

# GENERAC STEPPER MOTOR ELECTRONIC GOVERNOR

## Introduction

The Generac Stepper Motor Electronic Governor system is used on some small diesel and gas engines with 12 volt DC electrical systems. The governor system consists of a governor module mounted inside the generator control panel, a stepper motor mounted near the injection pump or carburetor, and interconnecting wires and connection boxes. (See Figure 1)

## Operational Analysis

During the engine start-up and run, a +12 volt DC is applied to the control module via the red (+ positive) and black (- negative) wires. The voltage from the main engine control latch/crank PCB wire #14 (run circuit) powers up the control module for governor system operation. The control module receives a speed "sensing" signal from AC output frequency via the two (2) blue wires.

The control module sends variable signals to the stepper motor via the orange, yellow, brown and black wires to position the stepper motor and throttle linkage to obtain a steady 50 or 60 Hz. (selectable on the control module frequency switch)

## Set-up and Adjustment Procedure

### (Stepper Motor/Throttle Linkage - Gas & Diesel)

Determine which direction the stepper motor must rotate to open the throttle to "full fuel". Adjust the rod length so when the throttle is wide open, the stepper motor is at it's full rotation, then tighten the jam nuts. Ensure linkage moves freely and does not bind in any way.

## Control Module Pots and Switches

the following is description of the adjustment procedure for the new electronic governor control module and stepper motor. (See Figure 1)

### POT SETTINGS:

Set GAIN, DROOP, and STABILITY pots to midpoint.

### SWITCH SETTINGS:

Set frequency switch to either 50 or 60 Hz.

\* Frequency switch set to "OFF" = 60 Hz.

\* Frequency switch set to "ON" = 50 Hz.

### SET DIRECTION SWITCH:

Determine which direction the stepper motor lever needs to be set to open the throttle. Some units are set to open at the clockwise position, and some are set to open at the counterclockwise position.

If the lever is set to open at the counterclockwise position, then the direction switch should be set in the "OFF" position. If the lever is set to open at the clockwise position, the direction switch should be set to the "ON" position.

When the switches and pots are set correctly, start the engine. Adjust the gain pot if necessary to stabilize engine speed.

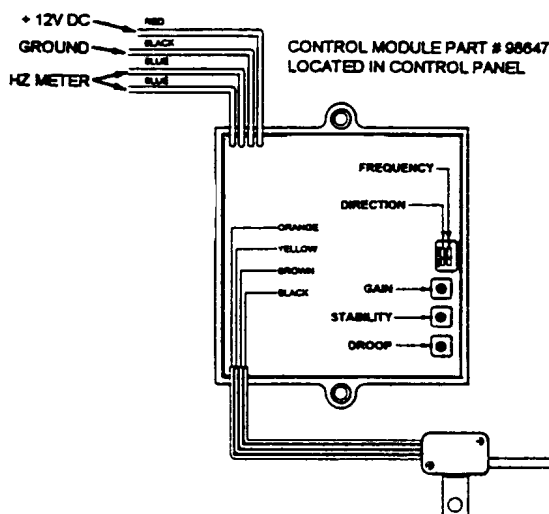
\* Apply load to system-25-50% is best. If system is unstable, reduce gain until it stabilizes.

\* Adjust droop pot so that the engine speed recovers to the pre-selected speed. (50 or 60 Hz based on unit).

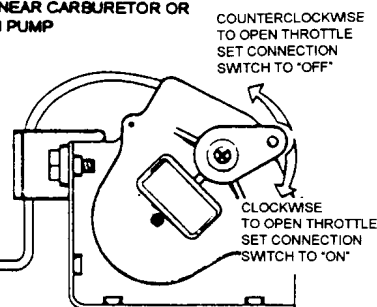
\* Observe performance of system when loads are applied and removed.

\* Increasing stability will decrease recovery time, but may result in damped oscillations (decreasing hertz around preset speed). Decreasing stability will soften the recovery and reduce the transient hertz.

Figure 1. Stepper Motor and Control Module



STEPPER MOTOR PART #98290  
LOCATED NEAR CARBURETOR OR  
INJECTION PUMP



Frequency and direction switches are integrated only at engine start. Changing switch settings while engine is running will have no effect until the engine is stopped and restarted.

# TROUBLESHOOTING

## Troubleshooting Stepper Motor Governor System

Troubleshooting the stepper motor governor system is generally limited to checking inputs to the control module, adjustments, settings, electrical connections, and testing the stepper motor windings.

**NOTE:** A fuel supply problem can sometimes be mistaken for a speed control problem. Verify whether a problem is fuel related before attempting to readjust the governor pot / switch settings.

The following is a list of possible problems and tests to perform, followed by descriptions of the tests.

**PROBLEM:** "Overspeeding"

**TEST PROCEDURES:** Check the Hz switch setting, TEST #1, TEST #2, TEST #3, TEST #4.

**PROBLEM:** "Instability, erratic operation"

**TEST PROCEDURES:** Adjust linkage and check for binding, adjust control module pots, TEST #3, TEST #4.

**PROBLEM:** "Low speed, no fuel"

**TEST PROCEDURES:** TEST #1, TEST #2, TEST #3, TEST #4, check position of the Hz switch.

### Test #1

#### (Check DC Voltage Supply to Control Module)

If the control module loses its 12 volt input, it will no longer be able to control or move the stepper motor. If this happens while the unit is under a load, an "overspeed" condition could occur as soon as the load is removed. The stepper motor could remain in a position supplying too much fuel for the "no load" condition.

### Test #2

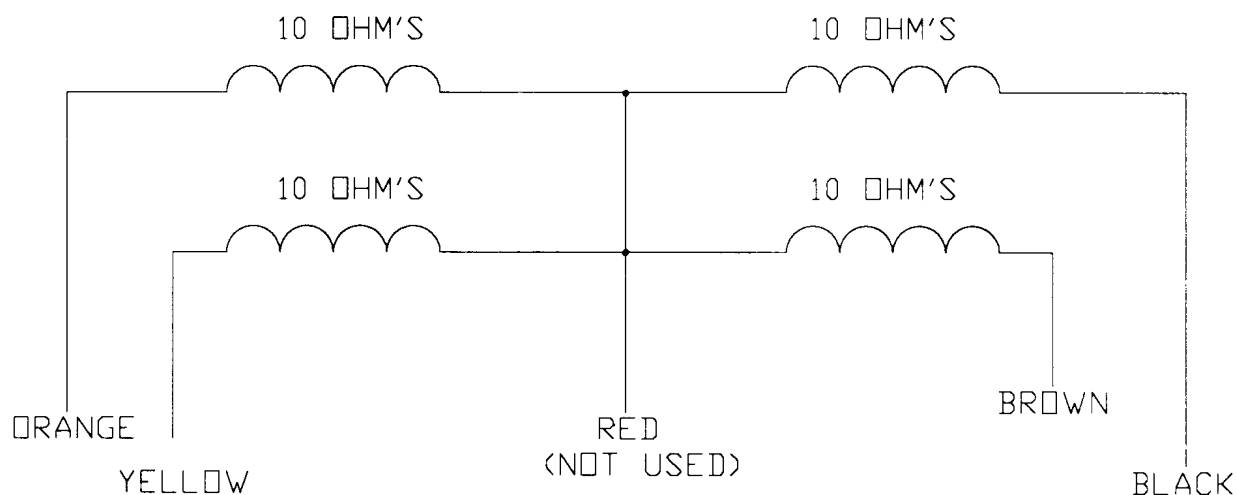
#### (Check AC Frequency Input to Control Module)

Similar to the control module losing its DC input, the control module will no longer be able to control the stepper motor if the Hz sensing input is lost. The stepper motor's inability to move or react properly could result in an "overspeed" condition.

To check Hz sensing input, run unit while manually controlling speed at a safe level. Ensure that the unit is providing AC output and that the hertz meter is indicating properly (the Hz meter is the connection point for the control module sensing leads).

Check the condition of the wires and connections on "blue" sensing leads between the Hz meter and the control module.

Figure 2. Schematic and Resistance Values



\*Measure resistance across any combination of orange, yellow, brown, or black should read approximately 20 OHMS.

\*Measure from red to any other lead should read 10 OHMS.

\*Testing from any lead to stepper motor case should read "infinity".

## TROUBLESHOOTING (continued)

### **Test #3**

#### ***(Check connections between Control Module and Stepper Motor)***

There are two "Plug-In" connectors housed inside the connection boxes in the harness between the control module and the stepper motor. Remove the covers from the boxes and carefully inspect the connections.

### **Test #4**

#### ***(Test Stepper Motor)***

A defective stepper motor can cause overspeed, low speed, or no-start, hard start or erratic operation.

**NOTE:** *It is difficult to perform an operational test on the Stepper Motor since the control voltages vary, and motor rotational movement is so small.*

If a defective stepper motor is suspected, the windings can be tested for resistance, open circuits, and shorts to the case. (See Figure 2) for schematic and resistance values. Any other readings other than those which are indicated, including continuity to case, indicates a faulty stepper motor.

### **Control Module**

If problems still persist after all the previous tests and adjustments have been completed, it is recommended to then replace the Control Module and adjust as necessary.