## TROUBLE SHOOTING

If the governor does not operate, measuring, in sequence, voltage between the various speed control unit terminals and ground (Terminals F, G, H and T are ground) will indicate the possible fault. Should all 5 voltage tests indicate normal values, the defect must be in the actuator or in the wiring to the actuator. (See Section on Defective Actuators on page 2).

| TERMINALS | NORMAL VALUE | PROBABLE CAUSE OF NON-NORMAL READING |
|---|---|---|
| S | 1.0 VAC - RMS minimum while cranking. | 1. Defective magnetic speed sensor.<br>2. Gap too large between speed sensor and gear teeth.<br>3. Improper or defective wiring to the speed sensor. |
| K | 10.1 ± 0.20 VDC while energized (Internal regulated DC supply) | 1. DC power not connected or low battery voltage.<br>2. Speed trim control shorted, ground or miswired.<br>3. Wiring error.<br>4. Defective speed control unit. |
| L | Above 5.1 VDC while cranking. (Inverse speed error signal.)<br>Above 5.1 volts is under speed signal. Below 5.1 volts is over speed signal.<br>On speed will indicate a steady 5.1 volts. | 1. Frequency adjust set too low. Turn CW.<br>2. Defective speed control unit. |
| N | 8.5 to 9.5 VDC while cranking. (Proportional actuator voltage.) | 1. Defective speed control unit.<br>2. Battery voltage may be too low while cranking. |
| B | 2.5 VDC maximum while cranking. (Transistor voltage.) | 1. Output transistor open (defective speed control unit).<br>2. Defective actuator (see page 2).<br>3. Error in wiring to actuator. |

## OTHER TROUBLE SHOOTING TESTS

| SYMPTOM | TEST | PROBABLE TROUBLE |
|---|---|---|
| Engine overspeeds | Determine voltage on terminal "L". Should be less than 5.1 VDC. | 1. Frequency set too high. Turn frequency adjust CCW.<br>2. Defective speed control unit. |
| Engine overspeeds | Measure the voltage across the insulated nut located on the side of the control unit. Should be more than 2.5 VDC. | 1. Output transistor shorted. (Defective speed control unit.)<br>2. Wiring to actuator incorrect. |
| Throttle does not move | Measure battery voltage at the battery while cranking. Must be 8.0 VDC minimum. | 1. Insufficient battery voltage. Put a momentary connection from terminal "B" on the control unit to negative ground while cranking (Terminal "G" is ground).<br>2. Replace with battery of higher amp hour rating. |
| Throttle does not move | Ground the insulated nut located on the side of the speed control unit, except on CU 673C-10 speed control units. Throttle should move to full open position. | 1. Wiring to actuator or battery incorrect.<br>2. Actuator or linkage bound.<br>3. Defective actuator. (See page 2.) |

# ERRATIC OR UNSTABLE GOVERNING

A. INSUFFICIENT MAGNETIC PICKUP SIGNAL

Although the speed control unit will govern well on. 0.5 volts RMS signal if it is a clean sine wave, a signal from the magnetic speed sensor of 3 volts RMS at full speed will eliminate any possibility of missed or extra pulses. This signal is mesured at terminals "S" and "T".

B. ELECTRICAL NOISE OR UNWANTED DROOP

If noisy electrical devices are present, such as magnetos, solid state ignition systems battery chargers or regulators which emit radio frequency interference (RFI), then unstable governing or droop may be noticed. The speed control unit has internal filters which provide some protection from radio frequency interference. Excessive levels of RFI must be treated separately. A metal shield placed around the emitting source will help. Placing the governor harness and speed control unit as far away as possible from the emitting source will help. Always twist the leads from the magnetic speed sensor all the way back to the speed control unit. Shield the speed sensor leads with the shielding connected to terminal "T" of the speed control unit **only**. Raise the magnetic speed sensor voltage by reducing the gap between the speed sensor and the ring gear. A gap of 0.030" will provide a strong signal. If noise is still present, a capacitor (1,000 mfd, 12 - 20 volts) may be connected across the speed trim control, terminal K + to terminal F −. This will reduce external interference coming from the power supply. When extreme RFI is encountered, it may be necessary to shield all the leads to the speed control unit. The shield should be grounded at terminal "G" of the speed control unit.

C. DEFECTIVE ACTUATOR

Should the coils of the actuator become open or shorted, replace the actuator. If the coils are not open or shorted, the wiring or connectors are defective.

D. LOW SPEED SURGING OR PERIODIC INSTABILITY

Each engine has certain response characteristics to which the governor must be adjusted to match. The increase or decrease of speed, as load on the engine changes, can be reduced to a minimum by proper adjustment of the gain control. Turning the gain control CW will shorten the amount of speed change. Too much gain adjustment will result in rapid throttle movement, which is instability. The amount of time which the engine needs to completely regain the set speed, after a load change, can be reduced to a minimum by turning the stability control CW. Excess CW adjustment will cause instability, usually in the form of a low frequency surge.

The governor system can be properly adjusted by the following procedure. Under no load conditions, turn the gain control CW until instability occurs. Then back off (CCW) until stability is restored. Next, turn the stability control CW until instability occure. Then back off (CCW) until stability is restored. Once more, adjust the gain control as above. Apply various loads up to full load to insure that stability is fixed at all loads. If not, reset the gain and stability adjustments, as above, under whatever load condition indicates some instability.

If the gain control is nearly full CCW or the engine is unstable at any position of the gain and stability control, proceed as follows:

Note the frequency of instability. In the instance of slow speed surging of about 1-3 oscillations per second, modifying the speed control for added dead time compensation (derivitive) will improve performance and stabilize the system. Connect a jumper from terminals "M" to "H" (if serial number is less than 2R 6239, an external capacitor is requied--see Service Letter EG-3 for details). Readjust the gain and stability as mentioned above. Some improvement must be noticed or the cause of instability lies elsewhere.

If the frequency of instability is very fast, such as 8-10 oscillations per second, then the dead time compensation can be reduced. Jumper "M" to "N". Readjust the gain and stability as above.

If the governor system allows for stable operation but speed overshoot is experienced because the gain control is almost fully CCW, a modification can be made to extend the gain control setting. Apply a 6.8K ohm resistor from terminal "L" to terminal "P". This will center the gain adjustment and improve its stability.

Another cause of instability is in the linkage arrangement. Any binding or high friction loads can cause instability. Use uniball joints on each end of the linkage rod. A maximum of 10 degrees misalignment of the linkage rod can be tolerated. The useful actuator movement must be in excess of 8° and less than 12°. Calculate the ratio of throttle motion to actuator motion and design the rod length and position on the throttle arm and actuator arm accordingly. The rod length should be such that the actuator is slightly off the stop when the throttle lever is in full shutoff position. Similarly, the rod length should be such that the actuator is slightly off the full travel stop when the throttle lever is in full fuel position. Before starting, make sure the linkage is free of any obstruction or binding. Manually push the actuator arm to full fuel position and release it. It must spring instantly to the shutoff position.

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