TENNANT® TECHNICAL SERVICE BULLETIN 98800–008

DATE: 01/01/98 (Rev. A)

TITLE:
GOVERNOR TROUBLESHOOTING GUIDE

APPLICABLE MACHINES:
800 ,810

SYNOPSIS:
Governor Troubleshooting Guide for machines with the Ford 2.3L engines with a Serial Number from 0000–1699. THE GOVERNOR TEST HARNESS IS PART NUMBER 66137.

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1. *The first step in this troubleshooting is to disconnect the throttle linkage at the carburetor and work the throttle at the carburetor by hand.*

   If you can run the engine by hand and it works with no problems, go to step four.

   If the problem continues, it is not with the governor, it is with the ignition signal fuel systems or the engine itself.

2. *Ignition Signal*

   The engine ignition system is a breakerless type. The ignition signal that drives the governor originate from the Ignition Control input leads. They are the Gray Wire #72A and the Gray Wire #72B. To test this, use the governor test harness as shown on Figure 2 on page 5. Once the harness is in place, use a tach/dwell meter to test for the proper RPM's and a flat ignition signal. Test at the text plug at either Pin C, or Pin D.

   The readings should be:

   a. Start –1350 +/– 250 RPM

   b. Idle – 1100 +/– 250 RPM

   c. Run – 2400 +/– 50 RPM

   If a steady tach reading is obtained, the signal is probably okay.

   If ignition signal is not steady, check ignition system, such as, bad spark plugs, and faulty high tension loads. These must be corrected before the governor can be analyzed.

A bad signal here will usually result in the engine overspeeding in the run position.

3. Fuel System

A common problem that has been encountered on LPG machines is a restricted fuel hose (a clogged fuel filter can have the same effect).

If the governor opens the carburetor wide open and the engine loses speed, the problem is not in the governor. The fuel system is at fault. The purpose of the governor is to open the carburetor and to bring the engine to set RPM's depending on where you have the speed control switch set at.

After you have verified that the ignition system and the fuel system are not at fault, go to the next step.

4. Linkage Adjustment

The next step in troubleshooting is to ensure that the linkage between the carburetor and actuator is correct. The linkage must move freely with no interference from binding ball joints, hoses, wires, etc.

To check this, disconnect the linkage, rotate the actuator and carburetor levers back and forth to ensure that they move smooth with no "binding."

The actuator has the only throttle return spring in the system. It must pull the carburetor lever against the idle stop. This is adjusted by first adjusting the idle speed to 1100 RPM. Then, with the engine off, remove the link rod from the carburetor ball joint. The rod length should be adjusted so that when the carburetor lever is against the idle stop and the actuator lever is against the idle stop, the length is such that it fits exactly between the carburetor and actuator. Add two turns of the ball joint to provide pre-load of the carburetor lever against the idle stop.

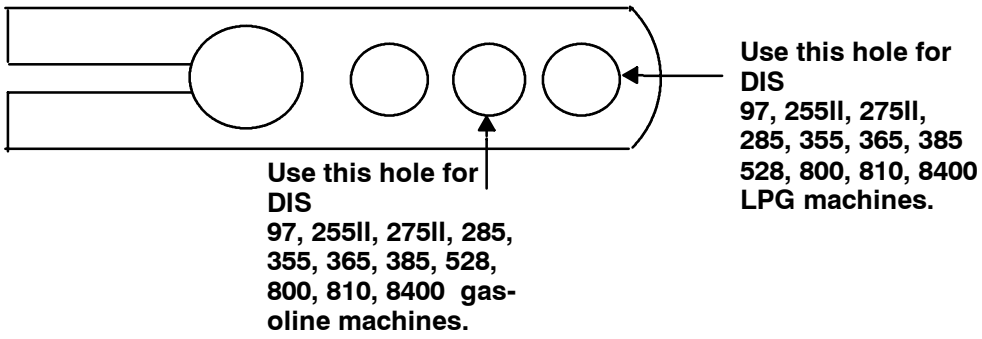
NOTE:

a. The LPG carburetors require that the link be extended for pre–load.
b. The gasoline carburetors require that the link be shortened two turns.

If the engine tends to "hunt" at no load but not when the accessories are turned on, the link may have more than two turns of pre-load.

If the engine responds sluggishly to switch changes, the link may have less than two turns of pre-load.

If the engine seems to wander in the start position, the pre-load against the idle stop is probably not adequate.

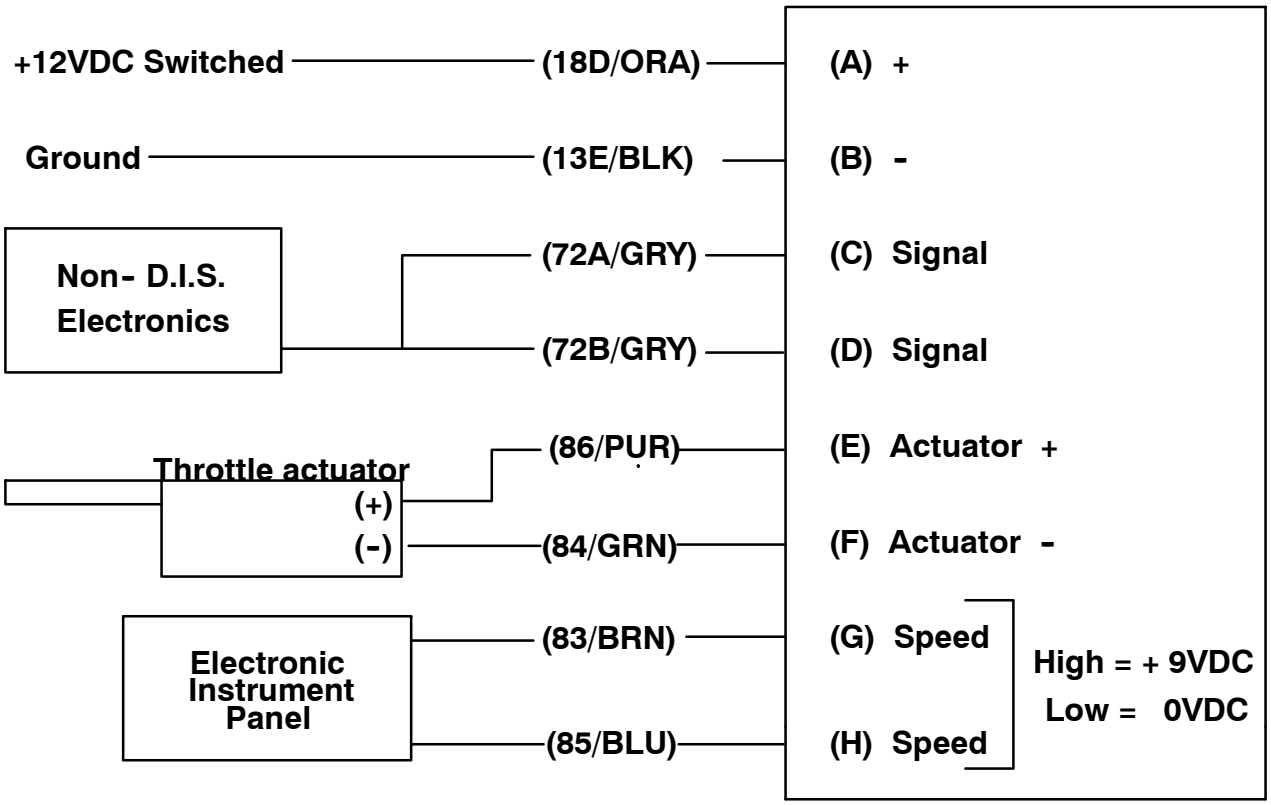


On units with the gasoline-fueled Ford engine, the carburetor levers are adjustable. Locate the carburetor lever so that it is horizontal when the carburetor is against the idle stop. On gasoline units, the governor lever should also be horizontal, to slightly below, when the link is disconnected. To pre-load the linkage, shorten the rod by turning the ball joints in two turns from the neutral point as before. The link rod should be installed in the middle hole on the governor arm.

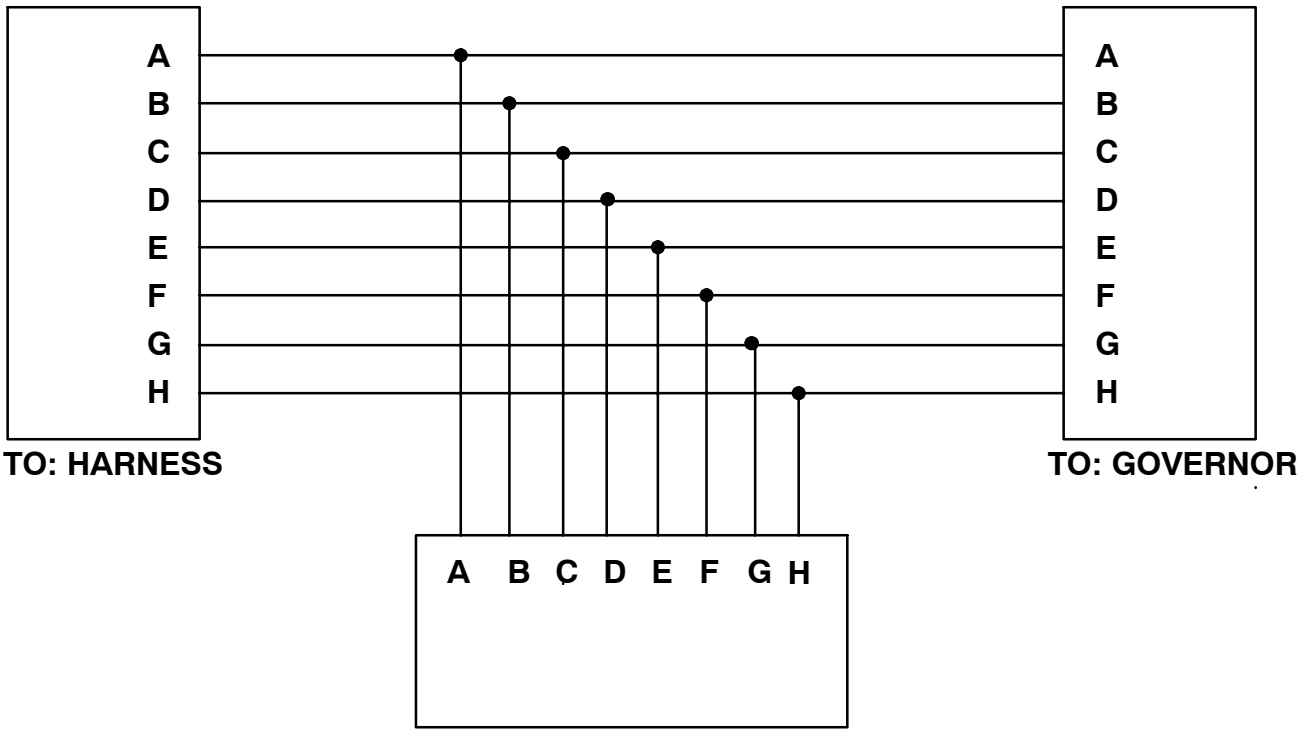
On units with LP-fueled Ford engines, the carburetor levers are also adjustable and should be located approximately 25° above horizontal. The governor lever should also be at a similar angle in the idle position. Make sure that the carburetor lever does not go "over center" and lock up in the full throttle position. If it does, raise both levers slightly until the condition is corrected. To pre-load the linkage in the idle position, extend the ball joints two turns to force the carburetor lever against the idle stop. The link rod should be installed in the outer (1.9") hole on the governor arm.

NOTE: These are approximate starting points to ensure proper operation.

Manually run the linkage through its full stroke to ensure that the rod does not hit the intake manifold, that the rod ends are free with no binding, and that the levers go through their full stroke.



800 / 810 ELECTRONIC GOVERNOR WIRING PICTORIAL Fig. 1



NOTE: The wire colors of the test harness don't necessarily match the machine harness.

TEST HARNESS Fig. 2

5. System Grounds

The wire harness grounds on the machines are routed to the stud on the alternator, and from there, a separate cable is routed to the bolt on the bell housing where the battery cable is attached.

If a bad ground is present, the engine will tend to run overspeed.

The machine must have good grounds throughout from the battery cable to the control box.

The battery cable must be clean and tight.

There must not be a greater voltage drop than .2 volts between Pin B, on the test harness, the engine, the alternator, and the battery positive terminal and the battery negative terminal.

To do this, take your voltmeter and set it on the DC volts scale. Then with your positive probe, clamp it to battery positive. Then with the negative probe, move it to the above-stated places on the machine.

The actuator is internally isolated and does not require that the cable be grounded.

6. Start-Up Check

With the throttle switch in the engine start position, turn the ignition switch to the on position. The actuator should cycle the carburetor lever once.

(A cycle is to move from the off or idle position to the open position and then return to the off or idle position.)

If this does not happen, the power wiring to the control box is probably at fault or the control box is faulty. IT IS RARE TO HAVE A FAULTY CONTROL BOX, so proceed with the following voltage checks BEFORE REPLACING IT.

7. Throttle Control Switch Check

If the engine doesn't respond to the throttle switch control:

a. With the engine running,
b. disconnect Wire 86, purple wire, at the actuator.
c. Connect a jumper wire from the battery terminal on the starter to the terminal where you removed Wire 86, purple wire, from the actuator.

The engine should come up to operating speed. If the engine comes up to speed, replace the throttle control switch. If the engine doesn't respond, go to the next step.

8. Operating Voltage

The following voltage checks are done with the machine not running and using a Fluke or Beckman digital multi-meter and the governor test harness shown on figure 2.

Throttle control switch in start position:

Pin A - Battery Voltage $\pm$ .2
Pin B - 0 - this is a ground
Pin C - Battery Voltage $\pm$ .2
Pin D - Battery Voltage $\pm$ .2
Pin E - Battery Voltage $\pm$ .2
Pin F - Battery Voltage $\pm$ .2
Pin G - Battery Voltage $\pm$ .2
Pin H - 3 to 3.5 VDC

Throttle control switch in the idle position:

Pin G - 3 to 3.5 VDC
Pin H - Battery Voltage $\pm$ .2

Throttle control switch in the run position:

Pin G - 3 to 3.5 VDC
Pin H - 3 to 3.5 VDC

The following voltage and RPM readings are at the electric control box using the test harness shown in Figure 2 with the machine running.

Please note when you are testing if you should be in the DC or AC scale on your multimeter. You will also need your tach/dwell for the RPM checks.

The readings are taken with either a Fluke or Beckman digital multimeter:

Throttle control switch in the start position:

Pin C – 1350 ± 25 RPM
Pin D – 1350 ± 25 RPM
Pin E – Battery Voltage ± .2
Pin F – 6 to 6.5 VAC
Throttle control switch in the idle position:

Pin C – 1100 ± 25 RPM
Pin D – 1100 ± 25 RPM
Pin E – Battery Voltage ± .2
Pin F – 6.5 to 7 VAC
Thottle control switch in the run position:

Pin C – 2400 ± 25 RPM
Pin D – 2400 ± 25 RPM
Pin E – Battery Voltage ± .2
Pin F – 7 to 7.5 VAC
If you do not get these values:

Pin A – Check battery, wiring/connections, and
also the charging system.
Pin B – Check all grounds.
Pin C – Check ignition system and fuel systems.
Pin D – Check ignition system and fuel systems.
Pin E – Possible control board.
Pin F – Possible control board.
Pin G – Possible switch.
Pin F – Possible switch.

The volt readings at the actuator with the machine running and using a Fluke or Beckman digital mult–meter:

At the terminal where Wire 84, green wire, is hooked to:

Start – 0 VAC ± .2
Idle – 4.5 to 5.5 VAC ± .2
Run – 6.5 to 7.5 VAC ± .2

At the terminal where Wire 86, purple wire, is hooked to:

Start – 0 VDC ± .2
Idle – 12 to 14.5 VDC ± .2
Run – 12 to 14.5 VDC ± .2

9. *Control Box Adjustment*

If all the above aspects, in particular the linkage, have been verified and the warmed up engine either:

a. Hunts at running speed with the accessories off.

b. Responds very sluggishly to switch changes, an adjustment change in the control box may be necessary.

A slight adjustment of the sensitivity screw may be necessary to correct the conditions mentioned above. Turn the screw approximately 2° at a time and wait for 30 seconds to verify the change. Be careful. Only a slight change is necessary, and the "pot" can be broken if too much force is used.

If, for some reason, the sensitivity adjustment became grossly misadjusted, a good starting point can be obtained by rotating the pot fully counterclockwise and then back clockwise 45°.

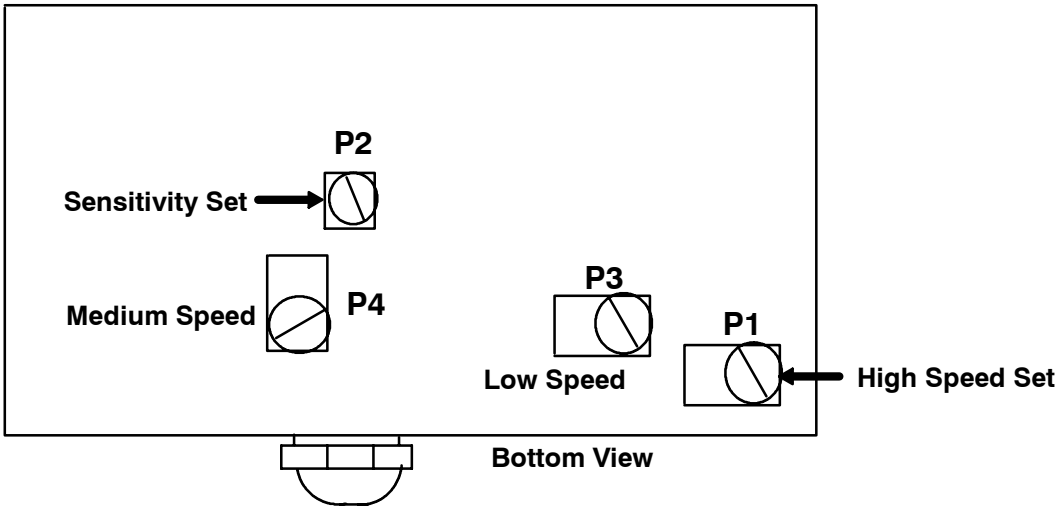
Check speeds: If incorrect, cut and remove the RTV seal on the back of the box. Refer to Fig. 3 for the location and function of the potentiometers.

Start with high – med – low.

After the speeds are reset, the sensitivity screw may have to be readjusted.

After the adjustments are made and verified, reassemble the back plate and reseat the plate with a bead of RTV to keep dust and moisture out of the box

Please note when you are testing if you should be in the DC or AC scale on your multimeter. You will also need your tach/dwell for the RPM checks.



GOVERNOR CONTROL BOX Fig. 3