

## Installation Instructions for Governor Output Module (Kit 541–1231)

This instruction sheet describes the installation of a governor output module on generator sets with a 1301 series control.

The following parts are included in this kit.

| Description             | Qty |
|-------------------------|-----|
| Electronic Governor PCB | 1   |
| Harness                 | 1   |

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

**⚠ WARNING** *Incorrect installation, service, or replacement of parts can result in severe personal injury or death and/or equipment damage. Only trained and experienced personnel are to perform the following procedures.*

**⚠ CAUTION** *A generator set control must be serviced only by technically qualified personnel. High voltages are present. These voltages can cause electrical shock, resulting in personal injury.*

*Even with power removed, improper handling of components can cause electrostatic discharge and damage to circuit components.*

**⚠ WARNING** *AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Incorrect installation, service, or parts replacement can result in severe personal injury, death, and/or equipment damage.*

Turn off or remove AC power from the battery charger and then remove the negative (–) battery cable from the set starting battery. This is to make sure the set will not start while working on it and to avoid circuit board damage, caused by voltage spikes when removing and replacing circuit board connectors.

**⚠ CAUTION** *If present, always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.*

**⚠ WARNING** *Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative [–] first).*

*Make certain the battery area has been well-ventilated before servicing the battery—Wear goggles—Stop the genset and disconnect the charger before disconnecting battery cables. Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur when a cable is removed or re-attached, or when the negative (–) battery cable is connected and a tool used to connect or disconnect the positive (+) battery cable touches the frame or other grounded metal part of the generator set. Always remove the negative (–) cable first, and reconnect it last. Make certain hydrogen from the battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if the battery has been connected to a battery charger.*

**⚠ WARNING** *Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near a battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.*

## INTRODUCTION

When this kit is installed on a genset with a 1301 series control, the control provides electronic governing capability. With the 1301 control, you can enable or disable the electronic governing feature. Isochronous speed governing is supported.

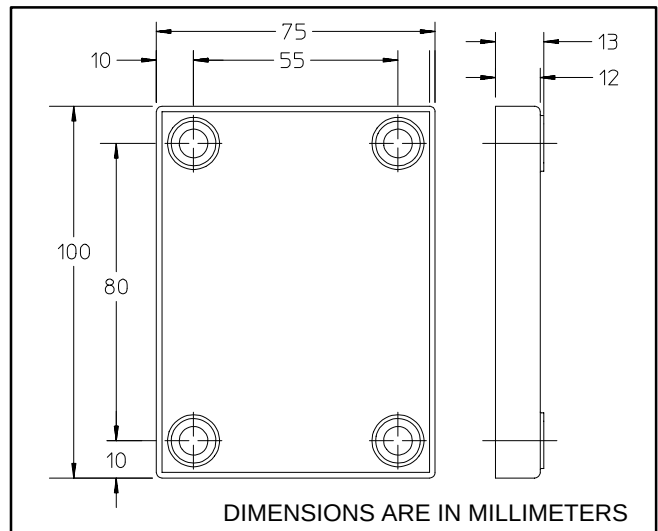
With governor output module installations,

- The maximum allowed rated current for the actuator drive for the governor power stage is 6.0 amps continuous max; 10 amps for one second
- The governing system is suitable for use with gensets using Cummins EFC normally closed actuators, Woodward, Ford Gas, or Barber-Coleman actuators with similar drive characteristics.
- It provides speed governor set-points of 1500 RPM and 1800 RPM. The governor set-point (50 or 60 Hz) can be adjusted.
- The optional display panel allows the operator to adjust frequency within plus or minus 5% of rated speed.
- The controller provides ramping at Startup and it has the ability to program the cranking fueling before the governor algorithm is enabled.
- Power module output from the 1301 series control board is connected as input to the Governor Power Module by a minimum 0.8 sq. mm (18 gage), 2 conductors, twisted shielded cable.

## KIT INSTALLATION

The electronic fuel actuator is driven by the output of the Governor Output Module.

1. Make sure the generator set is shut down and disabled:
  - a. The generator set Run/Off/Auto switch is in the Off position and the generator is cool (to the touch).
  - b. The battery charger (if equipped) is turned off and disconnected.
  - c. The negative (–) cable from the battery is disconnected to prevent accidental starting.
2. Select a location for mounting the Governor Output Module near the 1301 control board.
3. Mount the Governor Output Module using M4 hardware. Figure 1 shows the control board dimensions. The outside dimensions do not include necessary clearance for wire connections.



**FIGURE 1. GOVERNOR OUTPUT MODULE FOOTPRINT**

4. Connect the governor harness wires (see Table 1).

**NOTE:** Depending on whether or not your installation includes the fuel shutoff feature, refer to Figure 4 or 5 for wiring information.

5. Plug the harness P1 connector into the J1 connector on the governor module (see Figure 2).

6. Reconnect the generator starting battery negative (–) cable.

7. Connect the battery charger (If equipped).

8. Press any button on the control panel to “wake up” the control.

**NOTE:** The information on the following pages only applies to adjusting settings associated with the installation of a Governor Output Module. If settings located on other menus need to be adjusted, refer to the 1301 Series Control Operator/Installation Manual (900–0660) for more information.

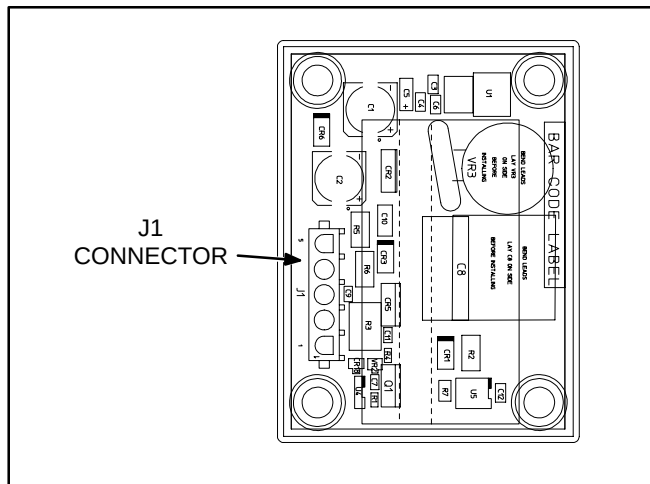


FIGURE 2. GOVERNOR MODULE DETAILS

TABLE 1. GOVERNOR MODULE CONNECTIONS

| Connector Pin | Signal Name   | Wire Color    | Comments                       |
|---------------|---------------|---------------|--------------------------------|
| P1-1          | Gov Drive –   | Orange/Yellow | 1301 PCB J11-7                 |
| P1-2          | Gov Drive +   | Orange        | 1301 PCB J11-4                 |
| P1-3          | B+            | Red           | Battery + (battery supply)     |
| P1-4          | Fuel Actuator | White         | Low side of governor actuator  |
| P1-5          | B+ Return     | Black         | Ground (battery supply return) |

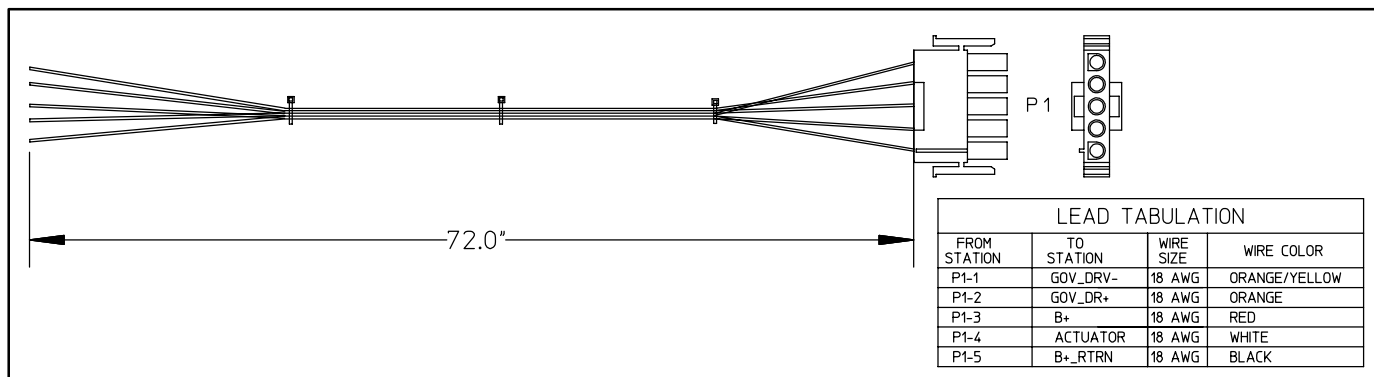
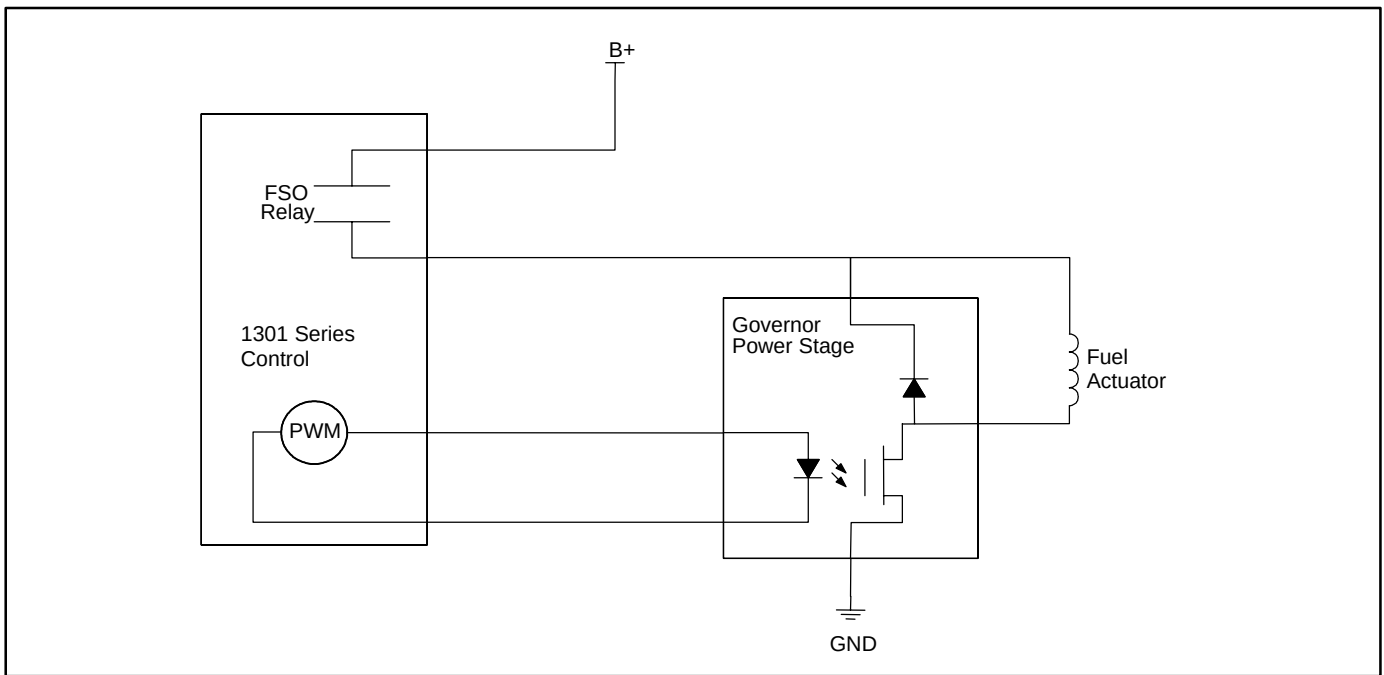
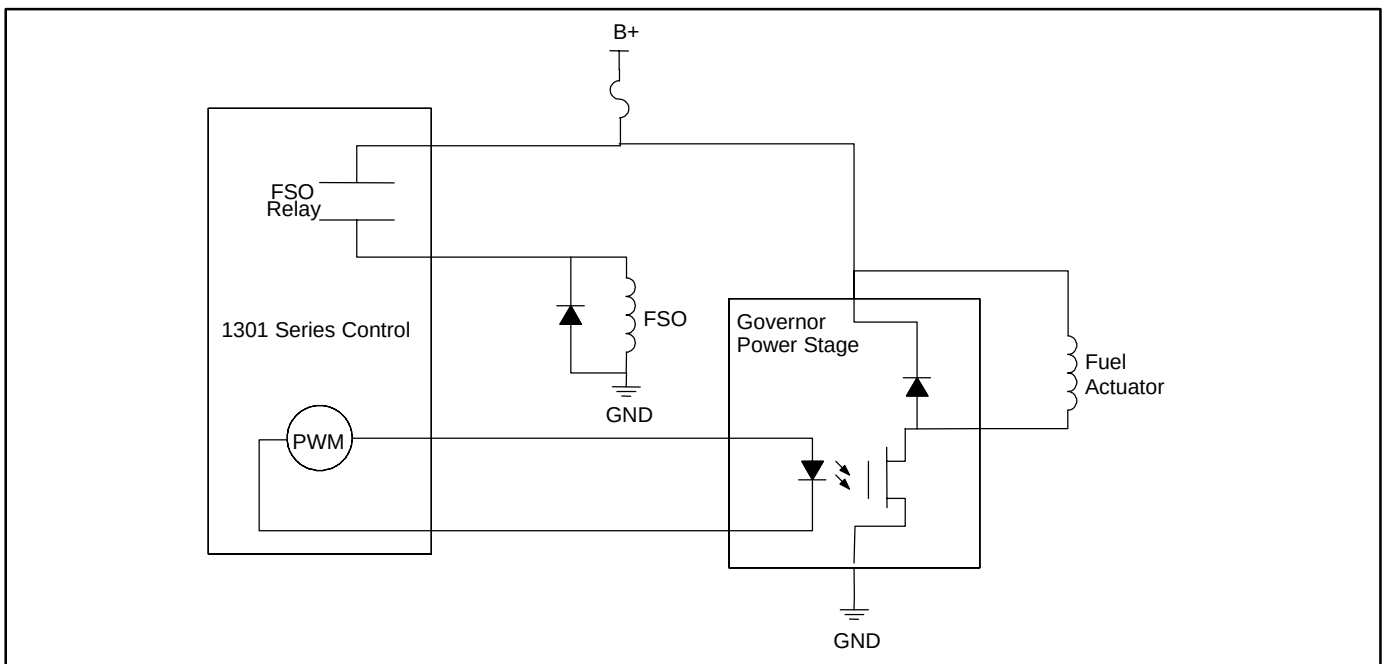


FIGURE 3. GOVERNOR HARNESS



**FIGURE 4. CONNECTIONS FOR APPLICATIONS WITHOUT FUEL SHUTOFF (FSO)**



**FIGURE 5. CONNECTIONS FOR APPLICATIONS WITH FUEL SHUTOFF (FSO)**

9. Access the control panel Service menus and enable the Governor Output Module (see Figure 6).
  - a. From any of the Operator menus, simultaneously press the ▲ and ▼ selection buttons for two seconds.
  - b. Select item 1, "Setup Menu".
  - c. Enter the Setup password: 574.
  - d. Select item 1, "Genset Service".
  - e. Select item 1, "Genset".
  - f. Press the "down" arrow key to scroll to the Elect. Governor menu.
  - g. If "Gov. Enable" is set to "No," press the "Adjust" button and change the setting to "Yes."
  - h. Press the **SAVE** button to save your settings.

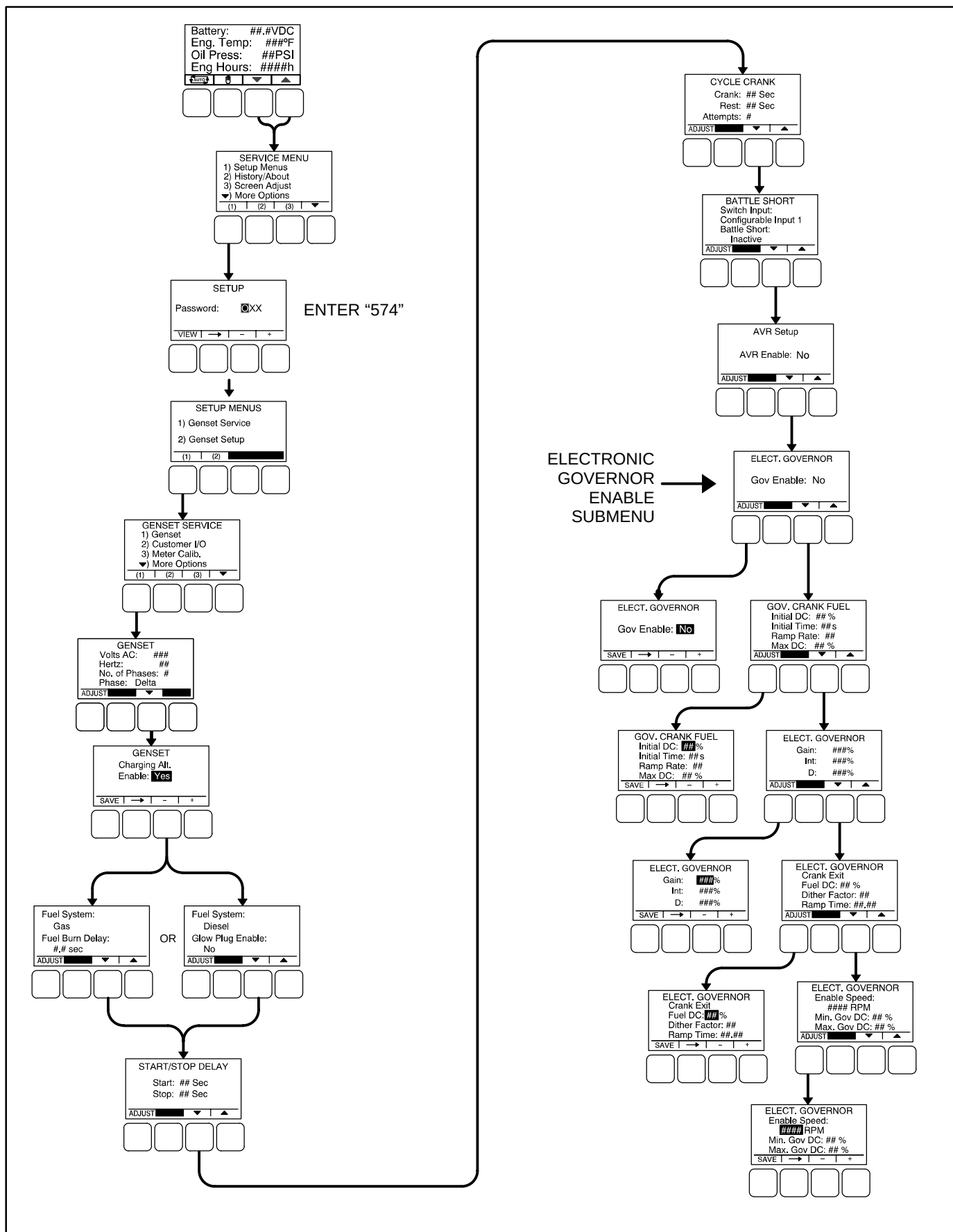


FIGURE 6. ELECTRONIC GOVERNOR MENUS

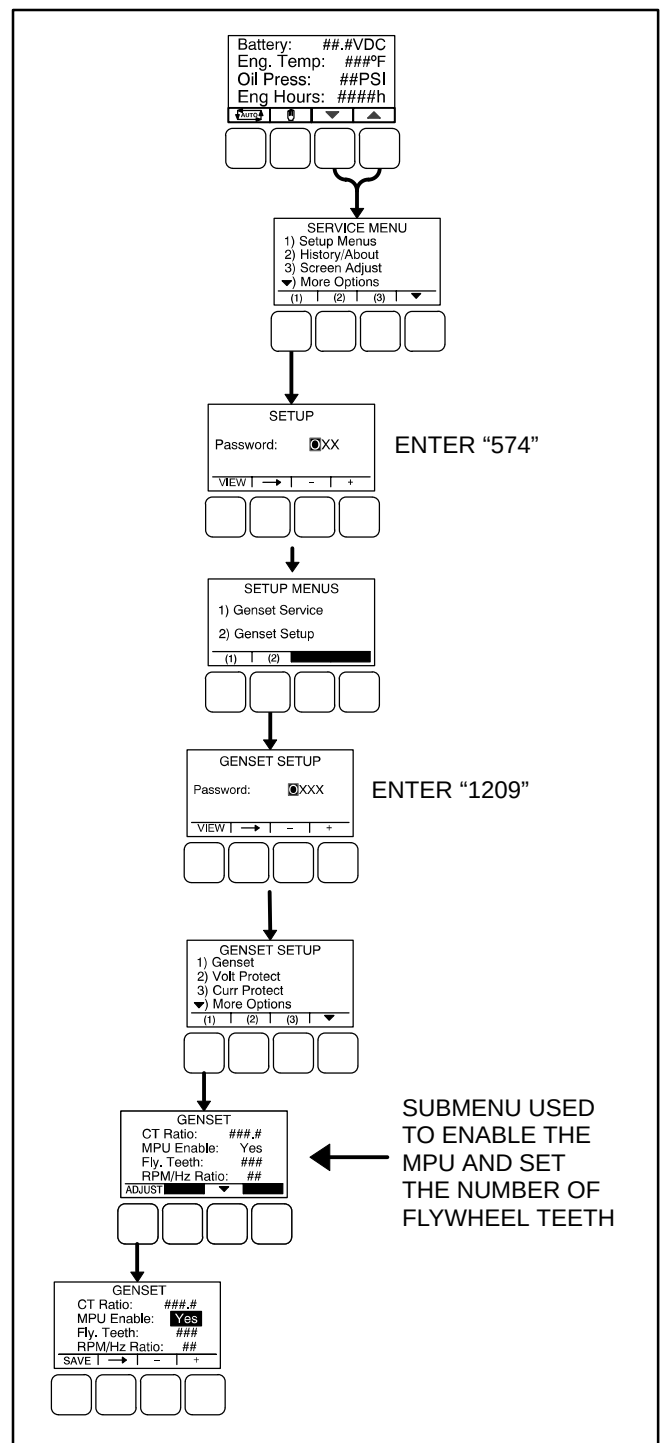
10. Review the electronic governor submenus and adjust the settings as necessary (see “Electronic Governor Submenus” on page 7. With each menu that you change any of the settings, press the **SAVE** button to save your settings.
11. Return to the Setup Menus menu.
12. For electronically governed gensets, the 1301 series control requires an engine speed input from a magnetic pickup (MPU) speed sensor. The magnetic pickup signal needs to be calibrated for the correct number of engine flywheel teeth.

Navigate to the appropriate Genset Setup submenu and verify that the MPU is enabled and that the flywheel teeth setting is correct for your engine (see Figure 7).

- a. From the Setup Menus menu, select item 2, “Genset Setup.”
- b. Enter the Genset Setup password: 1209.
- c. Select item 1, “Genset”.
- d. Make sure that the MPU is enabled and that the correct number of flywheel teeth is entered. Table 3-1 lists the number of flywheel teeth for some common engine types.
- e. Press the **SAVE** button to save your settings.

**TABLE 3-1. ENGINE FLYWHEEL TEETH**

| Engine Type                    | Number of Flywheel Teeth |
|--------------------------------|--------------------------|
| Cummins 4B and 6B              | 159                      |
| Cummins 4C                     | 138                      |
| Ford 4 Cycle Gas               | 104                      |
| Kubota Engines                 | 105                      |
| Cummins L10 and NT855          | 118                      |
| Komatsu 3.3 Litre              | 110                      |
| Cummins V28, K19, K38, and K50 | 142                      |
| Ford V6 and V10 Gas            | 133                      |



**FIGURE 7. GENSET SETUP MENU**

## ELECTRONIC GOVERNOR SUBMENUS

The Electronic Governor submenus are available only if the governor is enabled.

Four Electronic Governor submenus (see Figure 6) can be used to adjust governor settings.

### **Governor Crank Fuel Menu**

The Governor Crank Fuel menu allows for setting the Initial Crank Fuel Duty Cycle, the Initial Crank Fueling Period, the Crank Fuel Ramp Rate, and the Maximum Crank Fuel Duty Cycle.

- **Initial DC:** The Initial Crank Fuel Duty Cycle is the initial value assigned to the Governor Duty Cycle parameter when cranking begins. This value can be set from 0 to 50 percent (default = 25%).
- **Initial Time:** The Initial Crank Fueling Period is the amount of time for which the value of Initial Crank Fuel Duty Cycle is assigned to the governor duty cycle after cranking begins. This value can be set from 0 to 10 seconds (default = 2 seconds).
- **Ramp Rate:** The Crank Fuel Ramp Rate is the rate at which the value of the Governor Duty Cycle is ramped up by during the Crank State, after expiration of the Initial Crank Fueling Period. This value can be set from 5 to 100 (default = 25).
- **Max DC:** The Maximum Crank Fuel Duty Cycle is the maximum level to which the Governor Duty Cycle should be limited to during a crank state. This value can be set from 50 to 100% (default = 100%).

### **Electronic Governor Regulator Menu**

The Electronic Governor Regulator menu allows for setting proportional Gain, Integral Gain, and Damping values.

- **Gain:** The proportional governor gain (K1) multiplier can be set from 5 to 1000% (default = 100%). This allows for a scale factor of 0.05 to 10.0.
- **Int:** The integral governor gain (K2) multiplier can be set from 5 to 1000% (default = 100%).
- **D:** The governor Damping adjustment can be set from 95 to 105% (default = 100%).

### **Electronic Governor Menu**

The Electronic Governor menu allows for setting Crank Exit Fuel DC, Dither Factor, and Damping values. This menu is displayed only if the governor has been enabled with the Engine Electronic Governor Enable menu.

- **Crank Exit Fuel DC:** The Crank Exit Fuel Duty Cycle is the value at which the governor duty cycle is held after disengaging the starter until the governor is enabled. This value can be set from 0 to 100% (default = 25%).
- **Dither Factor:** Dither is a signal that is superimposed on the PWM (pulse with modulation) duty cycle to prevent the actuator valve from sticking. The Dither Factor is the dither percent added to the current duty cycle. The Dither Factor can be set from 0 to 30% (default = 15%). The dither function is disabled when the dither factor is set to 0%.
- **Ramp Time:** This feature is used to set the minimum governor speed reference ramp rate. The governor Ramp Time can be set from 0.00 to 30.0 seconds, in 0.01 second increments (default = 0.25 seconds).

### **Electronic Governor Enable Speed Menu**

These menus allow for setting the minimum and maximum governor duty cycle.

- **Min. Gov DC:** The Minimum Governor Duty Cycle can be set from 0 to 100% (default = 5%).
- **Max. Gov DC:** The Maximum Governor Duty Cycle (with dithered value) can be set from 0 to 100% (default = 95%).