EDG5500
Electronic Digital Governor
With Quikset Display

EGSA Electrical Generating Systems Association — ISO 9001 CERTIFIED

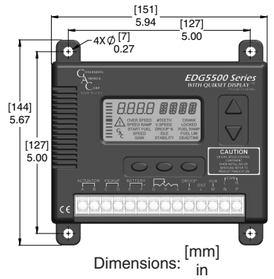
GAC Governors America Corp.®

1 INSTALLATION

Vertical orientation allows fluids to drain in moist environments.

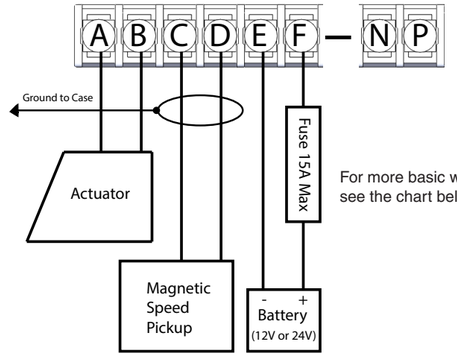
Mount in a cabinet, engine enclosure, or sealed metal box.

Avoid extreme heat.



Dimensions: [mm] in

2 BASIC WIRING (TERMINALS A - F)



For more basic wiring details see the chart below:

NOTE For additional wiring (Terminals G - P), see Section 3 OPTIONAL WIRING (TERMINALS G-P).

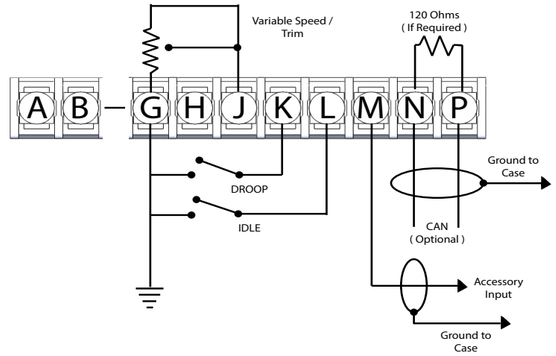
TERMINAL	DEFINITION	NOTES
A & B	Actuator (+/-)	#16 AWG (1.3mm sq) or larger wire
C & D	Magnetic Speed Pickup (D is ground)	Wires must be twisted and/or shielded for their entire length Gap between speed sensor and gear teeth should not be smaller than 0.02 in. (.51mm) Speed sensor voltage should be at least 1V AC RMS during crank
E & F	Battery Power (-/+)	#16 AWG (1.3mm sq) or larger wire A 15 amp fuse must be installed in the positive battery lead to protect against reverse voltage Battery positive (+) input is Terminal F
RECOMMENDATIONS		
1.	Shielded cable should be used for all external connections to the EDG control.	
2.	One end of each shield, including the speed sensor shield, should be grounded to a single point on the EDG case.	

WARNING

Loss of Magnetic Pickup Sensing

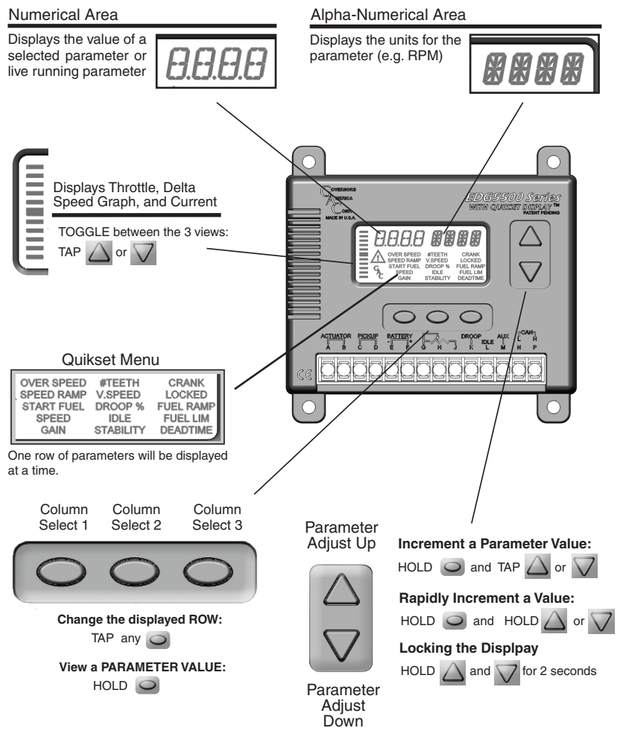
If the EDG5500 detects no input from the magnetic pickup, the EDG will set the actuator to 0V and set the speed to 0 RPM. After the EDG has detected loss of magnetic pickup, the display will flash the RPM along with the Warning Indicator. Parameters will be unchangeable.

3 OPTIONAL WIRING (TERMINALS G-P)



TERMINAL	DEFINITION	NOTES
G	Ground Signal	for Variable Speed/Trim Input
H	Not Used	
J	Variable Speed Input	0 - 5V DC
K	Droop Select	Active When Connected to Terminal G
L	Idle Select	Active When Connected to Terminal G
M	Aux Input	Load Sharing / Synchronizing, 5V Nominal
N & P	(Optional: CAN L & H)	CAN L is Terminal N
RECOMMENDATIONS		
1.	Shielded cable should be used for all external connections to the EDG control.	
2.	One end of each shield should be grounded to a single point on the EDG case.	

4 DISPLAY & CONTROLS



5 PRE-START SETUP & QUIKSET PARAMETERS

The parameters to the right must be set before starting the engine:

#TEETH	Input the Number of Teeth on the Flywheel
CRANK	Input the Crank Termination (RPM)
SPEED	Input the Fixed Speed of the Engine (RPM)

NOTE The EDG5500's parameters have been factory adjusted for optimal performance and are effective as of April-1-2014. If the default parameters set prior to this date are desired, refer to numbers in the brackets.

ADJUSTABLE QUIKSET PARAMETERS		
OVERSPEED	**#TEETH**	**CRANK**
RPM to automatically shutoff the actuator	Number of teeth on flywheel	RPM which EDG switches from starting to governing
Range: 500 - 9999 RPM Default: 2220 RPM	Range: 50 - 255 Default: 120	Range: 0 - 9999 RPM Default: 400 RPM
SPEED RAMP	**V.SPEED**	**LOCKED**
Rate at which speed changes from idle to speed and back	Maximum speed change allowed from trim input	Indicates if EDG will lock after 5 minutes of non-use
Range: 0 - 9999 Default: 400 [300]	Range: 0 - 9999 RPM Default: 5 RPM	Range: OFF, ON Default: OFF
START FUEL	**DROOP%**	**FUEL RAMP**
Percent of fuel to apply to actuator first upon cranking	Droop to apply under maximum load (based on current of actuator)	Percent per second to apply fuel as engine starts
Range: 0 - 100% Default: 99% [65%]	Range: 0 - 25.0% Default: 0.0% [5.0%]	Range: 0 - 100% Default: 2% [10%]
SPEED	**IDLE**	**FUEL LIM**
Operating speed of engine	Speed of engine when IDLE input is closed	Maximum actuator percentage allowed
Range: 0 - 9999 RPM Default: 1500 RPM [1800]	Range: 0 - 9999 RPM Default: 900 RPM [960]	Range: 0 - 100% Default: 99%
GAIN	**STABILITY**	**DEADTIME**
Proportional (P) set point of the PID control	Integral (I) set point of the PID control	Derivative (D) set point of the PID control
Range: 0 - 100, 100 = Max Gain Default: 20 [30]	Range: 0 - 100, 100 = fastest response Default: 36 [25]	Range: 0 - 100 Default: 21 [5]

6 SPECIAL PARAMETERS MENU

Display Special Menu Parameters: Hold ALL 3 until "AUX" appears in display

Selecting Parameters: Previous Parameter / Next Parameter

Return to Quikset Menu: Hold ALL 3 for 2 seconds

NOTE To change parameters, refer to Section 4 DISPLAY & CONTROLS.

SPECIAL MENU PARAMETERS			
Parameter	**Definition**	**Range**	**Default**
AUX	Auxiliary Input A	Off, On	Off
AVE	On=Averages four pulse samples from the Mag-Pickup for more accurate response Off= calculates Speed from pulses accumulated over the last system update	Off, On	Off
VSPD	Variable Speed or Trim Select (On=Variable Speed, Off=Trim)	Off, On	Off
SOFT	Soft Coupling - dampening of system (slow down response)	Off, On	Off
LEAD	Lead Circuit - response increase	Off, On	Off
D SW	Sets the droop mode (On=Auto Offset, Off = Manual Offset)	Off, On	On
DITH	Dither - adds white noise to actuator to prevent sticking in the fuel rack. (%)	0 - 10	0
DRNG	System current to the actuator that represents full load. Units in (A)	0.0 - 10.0	3.9
DSPD	Droop offset when D SW is set to Off (RPM)	0 - 9999	1500 [1800]
OVRC	Over Current - Turns off actuator if specified current value is exceeded. Units in (A)	0 - 12	11.7

7 FEATURES

J — TRIM or VARIABLE SPEED OPERATION — a 5K potentiometer can be connected at: (Terminals J & G)

Trim Function - Performs finer adjustments (e.g. generator frequency)

Variable Speed Function - Operates over a larger RPM range

	Special Menu Parameter	Quikset Menu Parameters	
MODE	**VSPD**	**SPEED**	**V. SPEED**
Trim (Default)	OFF	Rated Speed for Application. (e.g., 1500 RPM)	Percentage to allow speed trim (e.g., 5% = ±90RPM)
Variable Speed	ON	Minimum speed when potentiometer is at lowest resistance (e.g.,1000 RPM)	Maximum Speed when potentiometer is at the highest resistance (e.g., 2000 RPM)

K — SPEED DROOP OPERATION (Terminals K & G)(Quikset Menu)

Droop will replicate a mechanical governor's response to a load change. In Droop Operation, the engine speed will decrease as engine load increases. **DROOP%** (Quikset Menu) is based on the change in current in the actuator (**DRNG** see Section 5 Special Menu Parameters) from no load to full load.

Before Adjusting **DROOP%:**

-The optional external selector switch must be in DROOP position

MODE	D SW	SPEED
SPEED with Auto Offset (SPEED in Quikset Menu)	ON	Control will run at SPEED with an offset determined by the DROOP%
Droop Speed (DSPD in Special Menu)	OFF	Control will run to DSPD. A manual offset is required for operation

L — IDLE SPEED (Terminal L)

For IDLE Speed to be active:

- The optional external switch must be tied to pin "G".
- An alternating pressure switch may also be used.

M — Accessory Input (Terminal M)

The Aux Terminal accepts signals from:

- Auto Synchronizers
- Load Sharing Units
- Other Governing Accessories
- * GAC Accessories connect directly to this terminal

8 STARTING THE ENGINE

After setting the #TEETH, CRANK, and SPEED parameters, crank the engine with DC power applied to the governor system. The initial amount of power to the actuator is determined by the START FUEL parameter (default is 99% open). FUEL RAMP will control the rate at which fuel is increased to start the engine.

9 ADJUSTING FOR STABILITY

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

QUIKSET MENU		
PARAMETER		**ADJUSTMENT PROCEDURE**
A.	GAIN	1. Increase this parameter until instability develops. 2. Then, gradually decrease this parameter until stability returns. 3. Finally, decrease this parameter one increment further to ensure stable performance. 4. If instability persists, adjust the next parameter.
B.	STABILITY	1. Follow the same adjustment procedure as the GAIN parameter. 2. If instability persists, adjust the next parameter.
C.	DEADTIME	1. Follow the same adjustment precedure as the GAIN parameter.

NOTE The EDG5500 is equipped with two separate gains, one for rated speed, the other for idle speed. Both are set using the GAIN setting on the Quikset menu. By default, the gain for rated speed is selected. To modify the idle gain, connect the idle input to ground and change the gain value. When switching back, the rated gain value will remain.

Normally, adjustments made at no load achieve satisfactory performance. If further performance improvements are required, refer to Section (10) ADVANCED PARAMETERS MENU and Section (11) SYSTEM TROUBLESHOOTING.

10 ADVANCED PARAMETERS MENU

Advanced Menu Parameters will further adjust engine stability.

DISPLAYING ADVANCED MENU PARAMETERS: Hold ALL 3 until "RATE" appears in display.

Return to Quikset Menu: Hold ALL 3 for 2 seconds

NOTE To change parameters, refer to Section 4 DISPLAY & CONTROLS. The EDG5500's parameters have been factory adjusted for optimal performance and are effective as of April-1-2014. If the default parameters set prior to this date are desired, refer to numbers in the brackets.

ADVANCED MENU PARAMETERS

Parameter	Definition	Range	Default
RATE	The time (mS) between calls to the PID control loop.	4 - 250 mS	4
FLTR	Number of speed samples in frequency calculation. Filter is active when soft coupling (**SOFT**) is set to ON. Lower numbers filter high frequency noise.	1 - 62 samples	40
GMUL	If the **GAIN** parameter is at maximum and more **GAIN** is required, increase **GMUL**. **GAIN** will be more responsive. If small changes in the **GAIN** parameter are over responsive, decrease **GMUL.**	1 - 20	17
SMUL	If the **STABILITY** parameter is at maximum and more **STABILITY** is required, increase **SMUL**. **STABILITY** will be more responsive. If small changes in **STABILITY** parameter are over responsive, decrease **SMUL.**	1 - 20	17 [16]
DMUL	If **DEADTIME** value is at maximum and more **DEADTIME** is required, increase **DMUL**. **DEADTIME** will be more responsive. If small changes in **DEADTIME** parameter are over responsive, decrease **DMUL.**	1 - 20	12 [10]

CAUTION Multiplier Changes can make drastic changes. Changing a multiplier (e.g. GMUL) will affect the corresponding Quikset parameter (e.g. GAIN) in two ways:

1. If the multiplier is decreased by 1, corresponding Quikset value will double.
2. If the multiplier is increased by 1, corresponding Quikset value will halve.

NOTE The engine will maintain current operation while adjusting parameters. (i.e. **NO CHANGES**) Since the scaling will be made to the Gain, Stability, and Derivitive parameters automatically, go back and readjust these parameters to the diesired levels.

12 SPECIFICATIONS

RoHS CE

PERFORMANCE	
Isochronous Operation	± 0.25%
Speed Range / Governor	400Hz - 10 KHz
	(200-500 RPM w/ 120 tooth flywheel) continuous
Idle Adjust	Full Range
Droop Range	1 - 5% regulation
Speed Trim	Programmable 0-100%, (default = 5%)
INPUT / OUTPUT	
Supply	12-24 VDC Battery Systems (6.5 to 33 VDC)
Polarity	Negative Ground
Power Consumption	70mA max. continuous plus actuator current
Speed Sensor Signal	0.5-120 VRMS
Actuator	10 Amps Continuous
Load Share / Synchronizer Input	0-10 VDC (5V nominal, reversed, 100Hz / V)
Reverse Power Protection	Yes
Transient Voltage Protection	60V
RELIABILITY	
Vibration	7G, 20-100 Hz
Shock	20G Peak
Testing	100% Functional Testing
ENVIRONMENTAL	
Ambient Temperature	-40° to 85°C (-40 to 180°F)
Relative Humidity	up to 95%
All Surface Finishes	Fungus Proof and Corrosion Resistant
CE Rated	EN55011, EN50081-2, EN50082-2

COMPLIANCE / STANDARDS	
Agency	CE and RoHS Requirements
Communications	SAE J1939 (Option)
PHYSICAL	
Dimension	See Section 1 "Installation"
Weight	1.8 lbs. (820 grams)
Mounting	Any position, Vertical Preferred

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11 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 3. 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	WIRES	NORMAL READING	PROBABLE CAUSE OF ABNORMAL READING
1	F(+) & E(-)	Battery Supply Voltage (12 or 24V DC)	1. DC battery power not connected. Check for blown fuse 2. Low battery voltage 3. Wiring error
2	C & D	1.0V AC RMS min. while cranking	1. Gap between speed sensor and gear teeth too great 2. Check Gap 3. Improper or defective wiring to the speed sensor 4. Resistance between D and C should be 130 to 1200 ohms. See specific mag pickup data for resistance. Defective speed sensor.
3	F(+) & A(-)	1.0 - 2.0V DC while cranking	1. SPEED parameter set too low 2. Short/open in actuator wiring 3. Defective speed control 4. Defective actuator, see Actuator Troubleshooting

Instability

INSTABILITY	SYMPTOM	PROBABLE CAUSE OF ABNORMAL READING
Fast Periodic	The engine seems to jitter with a 3Hz or faster irregularity of speed. (Not as moderate)	1. Make sure LEAD Special parameter is set to "OFF". 2. Readjust the GAIN and STABILITY for optimum control. 3. In extreme cases, decrease the DEADTIME parameter.
Slow Periodic	An irregularity of speed below 3Hz. (Sometimes severe)	1. Verify the SOFT Special Manu parameter is disabled. 2. Decrease the update rate of the controller by decreasing the RATE Advanced parameter. (Each time RATE is changed, GAIN, STABILITY, and DEADTIME must be re-adjusted. 3. Check fuel system linkage during engine operation for: a. binding b. high friction c. poor linkage
Non-Periodic	Erratic Engine Behavior	1. Increasing the GAIN should reduce the instability but not totaly correct it. If this is the case, there is most likely a problem with the engine itself. Check for: a. engine mis-firings b. an erratic fuel system c. load changes on the generator set voltage regulator.

If unsuccessful in solving instability, contact GAC for assistance.
info@governors-america.com
413-786-5600

Unsatisfactory Performance

SYMPTOM	NORMAL READING	PROBABLE CAUSE OF ABNORMAL READING
Engine Overspeeds	1. Do Not Crank. Apply DC power to the governor system.	1. After the actuator goes to full fuel. Then disconnect the speed sensor at Terminal C & D. If the actuator is still at full fuel-speed then 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 A(-) & F(+) on the speed control unit.	1. If the voltage reading is 1.0 to 2.0V DC: a. SPEED parameter set above desired speed b. Defective speed control unit 2. If voltage reading is > 2.0V DC then check for: a. actuator binding b. linkage binding 3. If the voltage reading is below 1.0V DC: a. Defective speed control unit
	3. Check #TEETH parameter.	1. Incorrect tooth count entered.
Overspeed shuts down engine after running speed is reached	1. Examine the SPEED and OVER SPEED operating parameters for the engine	1. SPEED parameter set too high. 2. OVERSPEED set too close to SPEED. 3. Actuator or linkage binding. 4. Speed Control unit defective.

SYMPTOM	NORMAL READING	PROBABLE CAUSE OF ABNORMAL READING
Overspeed shuts down engine before running speed is reached	1. Check resistance between Terminals C&D. Should be 130 to 1200 ohms. See specific Magnetic Pick-up data for resistance.	1. OVERSPEED set too low 2. If the speed sensor signal is erroneous, then check the wiring.
Actuator does not energize fully	1. Measure the voltage at the battery while cranking.	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 B and E. The actuator should move to the full fuel position.	1. Actuator or battery wiring in error 2. Actuator or linkage binding 3. Defective actuator 4. Fuse open. Check for short in actuator or harness.
Engine remains below desired governed speed	1. Measure the actuator output, Terminals A & B, while running under governor control.	1. If voltage measurement is within 2V DC 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 parameter set too low

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