Cummins Service Manual

PT Fuel Pumps and Injectors

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Foreword

This manual covers the operating principles, disassembly, inspection, repair and assembly of the PT (type G) and PT (type R) fuel pumps. Testing and calibration are covered in separate manuals. Each part is disassembled, repaired and assembled in separate sections.

Cummins Engine Company, Inc.
Columbus, Indiana, U.S.A.

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Fuel Pump Service Tools

ST-302 Ball Joint Vise
ST-419 Oil Seal Tool
ST-422 “O” Ring Assembly Tool (5/8”)
ST-425 Peening Block Governor Weights
ST-490 Reaming Fixture
ST-546 Mounting Plate
ST-586 Sleeve Puller, PT (type R)
ST-709 Puller, Governor Weights
ST-855 “O” Ring Assembly Tool (1/2”)
ST-853 Driver, Governor Barrel Spring Dowel
ST-1032 Driver, Tachometer Oil Seal
ST-1224 Overspeed Stop Adjusting Tool
ST-1231 Governor Weight Gear Tool
ST-1241 Weight Assist Protrusion Checking Tool
ST-1249 Coupling Puller
ST-1250 Pressure Valve Tool

Other Fuel Pump Rebuild Tools

Dial Indicator (Starrett No. 196-B)
.750 inch Reamer
Torque Wrenches (Inch pound and foot pound)
Arbor Press
90° Block with Steel Puller
“V” Block with Steel Puller
Oven, 400°F, Maximum
Cleaning Solvent
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Compiled and Reproduced From Original by Jensales Inc.
Fig. 1, FS235, PT (type G) fuel pump - right handed gear pump.

Fig. 2, FS236, PT (type R) fuel pump.

Compiled and Reproduced From Original by JenSales Inc.
3. Start engine and adjust low speed stop screw (atop governor head) for desired idling speed.

**Speed Droop Adjustment**

1. Remove the top cover from the governor to expose the speed droop mechanism and adjustments, Fig. 5-119.

2. The speed droop bracket is clamped to the terminal level by the slotted screw. When loosened, it can be moved to the front or rear. Moving bracket to the rear produces more speed droop.

3. This speed droop lever movement thus produces a speed setting which is a function of terminal shaft position with speed decreasing as fuel flow increases. **This is speed droop.**

4. Speed droop is increased by moving the bracket to the rear and is reduced to approximately zero when the pivot pin is all the way forward. Since there is no calibration for the droop adjustment, the zero droop position may be precisely set only by trial and error on the engine or by use of a dial indicator on the speed droop lever during manual rotation of the terminal shaft.

5. Speed droop is required when using SG Woodward Governors. It must be set by operation on the engine. The speed droop bracket is adjusted to obtain the desired speed droop between full load and no load.

**Pierce Governor Operation**

The shaft to which the terminal lever, yoke and spring retaining arm are fastened may be considered a pivot point. Acting about this pivot point are a clockwise (viewed from the spring end) moment due to the weights acting through the yoke, and a counterclockwise (also viewed from the spring end) moment due to the spring tension acting through a moment arm equal in length to a perpendicular dropped from the center of the shaft (pivot point) to the line of action of the spring tension. This linkage to the fuel pump is made so that the clockwise (weight) moment acts to decrease fuel, and counterclockwise (spring) moment acts to increase fuel. When the system is at rest, the spring force holds the throttle wide open, and when the system is in equilibrium the two moments are equal, Fig. 5-120.

A decrease in speed due to added load results in a decrease of the clockwise (weight) moment; the counterclockwise (spring) moment then opens the throttle until it (the counterclockwise moment) again balances the clockwise (weight) moment. As the throttle opens, the spring deflection is reduced; hence the spring moment is reduced until a balance is reached.

Conversely, an increase in speed due to decrease in load gives an increase of the clockwise (weight) moment which closes the throttle. As the throttle is closed the spring tension is increased, equilibrium being reached when the two moments again balance.

Droop is adjustable by changing the length of the moment arm through which the spring tension acts. With a given set of conditions, 50 rpm speed increase will give a certain increase in clockwise (weight) moment. With a short moment arm, a great spring deflection will be required before the counterclockwise (spring) moment increases to the new equilibrium value. With a longer moment arm, a lesser deflection of the spring will be required to reach equilibrium. If the spring deflection is large, throttle travel will of course also be large, and the converse is true. Large throttle travel per speed change means less droop, while small throttle travel per speed change means more droop. Hence, a short moment arm will give less droop, and a long moment arm will result in a large amount of droop.
6. The lever arm connected to piston (8) by actuating shaft (6), rotates shaft; closing valve port. The lever is rotated by action of air intake manifold pressure (11) against piston and diaphragm (7), moving actuating shaft downward against resisting spring force. Fig. 5-2-2.

7. Anytime engine intake manifold air pressure is above preset "air actuation pressure," aneroid is "out of system."

8. The aneroid begins dumping when intake manifold air pressure drops below preset value as happens after deceleration in traffic, deceleration during gear shifts, down grade motoring with closed throttle or down grade operation on light load portion of governor droop curve.

9. The aneroid does not bypass fuel under full throttle down conditions until speed is low enough to reduce intake manifold air pressure to aneroid operating range (usually below engine stall-out speed).

Installing Aneroids On Fuel Pump Test Stands

Precision setting and/or checking of aneroids is accomplished by simulating engine operation on a fuel pump test stand. Cummins ST-848 Fuel Pump Test Stand must be equipped as follows:

1. Fabricate a suitable bracket or mount the aneroid on fuel pump test stand. This bracket may be used to mount an air regulator, such as used on ST-790 or ST-990 Injector Test Stands, and a mercury manometer of suitable scale length or 30 inch pressure gauge of known accuracy.

2. Air pressure from regulator must be piped to top of aneroid to actuate bellows.

3. Tee off regulator air line (outlet) into manometer or pressure gauge. Service Tool is ST-1256.

Testing Aneroid

Adjusting Fuel Screw

1. Mount a fuel pump on fuel pump test stand which has been calibrated to the same code as that on, or will be used, on engine. For instance, if aneroid is intended for use on an engine equipped with fuel pump calibrated to code No. 2049, use a pump set at same code (2049) to set aneroid.

2. Plumb aneroid to fuel pump in the normal manner, Fig. 5-2-5 and 5-2-6.

3. Start fuel pump test stand and purge all air from system.

4. Adjust air regulator to apply 30 inch [76,2 cm]. Hg pressure on aneroid bellows.

5. Set fuel pump at rated speed calibration point (Manifold PSI @ RPM and Flow Reading) specified for pump code.

CAUTION

The flow control valve setting must not be altered during the following checks. Altering flow will give false adjustments.

6. Reduce test stand speed to that shown in Table 5-2-1 under BHP @ Speed.
Injector Cleaning and Repair

Fig. 6-1-15, F60163. Testing injector spring

Testing injector spring Fig. 6-1-17, F60105.

New injector cup tip Fig. 6-1-16, F60109.

Injector springs Fig. 6-1-18, F60223.

Cup tip damaged by wire brushing.

Table 6-1-4: Injector Spring Data

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Approximate Wire Load Required to Compress Springs to Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Free Length [Inches [mm]] No. Coils</td>
</tr>
<tr>
<td>8091-1</td>
<td>2-7/16 [61.9] 7</td>
</tr>
<tr>
<td>128040</td>
<td>2-1/2 [63.5] 7</td>
</tr>
</tbody>
</table>

*Earlier model springs have 9.5 coils with two closely spaced as shown in Fig. 6-1-15, these may be used interchangeably.