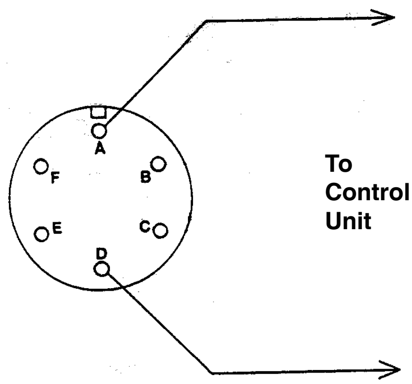
The actuators with 6 pin connectors are prewired for 24 V. Use the included harness to connect the actuator to the speed control unit or fabricate a cable harness to connect the speed control unit to the actuator. The recommended wire size of the cable harness is at least # 18 gauge (1.0 mm) for 24 volt systems. The wiring must be capable of handling typical current levels of 4 amps for 24 volt systems without experiencing a significant voltage drop. Larger gauge wire will be necessary for cable lengths greater than 10 ft. (3 meters).

32 Volt Operation

Wire the actuator electrical connector as illustrated for 24 Volt operation. A 1.5 ohm, 25 Watt resistor must be added in series with pin A of actuator and the output terminal of the speed control unit.

Connect A and D of the military connector or the 6 pin connector harness to the speed control unit. Refer to applicable speed control unit literature.

DIAGRAM 3
Military Connector Wiring



24 Volt Operation
A & D to output terminals
of speed control unit

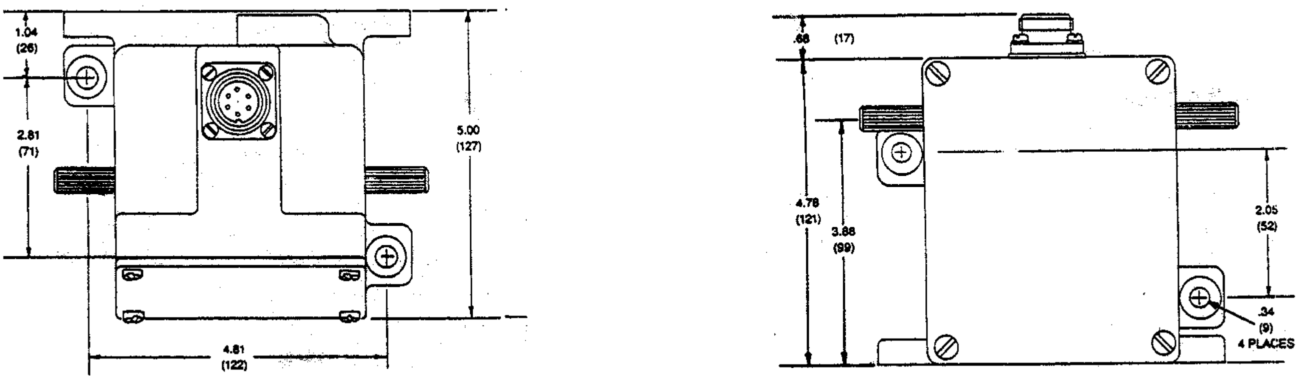


DIAGRAM 4
Actuator Outline Dimensions

LINKAGE ADJUSTMENT

The linkage can be optimized by adjusting for an actuator current difference from no engine load to full engine load of approximately 1 amp for 24 volt systems.

The no load current is altered by varying the length of the linkage, and the range is adjusted by changing the hole used by the rod end bearing on the actuator lever.

Smaller anlges of actuator travel may improve transient performance, but will reduce the force available at the fuel control lever. Adjusting the actuator to operate through at least one half (12 degrees) of its stroke will provide near optimum response.

TROUBLESHOOTING

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

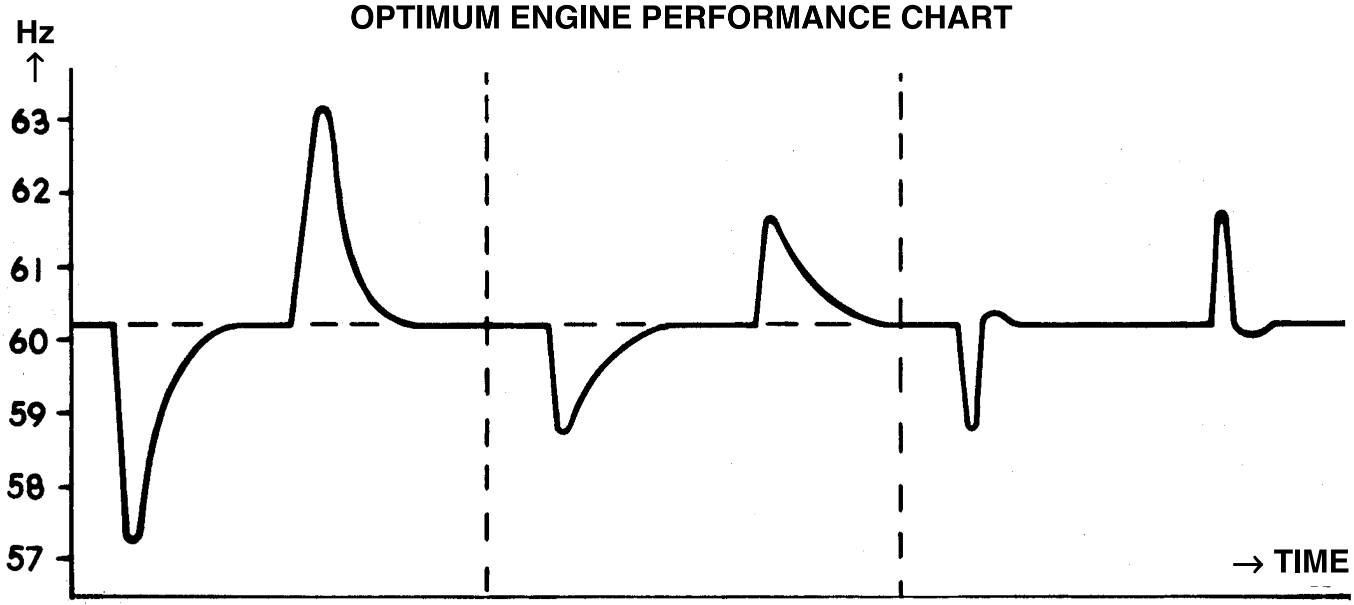
Measure the Resistance (PED 5000 & similar series)

A to D → 6.0 ohms • A to Housing → Infinity • C to Housing → Infinity

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 these tests, the problem is elsewhere in the system. Refer to the control unit troubleshooting publication.

OPTIMUM ENGINE PERFORMANCE CHART



Initial gain and stability control adjustments give a trace indicating, from the excursion of the transient, the gain should be increased by turning the gain control clockwise.

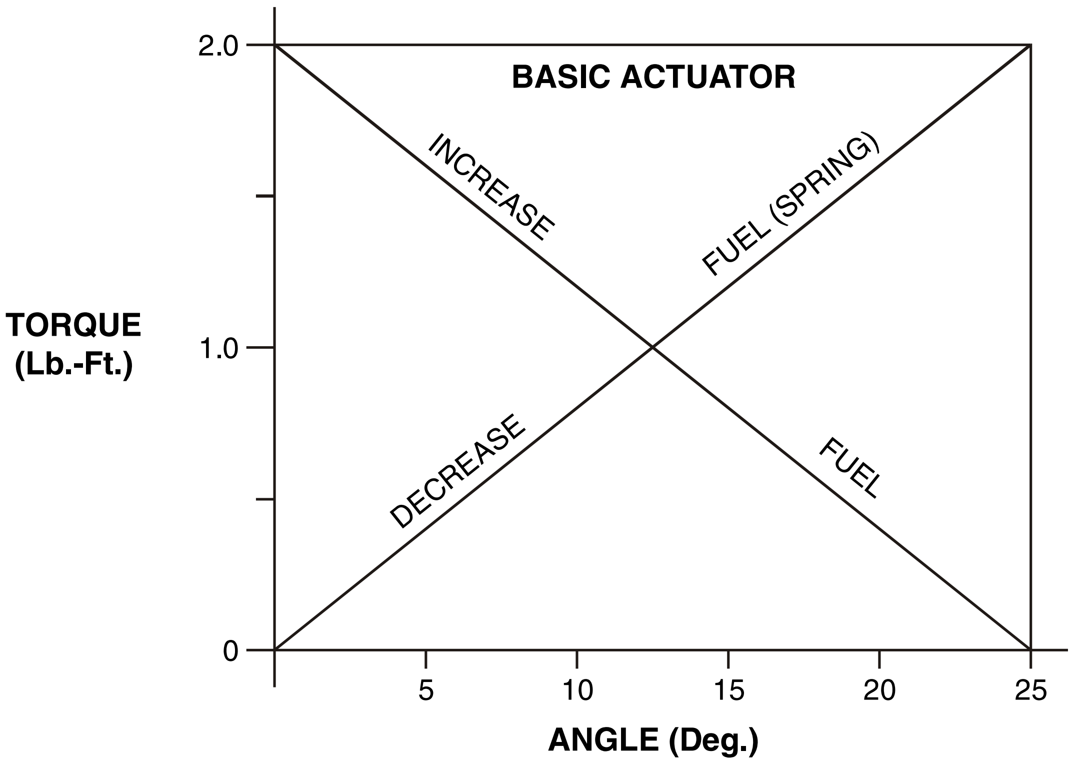
Increased gain resulted in a new transient with reduced excursion. It is apparent from the long tail on the transient that the stability control must be turned clockwise.

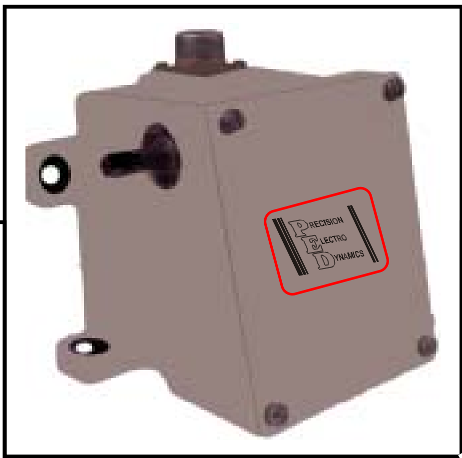
Readjusting both gain and stability controls gives a trace, indicating good transient at full load and good stability. The governor is now properly adjusted.

SPECIFICATIONS – PED 5000

PERFORMANCE	
Available Torque (See Diagram 5)	Max. 2.0 lb-ft (2.7 Nm)
Maximum Operating Shaft Angular Travel	25 ± 1 degree CW/CCW
POWER INPUT	
Operating Voltage	24, 32 VDC
Normal Operating Current	1.5 A at 24 / 32 VDC
Maximum Current - Continuously Rated	4 A at 24 / 32 VDC
ENVIRONMENTAL	
Temperature Range	– 65^{O} to + 200^{O} F (– 54^{O} + 95^{O} C)
Relative Humidity	up to 100%
All Surface Finishes	Fungus proof and corrosion resistant
PHYSICAL	
Dimensions	See Diagram 4
Weight	8.25 lbs. (3.75 kg)
Mounting	Any position, electrical connector at the top-preferred (See Installation Page 2)
RELIABILITY	
Vibration	upto 20 G @ 50 - 500 Hz
Testing	100% Tested
MATING HARDWARE	
Connector	EC1000 / MS3106R 14S-6S (6 pins)
Lever	LE1000-2 w/6 drilled ¼” holes
Rod End Bearings (to attach ¼-28THD linkage rod to the lever)	BR 200 (right hand) BR 201 (left hand)

DIAGRAM 5
Graph of Actuator Torque





ELECTRIC ACTUATOR

ELECTRONIC SPEED CONTROL UNIT

MAGNETIC PICKUP

ELECTRONIC ENGINE SPEED GOVERNING SYSTEMS

PRECISION ELECTRODYNAMICS

PED 8000
MAGNETIC SPEED SENSORS

INTRODUCTION

The magnetic speed sensor indicates when ring gear geeth, or the ferrous projections, pass the tip of the sensor. Electrical impulses are induced within the coil and sent to the speed control unit. The signal from the magnetic speed sensor, teeth per second (Hz) is directly proportional to the engine speed.

DESCRIPTION

The magnetic speed sensor is mounted in the ring gear case or by wheel belt housing of the engine. The threaded hole for the speed sensor should be perpendicular to the centerline of the crankshaft and centered over the ring gear teeth. A spot face should be present to provide a flat surface on which anchor the locknut. With the engine stopped, screw the speed sensor in until it touches a gear tooth, then back it out 3/4 of a turn and secured with the locknut. Any ferrous gear may be used as long as the frequency and amplitude of the resulting signal meet the speed control unit specifications.

The wire leads should be twisted for their entire length from the magnetic speed sensor to the control unit. The leads may need shielding if they are longer than 10 ft. (3 m) or if exterior interference is present.

Do not connect either of the speed sensor leads to anything but the speed control unit used. The shield should not be connected at the speed sensor end.

SPECIFICATIONS

Thread Size .... 5/8 - 18 UNF - 2A

Drill Size 37/64

Proximity to gear teeth .... 0.025 - 0.035 in. (0.64 – 0.89 mm)

Temperature Range .... – 65^{O} to 225^{O} F (– 55^{O} + 105^{O} C)

Output .... 0.5 – 30 Volts RMS is recommended for input to control units (1 V RMS when crancking engine)

Resistance .... 30 – 300 ohms

MADE IN INDIA BY

PRECISION ELECTRODYNAMICS

NO. 1/5, UNION CHAMBERS, OPP. APPOLLO TYRES LIMITED, NORTH KALAMASSERY,
ALAWYE, KERALA - 683104 • PHONE / FAX : (0484) 2551758