# ONAN® MARQUIS GOVERNOR TROUBLESHOOTING GUIDE

*A Service of* **FLIGHT SYSTEMS**
207 Hempt Rd. Mechanicsburg PA 17050
*Complimentary Technical Support is available by appointment on our homepage at*
www.flightsystems.com

**NOTE:** ***For a $25 test fee, we can verify if Onan® Governor P/N 151-0752 is functional. If bad, our own USA-built replacement (2 year warranty) is available.***

## Purpose of the Governor

The purpose of a governor is to control the speed of the engine and maintain it at the proper RPM regardless of the load on the generator. This is 1800 RPM for a 60Hz output on a four-pole generator. Most small gensets use a mechanical governor to accomplish speed regulation. The flyweights on the crankshaft move in or out in response to changes in engine speed. This slight in or out motion is linked to the throttle by a system of levers, rods and springs. If the engine slows down slightly because the load on the generator was increased, the governor responds by opening the throttle the right amount to compensate for it. The mechanical system is not perfect because of friction, wear, and the fact that there must always be a small "error" signal to cause the throttle to move.

## Electronic Governor Features

The Onan Marquis series, Spec. B and later, uses a microprocessor-based electronic governor (P/N 151-0752) to control the speed of the engine. The electronic governor is more accurate than a mechanical governor and incorporates some additional protection features beyond just speed control. These features include:

- Speed regulation at 1800 RPM
- Checking continuity of oil pressure switch and wiring
- Shutdown on loss of oil pressure
- Shutdown on underspeed during cranking
- Shutdown on underspeed or overspeed during running
- Shutdown on loss of 12 volt power from control board
- Shutdown on loss of ignition/speed signal

Outputs of the module consist of an enable signal to the control board and a command signal to the throttle actuator. The governor module is powered by way of the fuse on the control board. The extra current required by the governor is why the control board (P/N 300-3764 or 300-4902) has a 10 amp fuse instead of a 5 amp fuse.

## Normal Sequence of Operation

The start sequence is initiated by pressing and holding the START switch. The control board then applies power to the governor (J6-A), ignition, fuel pump, fuel solenoid and start relay K1. During cranking, the governor senses engine speed by measuring the frequency of the ignition signal at the primary (-) of the ignition coil and checks the oil pressure switch S2 (J3-2) to make sure it is closed to ground (also, no broken wire). When the cranking speed threshold (2.2 Hz ignition frequency or 132 RPM) is reached, the command signal to the throttle actuator goes to full throttle. The governor will close the throttle if the cranking speed drops below 1 Hz or 60 RPM during cranking. When the engine starts and reaches the oil pressure threshold speed (18 Hz ignition frequency or 1080 RPM), which is 60% of rated RPM, the enable signal (J6-B) switches to ground, energizing the run relay K2 on the control board. This also terminates cranking and field flash. The START switch can now be released and the engine will continue running and the RPM should stabilize at 1800. The oil pressure switch S2 opens when the oil pressure builds to at least 6 PSI and must open within 6 seconds of the RPM reaching the oil pressure threshold of 1080 RPM. If not, the governor removes the enable signal at J6-B, dropping out K2 and shutting down the engine. If at any time later the oil pressure is lost for more than 6 seconds, the engine will shut down. After the engine is up to speed (1800 RPM) and the oil pressure is satisfied, the RPM is constantly monitored. If the RPM should drop below 1760 (29.3 Hz ignition frequency), which is 97.8% of rated RPM, for a period of 30 seconds or more, the governor will remove the enable signal at J6-B, dropping out K2 and shutting down the engine. If the RPM should go above the overspeed threshold of 2700 RPM for 2 seconds or more at startup or at any time later, the governor will remove the enable signal at J6-B, dropping out K2 and shutting down the engine.

## Troubleshooting Procedure

The following procedure assumes that the engine is in good running condition and seeks to troubleshoot specifically governor-related problems. Make sure that the air filter is clean and the electric choke is operating properly. A clogged air filter or a choke that is not opening will result in an excessively rich mixture, smoking and spark plug fouling. These conditions lead to hard starting and rough running. For general troubleshooting procedures, please refer to our "RV Generator Troubleshooting Guide." For carburetor adjustments and engine repair procedures, please refer to the Onan Service Manual for models BGM and NHM.

**IMPORTANT:** To protect any appliances or devices that may be connected to AC power, open the AC circuit breaker(s) that connect the generator to the load, as voltage and/or frequency may deviate significantly from normal during troubleshooting.

1. Remove cover(s) to gain access. Unplug the electronic governor's three connectors, J3, J5 and J6. Refer to the diagram showing the connectors that mate with the governor and the governor pin assignment chart.

2. Measure the resistance of the throttle actuator between pins 1 and 2 on its plug (mates with J5). This resistance should be 6.3 to 6.5 ohms, slightly higher when hot. A significantly lower reading indicates a defective throttle actuator (P/N 151-0701). A significantly higher reading is likely due to a bad connection or wiring damage. Make sure the throttle rod moves freely without binding and that the return spring is able to close the throttle. Ground pin 2 and momentarily apply 12 volts to pin 1 of the actuator plug. The actuator should pull the throttle wide open easily with no difficulty and allow it to close when the voltage is removed.

3. Measure the resistance between pin C and ground of the triangular connector that mates with J6. This is the governor's ground connection and should be close to zero ohms.

4. Measure the resistance between pin 2 and ground of the connector that mates with J3. This checks the resistance of the oil pressure switch (closed with no pressure) and wiring and should be close to zero ohms.

5. Measure the DC voltage between pin 1 and ground of the connector that mates with J3. Press the START switch momentarily and observe that the voltage jumps up to nearly 12 volts. This checks the continuity of the speed sensing circuit.

6. Measure the DC voltage between pin A and ground of the connector that mates with J6. Press the START switch momentarily and observe that the voltage jumps up to nearly 12 volts. This checks the continuity of the governor's power circuit.

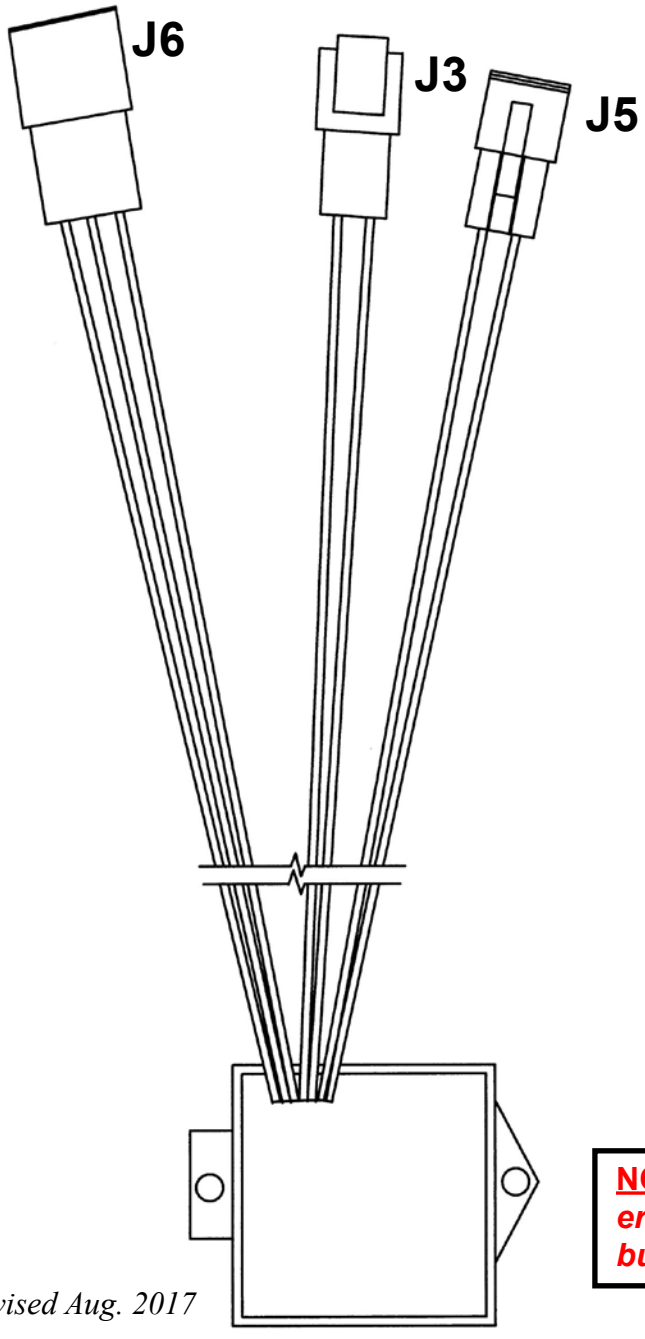
7. Measure the DC voltage between pin B and ground of the connector that mates with J6. Press the START switch momentarily and observe that the voltage jumps up to nearly 12 volts. This checks the continuity of the governor's enable circuit.

8. This next step requires three hands but is a way to briefly run the engine without the governor and perform some further checks. It might be helpful to have an assistant. Temporarily connect a switch or a pair of wires between pin B of the connector that mates with J6, and ground. This connection will simulate the enable signal to the control board normally supplied by the governor. You will need to close it manually after the engine starts to energize the run relay and terminate cranking and field flash. Be careful not to short to pin A as this may blow the control board fuse. Press and hold the START switch until the engine starts and then close the temporary "enable" switch (or connect the wires together). At the same time, you will have to feed fuel by manually pulling on the throttle linkage that connects the throttle actuator to the carburetor. The engine should continue to run as long as you can regulate the speed manually and not let it stall. Now, with your third hand (or assistant), measure the resistance between pin 2 and ground of the connector that mates with J3. It should now read infinity or open circuit since the oil pressure switch should now be open. If not, the oil pressure switch is stuck closed or the wire is shorted to ground. If desired, the ignition frequency may be measured between pin 1 and ground of the connector that mates with J3. It should be 30 Hz at 1800 RPM. However, it will be very difficult to hold the engine speed exactly constant by manipulating the throttle by hand.

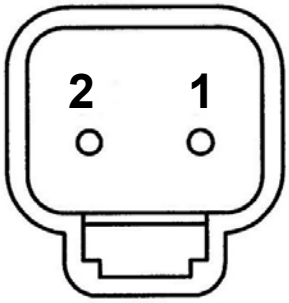
9. If the engine runs satisfactorily in the above test, it should run normally with a known good governor module connected. If the engine runs satisfactorily in the above test but does not run with the governor module that you have, the module is likely defective. IMPORTANT: Failure to maintain a constant speed, such as "hunting" or "surging", particularly at light load, can be caused by fuel or carburetor problems even with a perfectly good governor module.

| GOVERNOR | TO/FROM | FUNCTION |
|---|---|---|
| J3-1 | IGNITION COIL (-) | ENGINE SPEED SENSING |
| J3-2 | OIL PRESSURE SWITCH | OIL PRESSURE SENSING |
| J5-1 | THROTTLE ACTUATOR (+) | THROTTLE ACTUATOR POWER |
| J5-2 | THROTTLE ACTUATOR (-) | THROTTLE COMMAND SIGNAL |
| J6-A | CONTROL BOARD P1-6 | GOVERNOR 12V POWER |
| J6-B | CONTROL BOARD P1-5 | RUN ENABLE SIGNAL |
| J6-C | CONTROL BOARD P1-1 VIA TB1-LO | GROUND |

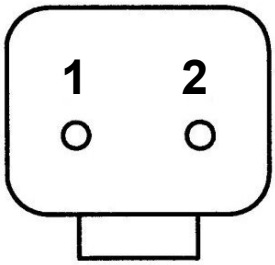
## GOVERNOR HARNESS CONNECTIONS



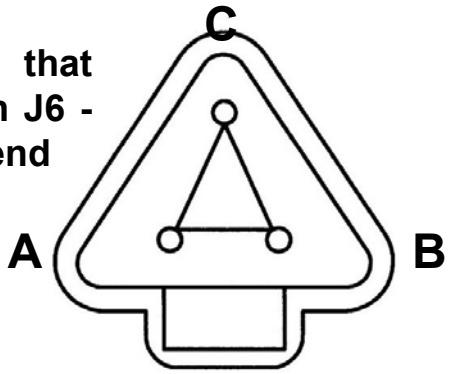

**Connector that mates with J3 - Mating end**




**Connector that mates with J5 - Mating end**




**Connector that mates with J6 - Mating end**

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*Revised Aug. 2017*