



ECC328 Generator Frequency Sensing Speed Control Unit



1 INSTALLATION

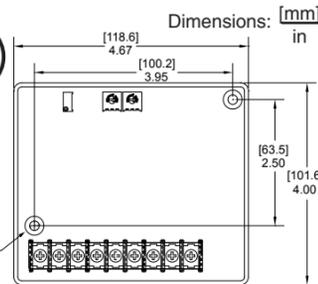
Vertical orientation allows for the draining of fluids in moist environments.



Mount in a cabinet, engine enclosure, or sealed metal box.



Avoid Extreme Heat



WARNING An overspeed shutdown device, independent of the governor system, should be provided to prevent loss of engine control which may cause personal injury or equipment damage. Do not rely exclusively on the governor system electric actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used.

2 BASIC WIRING

TERMINAL	DEFINITION	NOTES
A	Starter Crank	#16 AWG wire Starter solenoid crank post
B & C	Freq Trim	Potentiometer input for frequency trim (small)
D & E	Generator	Should be connected to generator's AC windings. These connections can be line to line or line to neutral. Terminal E should be connected to the neutral if this connection is chosen.
F & G	Battery	#16 AWG wire recommended Terminal F is positive (+) and should be fused for 15A
H & J	Actuator	#16 AWG wire recommended

NOTE See section 8 for wiring diagram.

3 STARTING THE ENGINE

IMPORTANT Before starting the engine, check to ensure that the GAIN, STABILITY, and external SPEED TRIM controls are set to their mid positions.

STARTING THE ENGINE: The ECC328 control is factory set to operate at approximately 60 Hz generator frequency.

Crank the engine with DC power applied to the governor system. The actuator will energize (within 1.5 VDC of battery voltage) and force the fuel control to its maximum fuel position until the engine starts. The governor system should then control the engine at near rated speed.

If the engine is unstable after starting, turn the GAIN and STABILITY pots CCW until the engine speed is stable. Section 5 details the procedure for stability adjustment.

4 GOVERNOR SPEED SETTING

The governed speed set point can be increased by the CW rotation of the SPEED adjustment. The remote speed adjustment (optional) can be used as a FREQ TRIM control. The frequency range is 40 - 80 Hz. See diagram in section 8.

5 ADJUSTING FOR STABILITY

Once the engine is running at operating speed and at no load, the following governor performance adjustment can be made to increase engine stability.

ADJUSTING FOR STABILITY	
PARAMETER	ADJUSTMENT PROCEDURE
GAIN	1. Rotate the GAIN adjustment CW until instability develops.
	2. Then, gradually move the adjustment CCW until stability returns.
	3. Finally, move the adjustment 1/8 of a turn further CCW further to ensure stable performance.
	4. If instability persists, adjust the stability parameter.
STABILITY	1. Rotate the GAIN adjustment CW until instability develops.
	2. Then, gradually move the adjustment CCW until stability returns.
	3. Finally, move the adjustment 1/8 of a turn further CCW further to ensure stable performance.

NOTE Normally, adjustments made at no load result in satisfactory performance across the entire load range. GAIN readjustment might be required after load is applied to the engine, if a non-linearity exists in the fuel control. A strip chart recorder or storage oscilloscope with appropriate electronics can be used to measure generator frequency to further optimize the governor's performance.

If instability cannot be corrected, or further performance improvements are required, refer to the Instability section under SYSTEM TROUBLESHOOTING (Section 7)

6 SPECIFICATIONS

PERFORMANCE	
Isochronous Operation	± 0.25%
Speed Range	40 - 80 Hz
Speed Drift with Temperature	±1%
Speed Trim	±2 Hz
ENVIRONMENTAL	
Ambient Temperature	-40° to 85°C (-40 to 185°F)
Relative Humidity	up to 100%
INPUT / OUTPUT	
Supply	12 VDC (8 - 15 VDC) Nominal 24 VDC (10 - 32 VDC) Nominal
Polarity	Negative Ground (Case Isolated)
Power Consumption	<50mA + actuator current
Maximum Actuator Current	4 Amps
Generator Frequency Sensing	Load on generator, 40K Ohms Minimum sensing 1 VAC RMS Maximum voltage 260 VAC
PHYSICAL	
Dimension	See Section 8
Weight	0.75 lb (0.34 kg)
Mounting	Any Position, Vertical Preferred
RELIABILITY	
Vibration	5G, 20-500 Hz
Shock	20G Peak
Testing	100% Functional Testing

7 SYSTEM TROUBLESHOOTING

System Inoperative

If the engine governing system does not function, the fault may be determined by performing the voltage tests described in Steps 1 through 4. Positive (+) and negative (-) refer to meter polarity. Should normal values be indicated during troubleshooting steps, then the fault may be with the actuator or the wiring to the actuator. Tests are performed with battery power on and the engine off, except where noted. See actuator publication for testing procedure on the actuator.

STEP	TERM.	NORMAL READING	PROBABLE CAUSE OF ABNORMAL READING
1	F(+) & G(-)	Battery Supply Voltage (8-15 VDC for 12V) or (10-32 VDC for 24V)	1. DC battery power not connected. Check for blown fuse 2. Low battery voltage 3. Wiring error
2	J(+) & H(-)	Battery Voltage less than 1.5 volt (When cranking)	1. Terminal (A) not connected to starter solenoid properly
3	J(+) & H(-)	Voltage present, but actuator does not move	1. Actuator circuit open; measure actuator resistance
4	J(+) & H(-)	Engine stalls after starting, 0 voltage	1. Generator residual voltage too low or absent, check wiring to terminals D & E

Instability

INSTABILITY	SYMPTOM	PROBABLE CAUSE OF ABNORMAL READING
Fast Periodic	An irregularity of speed above 3Hz. (Usually a jitter)	1. Interference from powerful electrical signals can be a cause. Turn off battery chargers or other electrical equipment to see if the symptom disappears.
Slow Periodic	An irregularity of speed below 3Hz. (Sometimes severe)	1. Adjustment of GAIN and STABILITY usually cures most situations by matching the speed control unit dynamics. If instability persists: 2. <u>Check:</u> a. The fuel system linkage for binding high friction, or poor linkage. b. Poor fuel mixture or bad ignition timing
Non-Periodic	Erratic Engine Behavior	1. Increasing the GAIN adjustment should reduce the instability but not totally correct it. If this is the case, there is most likely a problem with the engine itself. <u>Check for:</u> a. engine mis-firings b. an erratic fuel system c. load changes on the generator set voltage regulator.

Unsatisfactory Performance

SYMPTOM	NORMAL READING	PROBABLE CAUSE OF ABNORMAL READING
Engine Overspeed	1. Do Not Crank. Apply DC power to the governor system. Generated residual voltage must be 10 volts or higher for this test.	1. If actuator goes to full fuel, then disconnect speed sensing wires at Terminals D & E. If actuator is still at full fuel the speed control unit is defective. 2. If the actuator is at minimum fuel position and there exists an erroneous position signal, then check speed sensor
	2. Manually hold the engine at the desired running speed. Measure the DC voltage between Terminals H(-) & J(+) on the speed control unit.	1. If the voltage reading is 2.0 to 3.0 VDC: a. SPEED adjustment set above desired speed b. Defective speed control unit 2. If voltage reading is > 3.0 VDC then check for: a. actuator binding b. linkage binding 3. If the voltage reading is below 1.0 VDC: a. Defective speed control unit
Overspeed during start up	1. Low GAIN setting	1. Try to increase the GAIN setting CW and also turn the STABILITY CW as much as possible without causing instability. 2. Check the actuator for binding or friction.

Actuator does not energize fully	1. Measure the DC voltage at the actuator. It should be 0.8 to 1.5 VDC less than the actual battery voltage but not less than 8 VDC.	1. If the voltage is less than: a. 7V for a 12V system, or b. 14V for a 24V system, Then: Check or replace battery.
	2. Momentarily connect terminals J and F. The actuator should move to the full fuel position.	1. Actuator or battery wiring in error 2. Actuator or linkage binding 3. Defective actuator
Engine remains below desired governed speed	1. Measure the actuator output, Terminals J (+) & H (-) while running under governor control.	1. If voltage measurement is within 2 VDC of the battery supply voltage level, then fuel control is restricted from reaching full fuel position, possibly due to mechanical governor, carburetor spring, or linkage interference.
		2. SPEED adjustment set too low
Engine does not start or stalls	1. Turn speed pot CCW to increase speed set point	1. Check wiring to Terminal A, make sure Terminal A is connected to the Terminal of the starter.
	2. Measure VAC at terminals D and E while cranking.	1. Low speed reference set point below engine idle speed.

If unsuccessful in solving instability, contact GAC for assistance. info@governors-america.com or call: 413-233-1888

WIRING AND DIMENSIONS ON OTHER SIDE

