EG-3000

Governor Controller

Operation Manual

Smoke Limiting Governor Controller with Idle Speed Control suitable for All Type of Injection Pumps including PT Pumps, Built-in and Non Built in injection Pumps and electric over Oil Pressure Systems

1. SPECIFICATIONS

1.1 Electronic Specifications

Operating Voltage

12 or 24 VDC ±20%

Output Current

0.5 ~ 15 A

Run Speed Adjustment range

Speed adjustment Potentiometer (30 turn)

4 Segment Dip Switch Adjustable From 600 ~ 9500 Hz.

Idle Speed Adjustment Range

Run Speed 30 ~ 85%

Ramp Time

3 ~ 20 Sec

Remote Speed Pot

Ext. Remote speed pot terminal 6, 7, 8 (ILS) and 6, 7, 9 connect a 5KΩ potentiometer ±5% adjustment range.

Temp. Stability

<0.01%

Run Speed Stability

± 0.25 % at steady state

MPU input signal

1 ~ 120VAC RMS

Droop

4%

Adjustment

Run Speed, Idle Speed, Ramp Time,

Droop, Gain, Integration, DIF

Mechanical Vibration

1G @ 18 ~ 30 Hz, 2.5G @ 48 ~ 70 Hz

Relative Humidity

< 95%

Operating Temperature

-40 ~ 85℃

Storage Temperature

-40 ~ 85℃

Dimensions

147mm L * 114mm W * 50mm H

Weight

690g ± 2%

2 Function Descriptions

The EG3000 provides both an adjustable Idle Speed and ramp, for controlling engine smoke, vibration and warm-up.

With the correct DIP SW setting, the governor will achieve stable operation for external, built-in and PT pump type actuators.

2.1 Controller

Together, the EG3000 Controller, Actuator and MPU (Magnetic Pickup) form the electronic engine governor assembly.

The EG3000 receives the signal from the MPU and, depending on the engine RPM, the actuator controls the fuel intake on the engine.

The EG3000 receives its power from the engine batteries or an AC to DC power supply rated from 12 or 24 VDC ±20% matching the Actuator voltage. The average operating current is around 2.5 to 3.5 amps, but it may reach 15 Amps during engine start or sudden load changes.

2.2 Installation Descriptions

1. Protect the EG3000 by installing it inside the engine instrument control panel.
2. Mount the Actuator close to the engine fuel system. See actuator manufacture instructions.
3. Always choose a point on the actuator control arm in which it can rotate freely, providing minimum and maximum fuel (But do not bottom out the actuator; leave 2 to 3 degrees before the off and on position).
4. Use a Non-Linear link on Gas engines to get low Gain at light loads and high Gain at heavy loads and a linear link on diesel ejection pumps.

5. Mount the magnetic pickup on the flywheel bell housing to count the teeth on the ring gear. The teeth are converted to an electrical pulse by the MPU. These pulses are cross referenced with the original setting on the EG3000. Any difference is used by the actuator to change engine RPM to maintain the same pulse count.

3. CONNECTION

1, 2	DC Power Input
2, 3	IDLE Terminal
4, 5	For ACT, Max @ 15A
6, 7, 8	Remote speed control. Connect 5KΩ potentiometer approx. ±5% adjustment range.
6, 7, 9	
10, 11	MPU input, Ground Terminal No. 10

1. Terminal 1 & 2 used for DC power input. Terminal 1 for Positive (+) and Terminal 2 for Negative (–) input -Voltage can be 12/24VDC ±20%.
2. Terminal 2 & 3 are the IDLE SW. Terminal when 2 & 3 open normal Run Speed, When Terminal 2 & 3 shorted engine in Idle.
3. Terminal 4 & 5 is the output terminal for the actuator, providing a maximum of 15A.
4. Terminal 6 and 7-8 and terminal 6 and 7-9 are two sets of remote speed control. Referring to figure 4, connect a 5KΩ potentiometer, and turn the knob to central position. Let engine run on Run Speed to adjust to the rated engine speed, the adjustable range is ±5%. Users can also series a resistor to the potentiometer variable point to either terminal 8 or 9 to narrow the adjustable range. The wirings used to connect to terminal 6, 7-8 and 6, 7-9 must use the 3-wire shielded cable. The drain shield wire is to be connected to terminal 10 and the other end of the drain shield wire must cut off and taped.
5. Terminal 10 and 11 is the MPU signal input terminal. The wiring used to connect to the terminals must use a 2-wire shield cable. The drain shield wire is to be connected to Terminal 10 and the other end of the drain shield wire must cut off and taped.
6. Harness used to connect to Terminal 1, 2, 4 and 5 must use the 2.0mm twist pair harness.

4. OPERATION

4.1 Idle Speed and Smoke Limiting Adjustment The EG3000 has two settings used for smoke limiting :

1. Idle Speed

The setting of the lowest engine operating speed.

- Before firing the engine, adjust the Idle Speed to the maximum, and Ramp Time to the minimum.
- Adjust Run Speed to minimum and let Terminal 2 & 3 be Open Circuit.
- Start engine. The engine speed may rev to Run Speed right away. Slowly adjust Run Speed to the rated generator RPM.
- Short Terminal 2 & 3 the engine speed should drop, slowly set Idle Speed to a comfortable engine idle.
- Stop engine and adjust Ramp. Time to it center setting then restart engine. At this time, the engine speed will stay in Idle and slowly Ramp up to normal engine speed. Adjust to preferred Ramp speed. Refer to Figure 1.
- When operating at normal RPM closing the IDLE SW, decreases engine RPM back to idle RPM according to preset Ramp Time.
- To ensure positive engine starts every time follow step (4) and turn the Idle Speed potentiometer an additional 3 to 5%.

2. Ramp Time.

- On hot engines, a specific fuel limit setting will control start-up smoke, but not completely. A hot engine does not need the same fuel limits to start as a cold starting engine.
- Ramp Time can be set from 3 up to 20 seconds. The Ramp Time is the length of time from Idle to the rated Run Speed.

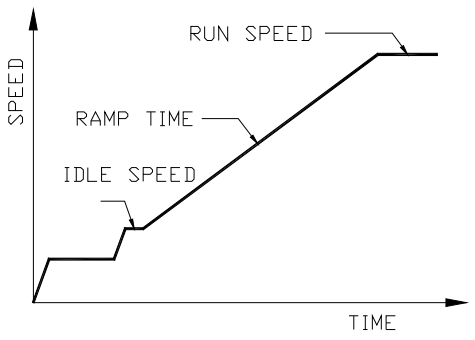


Figure 1

4.2 Isochronous Adjustment

Isochronous operation is obtained by setting Droop potentiometer fully counterclockwise. EG3000 is normally operated in the isochronous mode; i.e., engine RPM is constant (±0.25%), under steady state load conditions, up to the engine's maximum capability, regardless of load on the engine. Please refer to Figure 2.

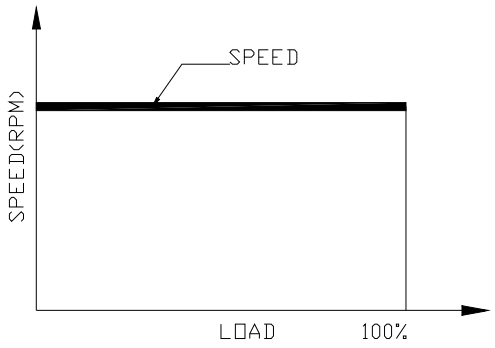


Figure 2

4.3 Non-isokinetic Operation

When operated under Non- isochronous (Paralleled), Droop is used to distribute the actual power from the generators. Please refer to Figure 3.

Droop operation is obtained by setting the Droop potentiometer. Moving Droop Pot clockwise increases the Droop. The amount of Droop for a given setting depends on the magnetic pickup frequency and no load to full load actuator shaft rotation.

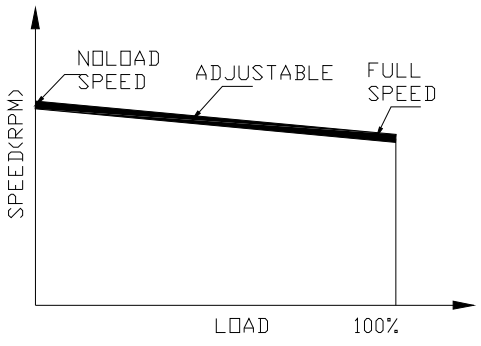


Figure 3

A Droop potentiometer setting of 10 o'clock will give about 4% Droop, no load to full load when the pickup frequency is 4600Hz and actuator shaft rotation is approximately 30 degrees from no load to full load. Lower pickup frequency or smaller shaft rotation results in less Droop for the system.

4.4 Remote Speed POT Adjustment

EG3000 is equipped with 2 sets of Remote Speed Potentiometer adjustment. By adding a 5KΩ Potentiometer, user can adjust the engine speed from as far as 60 meters away from the engine. Please refer to Figure 4 for connection. To narrow the adjustment range, series a resistor on either Terminal 8 or 9 to reduce. Without the resistor the adjustment range is approximately 5%.

4.5 INT, GAIN, DIF Adjustment

1. Shutdown engine and DC input turned off.
2. Potentiometer original setting.
3. Adjust INT., Gain, DIF, and Ramp Time Potentiometer to minimum setting (Fully Counterclockwise)
4. Under Isochronous operation, set Droop potentiometer fully counterclockwise.
5. Set the MPU frequency range :

Select the suitable frequency setting according to the highest engine frequency range

Input Signal Frequency :

$$\frac{\text{RPM} \times \text{Flywheel teeth}}{60 \text{ sec}}$$

Frequency Selection	
SW-1 ON	600 ~ 1200Hz
SW-2 ON	1200 ~ 2500 Hz
SW-3 ON	2500 ~ 5000 Hz
SW-4 ON	5000 ~ 9500 Hz

(If uncertain Set SW3-ON and the balance to OFF)

6. Idle Speed set to maximum, Run Speed set to minimum
7. Adjust Remote Speed POT to central (If used)
8. Start Engine

At this time the engine should rev to Run Speed, (If engine speed exceeds its rated speed, Stop engine and immediately choose a lower frequency setting) slowly adjust Run Speed pot clockwise to the rated engine speed.

For Idle Speed, Ramp Time And Idle Sw Setting, Reference To Paragraph 4.1

9. Slowly adjust Gain clockwise until the actuator begins to oscillate.
10. Slowly adjust Gain counterclockwise until it becomes stable.

11.Manually move the linkage. If the linkage oscillates 3 to 5 times and then stabilizes, then the setting is correct.

12.If engine speed overly increases or decreases when adding load or reducing load, please adjust the Gain VR clockwise a little.

13.If engine speed recovers too slowly, adjust INT. (Integration) clockwise, in the same time decrease the GAIN setting. Observe the actuator linkage. If the linkage is stable, manually adjust the linkage. If the linkage slowly oscillates, then the response time is inadequate. Adjust INT. counterclockwise until the response is improved.

14.After completing the above steps, slowly adjust DIF clockwise until engine speed begins to oscillate then slowly adjust counterclockwise to stable critical point / knee point.

*** Knee point is the position where the adjustment is at the point of stable and edge of unstable.**

15.Slowly adjust GAIN clockwise until engine speed reach the stable critical point / knee point.

16.Again manually adjust the linkage. If the linkage begins to oscillate 3 to 5 times and then stabilizes, then the setting is complete.

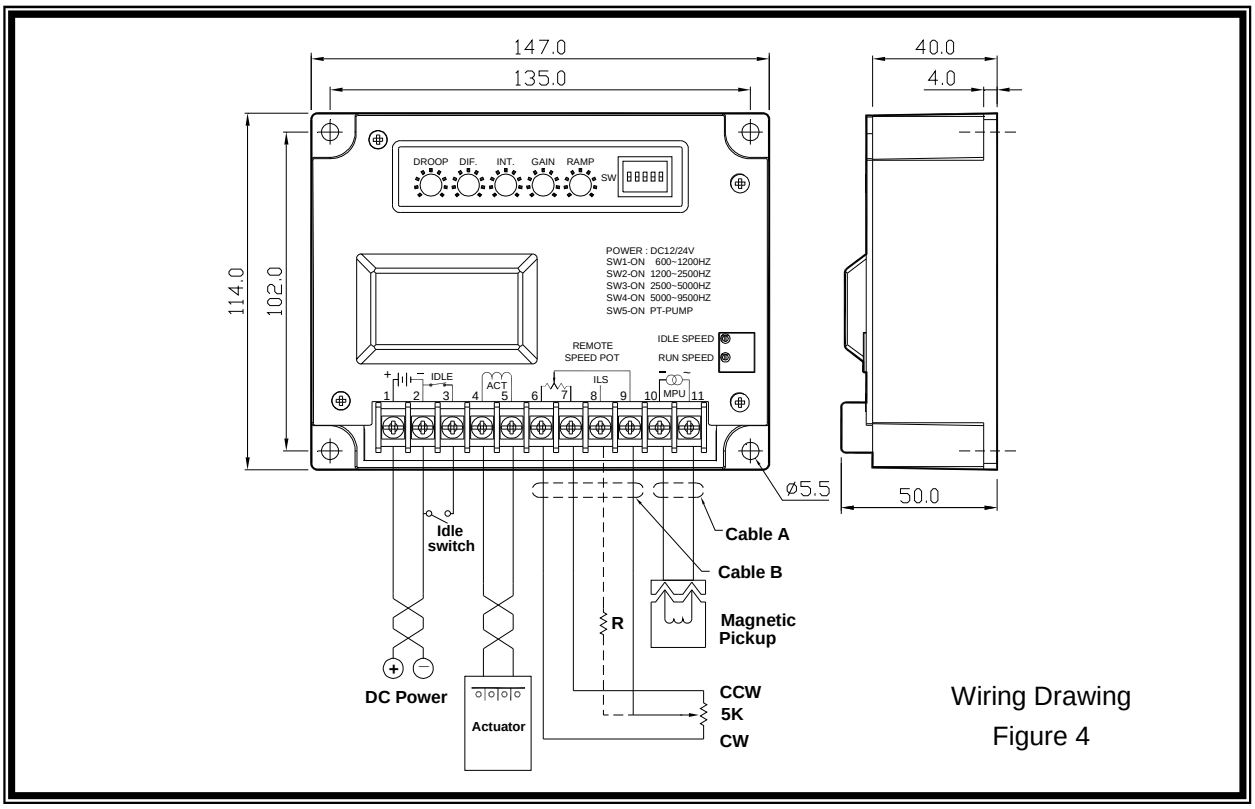
17.Set SW-5-ON will decrease the effect of GAIN and make suitable for PT-PUMP type actuator.

- Please reference from 4.2 and 4.3 for Droop setting.

Note 1：If GAIN or DIF is over adjusted, it causes the engine speed to oscillate. Repetitively increasing and decreasing the GAIN and INT. arrangement can help to obtain the best performance.

Note 2：Due to different types of external and internal built-in type actuators, the adjustment of Gain is very important, together with INT. (Integration) adjustment. In PT pump type actuators, the movement is very limited, so Gain is set to the minimum using INT. (Integration),DIF to adjust engine speed compensation.

5. DIMENSION AND TYPICAL WIRING DIAGRAM



Wiring Drawing
Figure 4

* Cable A, B - use a cable with a wrapped Mylar aluminum foil shield with a drain wire.

* To connect the 5KΩ potentiometer, refer to paragraph 3. Connections.

1. To connect the DC power supply and actuator use a 12 AWG / 2mm twist pair harness.

2. Connect the MPU to the EG3000 using a 2-wire shielded cable. Anchor the drain shield wire to Terminal 10 and the other end cut and tape off.

5. TROUBLESHOOTING

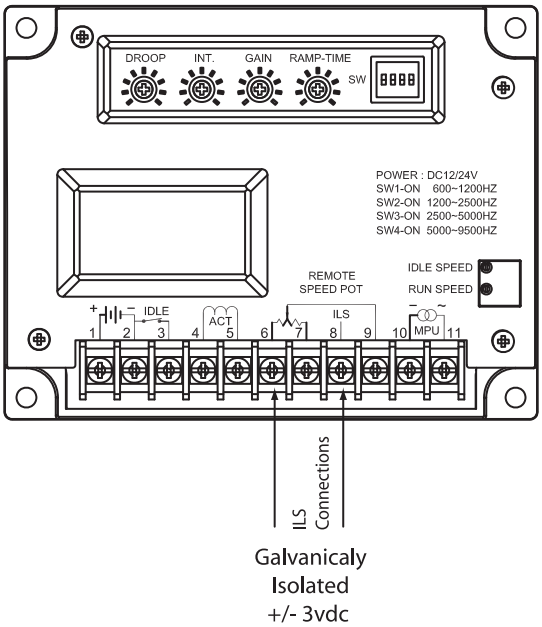
PROBLEM	CORRECTIVE ACTION
Actuator goes to full stroke when DC power is turned on (Engine is not operating)	1. Check magnetic pickup leads for proper shielded wire or open shield. Verify and correct wiring as necessary. Be sure there is no jumper between terminals 2 and 3. 2. Failsafe circuit in the controller may be damaged or defective. Replace with new controller. 3. With DC power OFF remove leads at actuator. Check continuity of conduction on each terminal to case. There should be no continuity of conduction between any terminal and case of EG3000. If conduction is measured, please replace the controller. 4. If remote speed potentiometer has been connected to terminals 6, 7 and 9 of the controller, disconnect these leads. Turn DC power ON to the governor if the actuator is now normal. Proceed to corrective actions for the next problem.
Governor is completely dead and actuator lever stays at minimum position when power is applied to governor.	1. Check battery voltage at terminals 1 and 2 on controller. Terminal 1 is positive. Check battery connections and contacts for turning power ON to the controller. 2. Check for proper linkage setup. Correct and free linkage. 3. Magnetic pickup signal absent or too low. Measure AC voltage across terminals 10 and 11 while cranking the engine. Voltage should be min. 1.0 VAC. NOTE: The voltmeter should have an impedance of 5000 ohms / volts or higher. Check pole tip gap over gear tooth. Should be 0.037 mm ~ / -0.127 mm. 4. Measure the resistance of the magnetic pickup coil. This should be above 50 ohm. If there is an open or shorted coil, replace the magnetic pickup. 5. Measure the resistance of each pin to the metal case of the magnetic pickup. No continuity should be evident. 6. If there is continuity of conduction to the case, replace with new magnetic pickup. 7. Measure actuator coil resistance: If actuator coil is open or shorted to case, replace the actuator. If governor still does not operate, continue with steps below. 8. Measuring the resistance of each coil lead to the actuator case should indicate an open circuit on a low scale of the ohm meter. If continuity is defected, replace the actuator. 9. With DC to the governor ON and the engine OFF, measure the DC voltage from terminal 6(+) to terminal 2(-). This should be approx. 4VCD. If 4 VCD is not present, replace the controller. 10. Between terminal 7(+) and terminal 2(-), the voltage should be approx. 4.6 VDC. If 4.6VDC is not present, replace the controller.

PROBLEM	CORRECTIVE ACTION
Erratic governor operation	1. Measure DC voltage at 1 and 2 on controller terminal strip. Normal battery voltage should be indicated. If nominal voltage is present, wiring is correct. 2. Low battery voltage 20% below rated can cause erratic operation. Check battery and charging system. 3. RFI noise due to incorrect shielding. Correct wiring. 4. RFI noise fed through power supply leads. Connect power leads directly to the battery.
Improper operation from remote speed potentiometer	1. Investigate wiring to remote speed potentiometer for open or shorted circuits. Checking wiring. 2. If the leads at terminals 6 and 7 to the remote speed potentiometer are reversed, speed control by the remote speed potentiometer will be reversed. Correct wiring. 3. Lead wire to remote speed setting potentiometer should be 3-wire shielded cable. Verity that the drain shield wire is isolated from ground at the potentiometer. If terminal 6 lead to the remote speed potentiometer is open, engine speed will go high. Correct the wiring. 4. If lead 8 and 9 (wiper lead to remote potentiometer) is open, there will be no control by the remote speed potentiometer. Verify and correct wiring. 5. If lead 7 to the clockwise terminal of the remote speed potentiometer is open, speed will remain at the value set in EG3000.
Slow, small amplitude hunting of speed or frequency	Jammed or very loose linkage. Correct linkage.
Fast oscillation of governor linkage	Verity calibration setting of the controller. Readjust setting as necessary.
Engine will not start – Actuator goes to full fuel during cranking	1. Make sure fuel is available. Check fuel to engine. Check for correct wiring to the automatic shutdown circuits. 2. Air may be trapped in fuel line. Check fuel lines for leaks. 3. Try to operate engine manually.

※ Please accept our sincere apology if any modification in performance, specification or appearance is made without prior notice.

ILS Connectios

For ILS Connectios do not use the remote pot and connects signal to terminals 6 and 8.



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