GAC's EEG6500 digital governor is designed to regulate engine speed on diesel and gaseous-fueled engines. The EEG system is a suitable replacement for any mechanical governor system that needs flexibility, precision, or accurate control of governed speed. The EEG is designed for industrial engine applications from generator sets, and mechanical drives, to pumps or compressors.

With the use of GAC's Quickest Display, the EEG requires no computer or Internet connection.

---

## INTRODUCTION

### PERFORMANCE

- **Isochronous Operation**: ± 0.25%
- **Speed Range / Governor**: 100Hz - 12 KHz
  (200-4000 RPM w/120 tooth flywheel) cont.
- **Idle Adjust**: 1500 RPM
- **Droop Range**: 1 - 25% regulation
- **Speed Trim**: Programmable ±120 Hz

### INPUT / OUTPUT

- **Supply**: 12-24 VDC Battery Systems (7.0 to 32 VDC)
- **Polarity**: Negative Ground
- **Power Consumption**: 70mA max. continuous plus actuator current
- **Speed Sensor Signal**: 1.0-120 VRMS
- **Actuator Output**: 8-10 Amps Continuous Max, Momentary >10A; works with all GAC ATB's & ACB2001
- **Load Share/Synchronizer**: 0-10 VDC (5V nominal, reversed polarity, 145Hz / V )
- **Reverse Power Protection**: Yes
- **Transient Voltage Protection**: 60V

### 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

### PHYSICAL

- **Dimension**: See Section 3 “Installation”
- **Weight**: 1.8 lbs. (820 grams)
- **Mounting**: Any position, Vertical Preferred

### RELIABILITY

- **Vibration**: 7G, 20-100 Hz
- **Shock**: 20G Peak
- **Testing**: Functional Tested

### COMPLIANCE / STANDARDS

- **Agency**: CE and RoHS Requirements
- **Communications**: SAE J1939 (Optional)

---

## INSTALLATION

- Improved & Simplified LCD User Interface
- Fast Setup with 5 Push Buttons, No Potentiometers
- Rated, Idle Speed, and Variable Speed
- Selectable Isochronous, Droop, & Variable Governing
- Built-In Fault Protection With Overcurrent Sensing
- Adjustable Starting Fuel Strategy (Black Smoke Reduction)
- Extended Speed Range to 12KHz or 4000 RPM with Frequency Display
- Speed Ramping (Idle to Rated or any Speed Setting)
- Includes Standard GAC AUX Input for Synchronizing and Load Sharing
- J1939 Engine Data and Speed Output
- Overspeed Sensing & Protection

With vertical orientation, allowing for the draining of fluids in moist environments. Mount in a cabinet, engine enclosure, or sealed metal box. Avoid Extreme Heat.
**WARNING**

**Loss of Magnetic Pickup Sensing**

If EEG detects no input from the magnetic pickup, the EEG will set the actuator to 0V and set the speed to 0 RPM. The display will flash the RPM along with the Warning Indicator. Parameters will be unchangeable.

---

**RECOMMENDATIONS**

1. Shielded cable should be used for all external connections to the EEG control. One end of each shield, including the speed sensor shield, should be grounded to a single point on the EEG case.

2. Case should be grounded

---

**DISPLAY & CONTROLS**

- **Parameter Value**
  - Displays the value of a selected parameter or live running parameter. This area will blink if a system shutdown and restart is required.

- **Parameter Units**
  - Displays the units for the parameter (e.g. RPM)

- **Parameter Adjust**
  - Increment a Parameter Value:
    - Hold and TAP or
  - Rapidly Increment a Value:
    - Hold and HOLD or

- **Column Select Buttons**
  - A
  - B
  - C

- **Lock Feature**
  - Once the LOCK parameter on the main menu is enabled (“ON”), the display can be manually locked.

- **Over Speed**
  - “Over Speed” will blink when the unit is in overspeed.

---

**PIB 5010**

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6 FEATURES

TRIM or VARIABLE SPEED OPERATION

Trim Function - Performs finer adjustments (e.g. generator frequency)
Variable Speed Function - Operates over a larger RPM range

MODE | VSPD | SPEED | V. SPEED
--- | --- | --- | ---
Trim (Default) | OFF | Application Rated Speed (e.g., 1500 RPM) | Speed Trim Percentage (10 = ±10Hz)
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)

IMPORTANT Increasing voltage or resistance increases speed.

RESISTIVE POTENTIOMETER OR VOLTAGE

Voltage
0 - 2.5V, into J

COM VSPD H J CCW
Terminal J Utilizes A CCW Potentiometer

5KΩ

SPEED DROOP OPERATION

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 6 Special Menu Parameters) from no load to full load.

IMPORTANT Before adjusting DROOP%, the optional external selector switch must be in DROOP position. DROOP icon will blink.

IDLE SPEED

IMPORTANT The optional external switch must be tied to terminal "H". Pressure switch may also be used as a method of enabling. When enabled, IDLE has independent Gain adjustment.

ACCESSORY INPUT

The Aux terminal accepts signals from auto synchronizers, load sharing units, and other GAC accessories.

7 PRE-START SETUP & QUIKSET PARAMETERS

Set the parameters below before starting the engine:

#TEETH Input the Number of Teeth on the Flywheel. This can not be changed while engine is running.
CRANK Input the Crank Termination (RPM)
SPEED Input the Fixed Speed of the Engine (RPM)

ADJUSTABLE QUIKSET PARAMETERS

<table>
<thead>
<tr>
<th>OVER SPEED *</th>
<th>#TEETH</th>
<th>CRANK *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: 400 - 4000 RPM</td>
<td>Range: 60 - 250</td>
<td>Range: 250 - 1000 RPM</td>
</tr>
<tr>
<td>Default: 2220 RPM</td>
<td>Default: 120</td>
<td>Default: 400 RPM</td>
</tr>
</tbody>
</table>

RPM to automatically shut off the actuator
Number of teeth on flywheel
RPM which EEG switches from starting fuel limit to fuel limit

SPEED RAMP | V.SPEED * | LOCKED |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: 25 - 1000</td>
<td>Range: 0-4000 RPM (vspd)</td>
<td>Range: OFF, ON</td>
</tr>
<tr>
<td>Default: 300</td>
<td>0-120 Hz (trim)</td>
<td>Default: 0</td>
</tr>
<tr>
<td>Default: 0 RPM (trim)</td>
<td>: 0 RPM (trim)</td>
<td>Default: OFF</td>
</tr>
</tbody>
</table>

Rate at which speed changes from idle to speed and back
Maximum speed change allowed from trim input
Enables the ability for Manual/Auto locking of display

START FUEL | DROOP% | FUEL RAMP |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: 0 - 100%</td>
<td>Range: 0 - 25.0%</td>
<td>Range: 10 - 100%</td>
</tr>
<tr>
<td>Default: 90%</td>
<td>Default: 5.0%</td>
<td>Default: 10%</td>
</tr>
</tbody>
</table>

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 cranks.

SPEED * | IDLE * | FUEL LIMIT |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: 0-4000 RPM (fixed)</td>
<td>Range: 300 - 1500 RPM</td>
<td>Range: 0 - 100%</td>
</tr>
<tr>
<td>Default: 1800 RPM (droop)</td>
<td>Default: 1000 RPM</td>
<td>Default: 100%</td>
</tr>
<tr>
<td>Default: 50 RPM (droop)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Operating speed of engine
Speed of engine when IDLE input is closed
Maximum actuator percentage allowed

GAIN | STABILITY | DEADTIME |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Range: 1 - 100, 100 = Max Gain</td>
<td>Range: 1 - 100, 100 = fastest response</td>
<td>Range: LOW, HI</td>
</tr>
<tr>
<td>Default: 50</td>
<td>Default: 50</td>
<td>Default: HI</td>
</tr>
</tbody>
</table>

Proportional (P) set point of the PID control at operating SPEED and IDLE
Integral (I) set point of the PID control
Derivative (D) set point of the PID control

* Maximum 12KHz
### ADVANCED PARAMETERS MENU

#### 10 Display Special

**Menu Parameters:** “AUX” appears in display

**Selecting Parameters:**

- [ ] Previous
- [ ] Next

**Adjust Parameters:**

- Increase
- Decrease

**Return to Quikset Menu:** Hold ALL 3 for 2 seconds

**NOTE**

1. After 3 minutes of no user input, EEG switches to Quikset Menu.
2. “Lock” is displayed when attempt to change a Read-Only parameter.

#### 9 ADVANCED PARAMETERS MENU (CONFIGURABLE)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Definition</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX</td>
<td>Auxiliary Input Enable</td>
<td>Off, On</td>
<td>Off</td>
</tr>
<tr>
<td>VSPD</td>
<td>Variable Speed or Trim Select (On=Variable Speed, Off=Trim)</td>
<td>Off, On</td>
<td>Off</td>
</tr>
<tr>
<td>LEAD</td>
<td>Lead Circuit - Response increase</td>
<td>Off, On</td>
<td>Off</td>
</tr>
<tr>
<td>DRNG</td>
<td>System current to the actuator that represents full load. Units in (A)</td>
<td>0.0 - 10.0</td>
<td>4.0</td>
</tr>
</tbody>
</table>

#### 8 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.

### GAIN - RATED SPEED & IDLE SPEED

**NOTE**

The EEG6500 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.

<table>
<thead>
<tr>
<th>GAIN TYPE</th>
<th>ADJUSTMENT PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RATED SPEED</td>
<td>1. Selected when IDLE input is disconnected.</td>
</tr>
<tr>
<td>IDLE SPEED</td>
<td>1. Connect the idle input to ground.</td>
</tr>
<tr>
<td></td>
<td>2. Change GAIN value.</td>
</tr>
<tr>
<td></td>
<td>3. Disconnect idle input from ground to switch back to Rated.</td>
</tr>
</tbody>
</table>

**NOTE**

Idle icon will blink.

### QUIKSET MENU

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>ADJUSTMENT PROCEDURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>GAIN</td>
<td>1. Increase this parameter until instability develops.</td>
</tr>
<tr>
<td></td>
<td>2. Then, gradually decrease this parameter until stability returns.</td>
</tr>
<tr>
<td></td>
<td>3. Finally, decrease this parameter one increment further to ensure stable performance.</td>
</tr>
<tr>
<td></td>
<td>4. If instability persists, adjust the next parameter.</td>
</tr>
<tr>
<td>STABILITY</td>
<td>1. Follow the same adjustment procedure as the GAIN parameter.</td>
</tr>
<tr>
<td></td>
<td>2. If instability persists, adjust the next parameter.</td>
</tr>
<tr>
<td>DEADTIME</td>
<td>1. If fast instability occurs, switch DEADTIME to low and repeat steps A &amp; B.</td>
</tr>
</tbody>
</table>

**NOTE**

Normally, adjustments made at no load achieve satisfactory performance. For further performance, refer to sections (10) & (11).

#### 7 ADJUSTING FOR DROOP

After the initial set up is completed and the # of Teeth, Crank Termination Speed and Rated Speed are set, position the external switch connecting terminals ‘H’ and ‘K’ on to activate the DROOP mode following these sequence steps.

1. Go to the Advanced menu: Press and hold all three buttons simultaneously for two seconds to switch to Advanced Menu.

2. Confirm that the VSPD (Variable Speed / Fixed Speed Control) is off. Default position is off.

3. Confirm that the LEAD circuit is off. Default position is off.

4. Set the DRNG (current representing 100% load) to the normal operating current for the actuator being used, at its given system voltage (default value is 4.0 amps.)

5. Return to the Main Menu: Press and hold all three buttons simultaneously for two seconds to switch to the Main Menu.

6. Select and set DROOP to the desired percentage.

7. Change the Speed parameter, which turns into the ‘DROOP OFFSET’. This sets the RPM, above operating speed, to which the system will be commanded when DROOP is enabled. This is an offset value.

**EXAMPLE**

500 RPM operating speed x 0.05 (5.0% droop) = 25 RPM Input 25 RPM, this is the offset value.

### GAIN - RATED SPEED & IDLE SPEED

**NOTE**

IDLE SPEED

1. Connect the idle input to ground.
2. Change GAIN value.
3. Disconnect idle input from ground to switch back to Rated.

**NOTE**

Idle icon will blink.

### QUIKSET MENU

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**EXAMPLE**

500 RPM operating speed x 0.05 (5.0% droop) = 25 RPM Input 25 RPM, this is the offset value.

### GAIN - RATED SPEED & IDLE SPEED

**NOTE**

IDLE SPEED

1. Connect the idle input to ground.
2. Change GAIN value.
3. Disconnect idle input from ground to switch back to Rated.

**NOTE**

Idle icon will blink.

### QUIKSET MENU

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**NOTE**

Normally, adjustments made at no load achieve satisfactory performance. For further performance, refer to sections (10) & (11).
11 **INSTABILITY**

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>PROBABLE CAUSE OF ABNORMAL READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Periodic The engine seems to jitter with a 3Hz or faster irregularity of speed.</td>
<td>1. Readjust the GAIN and STABILITY for optimum control. 2. In extreme cases, change the DEADTIME parameter.</td>
</tr>
<tr>
<td>Slow Periodic Speed irregularity below 3Hz. (Sometimes severe)</td>
<td>1. Check fuel system linkage during engine operation for: a. binding b. high friction c. poor linkage 2. DEADTIME Parameter set too high.</td>
</tr>
<tr>
<td>Non-Periodic Erratic Engine Behavior</td>
<td>1. Increasing the GAIN should reduce the instability but not totally 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.</td>
</tr>
</tbody>
</table>

If unsuccessful in solving instability, contact GAC for assistance.  
GAC@governors-america.com or call: 1-413-233-1888

12 **J1939 CAN INFO**

J1939 Address: 26

<table>
<thead>
<tr>
<th>PGN</th>
<th>DEFINITION</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>61444</td>
<td>Engine Speed</td>
<td>Engine speed in RPM</td>
</tr>
</tbody>
</table>

13 **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** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F(+) &amp; E(-)</td>
<td>Battery Supply Voltage (12 or 24V DC)</td>
<td>1. DC battery power not connected. Check for blown fuse 2. Low battery voltage 3. Wiring error</td>
</tr>
<tr>
<td>2</td>
<td>C &amp; D</td>
<td>1.0V AC RMS min. While Cranking</td>
<td>1. Gap between speed sensor and gear teeth too great 2. Improper or defective wiring to the speed sensor 3. Resistance between D and C should be 130 to 1200 ohms. 4. Defective speed sensor.</td>
</tr>
<tr>
<td>3</td>
<td>F(+) &amp; A(-)</td>
<td>1.0 - 2.0V DC While Cranking</td>
<td>1. SPEED or IDLE parameter set incorrectly 2. CRANK or START FUEL set incorrectly 3. Short/open in actuator wiring 4. Defective speed control 5. Defective actuator, see Actuator Troubleshooting</td>
</tr>
</tbody>
</table>

10 **FAULT CODES**

**ADVANCED MENU PARAMETERS (CONFIGURABLE)**

<table>
<thead>
<tr>
<th>CODE</th>
<th>CAUSE</th>
<th>EFFECT</th>
<th>CUSTOMER ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actuator over current (continuous)</td>
<td>Actuator turned off for 30 sec.</td>
<td>Check actuator wiring.</td>
</tr>
<tr>
<td>2</td>
<td>Loss of speed signal (inc/dec in speed by more than 64Hz in 4ms, 16KHz/s)</td>
<td>WARNING indicator blinks then system shutdown</td>
<td>Check speed pickup.</td>
</tr>
<tr>
<td>3</td>
<td>Over speed (speed exceeds OVER SPEED setting for 12 ms)</td>
<td>WARNING and OVER SPEED indicators blink then system shutdown.</td>
<td>Check fuel system as well as OVER SPEED, SPEED, and V.SPEED</td>
</tr>
<tr>
<td>203</td>
<td>Variable Speed settings are reversed. V.SPEED is lower than SPEED.</td>
<td>WARNING indicator blinks, speed set to V.SPEED setting, variable speed input unresponsive.</td>
<td>Flip V.SPEED and SPEED settings.</td>
</tr>
<tr>
<td>206</td>
<td>No potentiometer/signal detected on variable speed input when VSPD enabled.</td>
<td>WARNING indicator blinks, speed set to SPEED setting.</td>
<td>Check potentiometer wiring.</td>
</tr>
<tr>
<td>241</td>
<td>New software loaded. Configuration not compatible.</td>
<td>Default configuration used.</td>
<td>Reset configuration.</td>
</tr>
<tr>
<td>251</td>
<td>Software loaded on incompatible hardware.</td>
<td>WARNING indicator blinks then System shutdown.</td>
<td>Return unit to GAC</td>
</tr>
</tbody>
</table>

**IMPORTANT** For all other codes, note the condition and contact GAC. The WARNING indicator will blink and failures will cause a system shut down.
### UNSATISFACTORY PERFORMANCE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>NORMAL READING</th>
<th>PROBABLE CAUSE OF ABNORMAL READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Over Speeds</td>
<td>1. Do Not Crank. Apply DC power to the governor system.</td>
<td>1. If the actuator is at minimum fuel position and there exists an erroneous speed signal, then check speed sensor.</td>
</tr>
</tbody>
</table>
|                                              | 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:  
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.                                                                   |
| Over Speed 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. OVER SPEED set too close to SPEED.  
3. Check SPEED RAMP parameter.  
4. Actuator or linkage binding.  
5. Speed Control unit defective.  
| Over Speed 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. OVER SPEED set too low  
2. If the speed sensor signal is erroneous, then check the wiring. |

### UNSATISFACTORY PERFORMANCE

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>NORMAL READING</th>
<th>PROBABLE CAUSE OF ABNORMAL READING</th>
</tr>
</thead>
</table>
| 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: 1. Check wiring  
2. Check circuit protection/relay  
3. Check charging system  
4. Check battery |
|                                              | 2. Momentarily connect Terminals A 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  
4. Fuse open. Check for short in actuator or harness.  
5. Check START FUEL and CRANK |
| 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. Check SPEED, IDLE, GAIN, START FUEL, and CRANK |