EEG7000 with GAConfig Tool
Electronic Digital Speed Controller

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1 INTRODUCTION

GAC's EEG7000 electronic digital speed controller is designed to regulate engine speed on diesel and gaseous fueled engines. When paired with a GAC actuator the EEG7000 is a suitable upgrade for any mechanical governor system that needs flexibility, precision, and accurate control of governed speed.

The EEG7000 is designed for industrial engine applications including generator sets, mechanical drives, pumps, compressors and off-road mobile equipment. The GAConfig Tool adds the ability to monitor and set parameters from your PC. With CAN J1939 capability it has the ability to accept TSC1 messages over USB as a mini engine control module (ECM). It can be controlled directly over J1939 with aftermarket displays such as ComAp, Dynagen, and Murphy – a solution for every application.

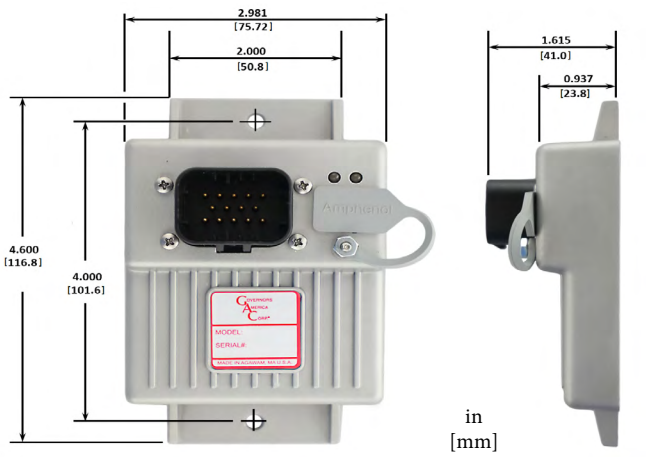
- Mini-ECU, J1939 TSC1 Control capable with Diagnostic Messages (DM)
- Isochronous, variable, or customizable droop governing
- 3 fixed speeds or variable speeds with Direct 0 – 5 V DC, 5 kΩ, or 4 – 20 mA Input
- Built-in USB port for easy configuration with free software
- Black smoke reduction, speed ramp control, load sharing/synchronizing option, Cummins EFC-capable
- Built-in speed switch output for crank or overspeed
- Battery voltage, engine hour meter and service timer
- Fully sealed, IP67
- Multi- V DC
- Gaseous or Diesel
- Built-In Configurable Speed Switch Output

2 EEG7000 SPECIFICATIONS

PERFORMANCE	
Isochronous Operation	± 0.25 %
Speed Range	100 - 12 kHz
Droop Range	0.1 - 25 % regulation
Speed Ramp Time Acceleration. Adj. Range	25 to 2000 RPM/s
Deceleration. Adj. Range	25 to 2000 RPM/s
Starting Fuel Adjustment	
Actuator Ramp Rate	1 to 100 %
Actuator Begin Point	0 to 100 %
Overspeed Set Point	400 to 6000 RPM
Crank Termination Set Point	100 to 1000 RPM
Speed Switch Adjustment Range	1000 - 100000 Hz
Speed 1	0 to 6000 RPM
Speed 2 & 3	150 to 6000 RPM
Reverse Power Protection	Yes
Transient Voltage Protection	60 V DC
Load Share / Synchronization Input	0 - 10 V DC (5 V Nominal, Selectable Polarity, 145 Hz / V Sensitivity)
Speed Sensor Signal Input	1.0 - 60.0 V RMS
Speed Switch (SSW)	Rated to 2 A DC

ENVIRONMENTAL	
Ambient Temperature	-40 to 85 °C [-40 to 180 °F]
Relative Humidity	up to 90 % non-condensing at 38 °C
Vibration	4 g, 20 - 1000 Hz
Shock	Per J1455
Testing	100 % Functional Testing
All Surface Finishes	Fungus Proof and Corrosion Resistant
ELECTRICAL	
Power Supply	12 - 24 V DC Battery Systems
Continuous Supply Voltage	6.5 to 32 V DC
Polarity	Negative Ground (Case Isolated)
Power Consumption	100 mA (No Actuator Current)
Actuator Current	6 A Continuous, 8 A Peak
COMPLIANCE / STANDARDS	
Agency	CE and RoHS Requirements
Communications	USB, RS-232-C, SAE J1939
PHYSICAL	
Dimension	See Section 3, Installation,
Weight	8 ozf [227 gf]
Mounting	Any position, Vertical preferred

3 EEG7000 INSTALLATION



Before you begin, note the following required items:

- A Windows 7 or better computer with USB port and Internet connection
- 14-pin connector (GAC EC1502) or cable harness assembly (CH1520)

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

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

Avoid extreme heat. Do not mount next to turbo-charger, exhaust manifold, or other high tempera-ture equipment.

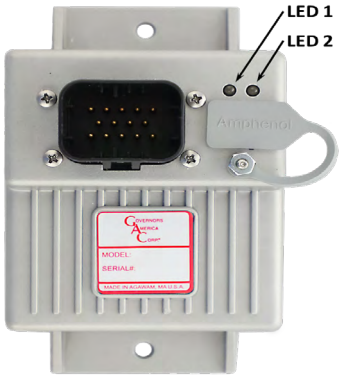
An overspeed shutdown device, independent of the governor system, should be used to prevent loss of engine control which may cause personal injury or equipment damage.

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.

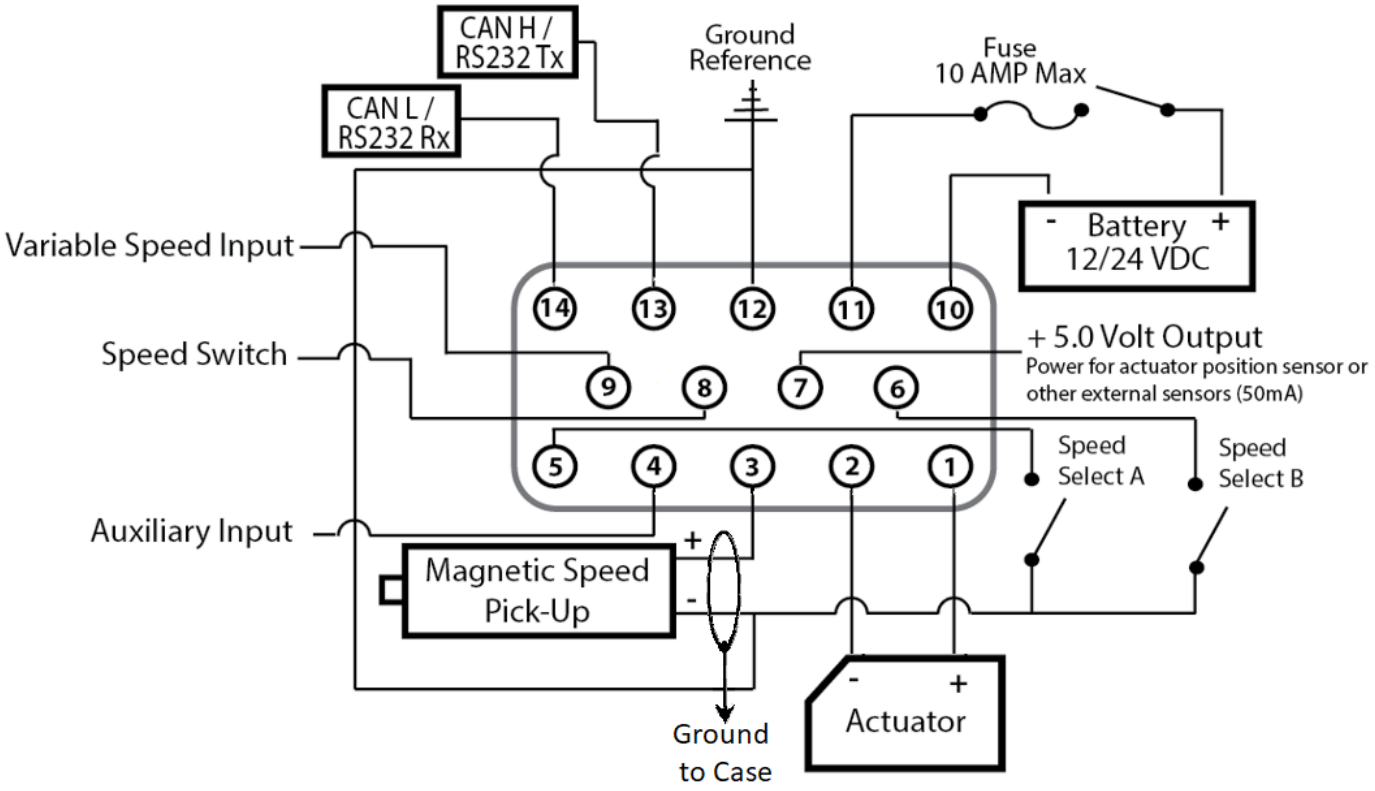
4 LED DEFINITIONS

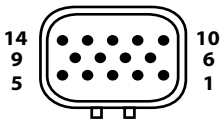
Error messages display in the GAConfig Tool, and on the controller itself as LED displays.

LED	COLOR	DEFINITION
1	SOLID GREEN	Controller is powered on
2	OFF	No faults, system is working properly
2	SOLID YELLOW	Warning: Engine service due, or other warning as displayed in the GACConfig Tool. If using J1939 see the J1939 CAN INFO / DIAGNOSTIC TROUBLESHOOT-ING CODES (DTC) section in this guide.
2	BLINKING RED	Actuator current high, shutdown and retry in 30s.
2	SOLID RED	System shut-down: • Actuator current exceeds 8.0 A for 12 ms continuously • Engine speed drops or rises faster than 25 kHz/s • Engine speed exceeds overspeed • User commanded engine shutdown • Incompatible hardware • Loss of magnetic pickup signal



5 EEG7000 WIRING OVERVIEW





14-pin AMPSEAL requires GAC mating connector kit EC1502 or cable harness CH1520. Use a crimping tool to connect the connector and harness.

PIN	DEFINITION	GAUGE	NOTES
1	Actuator (+)	16	Polarity not required for actuator
2	Actuator (-)	16	
3	Magnetic Pickup (+)	20	* Ground to Pin 12
4	Aux Input	20	* 0 - 10 V Range, 5 V Nominal, Selectable Polarity
5	Speed Select A	20	* Ground to Pin 12 to Enable
6	Speed Select B	20	* Ground to Pin 12 to Enable
7	+5.0 Volt Output	20	* Power for external sensors (50 mA)
8	Speed Switch Output	16	* 2A MAX, LSO
9	Variable Speed Input	20	* Potentiometer, 0- 5 V DC or 4 - 20 mA, selectable polarity
10	Battery Ground (-)	16	Battery ground
11	Battery Power (+)	16	A 10 amp fuse must be installed in the positive battery lead to protect against any overload or short circuit or reverse voltage
12	Ground Reference / Speed Select Ground	20	Ground reference for magnetic pick-up (-), sensors and switches
13	CAN H / RS232 Tx	20	CAN bus or RS-232 configurable through the GAConfig Tool
14	CAN L / RS232 Rx	20	

*Pin assignments are not the same as EDG6000.
Review all diagrams and/or additional notes before wiring.

WIRING RECOMMENDATIONS

- Use the GAC mating connector EC1502 or cable harness CH1520 with the 14-pin AMP-SEAL with the EEG7000.
- Ground the EEG controller case to the engine battery (-).
- Wires must be twisted and/or shielded for their entire length (14 turns per foot). Ground shield to case.
- Minimum gap between speed sensor and gear teeth is 0.02 in [.5 mm].
- The minimum speed sensor voltage is 1 V AC RMS during crank.
- See the product bulletins of the equipment you are connecting to for more detailed wiring information on those items.
- Values are assigned to the wiring parameters using the GAConfig Tool.

6 EEG7000 BASIC WIRING

PIN 3 - MAGNETIC SPEED PICK-UP

A magnetic speed sensor detects when ring gear teeth pass the tip of the magnetic speed sensor. The output signal is an AC sine wave whose frequency is converted to crankshaft revolutions per minute (RPM). The following are required:

- A magnetic pickup must be installed in the engine bell housing, ring gear case, or fabricated bracket.
- All wires must be twisted and/or shielded for their entire length (14 turns per foot).
- Ground shield to case. Do not tie case to ground.
- The magnetic speed sensor voltage should be at least 1 V RMS while cranking. During operation, 5 to10 V RMS is recommended.
- If the EEG7000 detects no input from the magnetic pickup, the EEG sets the actuator to 0 V DC and the speed to 0 RPM. If the EEG detects loss of magnetic pickup, LED 2 turns solid red and the system must be reset.
- To reset the EEG, cycle DC power.
- The magnetic speed sensor connections MUST BE TWISTED AND/OR SHIELDED for their entire length.
- The speed sensor cable shield must only be connected to the case. The shield should be insulated to ensure that no other part of it comes into contact with engine ground, otherwise stray signals may be introduced into the speed switch.
- Minimum gap between speed sensor and gear teeth is 0.02 in [.5 mm]. When the engine is stopped, adjust the gap between the magnetic speed sensor and the ring gear teeth. Usually, backing out the speed sensor 3/4 turn after touching the ring gear tooth will result in a satisfactory gap.

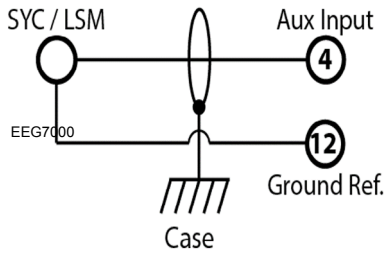
PIN 4 - AUXILIARY INPUT

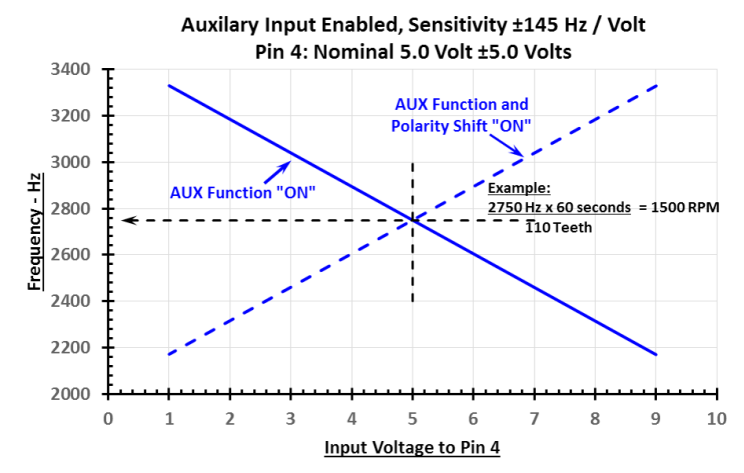
The auxiliary (AUX) pin accepts input signals from load sharing units, auto synchronizers, and other governor system accessories. The AUXILIARY input from Pin 4 is activated by selecting Auxiliary Enable in the GAConfig Tool Advanced Governor Settings menu and selecting the desired Auxiliary Polarity.

The AUX function decreases engine speed with increasing input voltage, the polarity shift function increases engine speed with increasing input voltage. Aux input is nominally 5.0 V +/- 5.0 V DC.

Aux accepts signals from:

- GAC accessories
- Auto synchronizers
- Load sharing units
- Other governing accessories



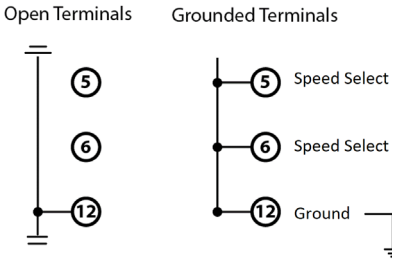


6 EEG7000 BASIC WIRING (CONTINUED)

PINS 5 AND 6 - SPEED SELECT

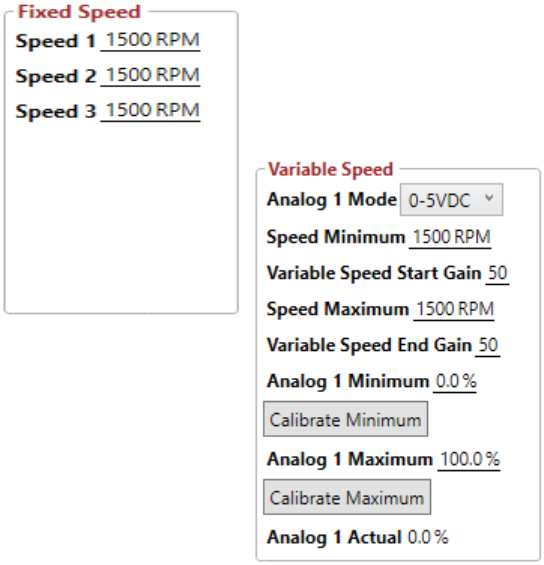
The EEG7000 has two inputs which, in various combinations, allow the user to use three fixed speed settings or the variable speed setting. This is accomplished by tying inputs to ground or leaving them open. Fixed Speed 1 can be set to idle as required.

WIRING COMBINATIONS		
PIN 5	**PIN 6**	**Speed Mode**
Open	Open	Variable Speed (or Fixed Speed)
Ground	Ground	Fixed Speed 1
Open	Ground	Fixed Speed 2
Ground	Open	Fixed Speed 3



Speed is set from the GAConfig Tool on the Engine Tuning menu in the Fixed Speed and Variable Speed blocks.

- To set variable speed, select the analog mode for your variable input signal, and input desired RPM. See Section 10, Setting Variable Speed Parameters bulletin for more details.
- The Analog 1 minimum and maximum settings can be automatically calibrated using Calibrate Minimum or Calibrate Maximum.
- To calibrate the minimum percent set the potentiometer to the desired start value and click the Calibrate Minimum button. To calibrate the maximum percent set the potentiometer to the highest end value and click Calibrate Maximum button. The difference between the analog minimum speed settings will be at least 25 % to prevent rough idle.



PIN 7 - ANALOG INPUT

Pin 7 provides analog input from external trim or variable speed potentiometers. It is also used to create resistive Input: (Select 0 - 5V / Resistive). Connect a 5 k Ω potentiometer between Pins 7, 9 and 12 as shown under Variable Speed.

PIN 8 - SPEED SWITCH OUTPUT (SSW)

When the EEG7000 detects engine speed has reached the user defined Limit / Threshold value, the EEG7000 controller changes the state of Pin 8. The SSW can be used for overspeed protection, starter cutoff (crank termination), and other general auxiliary functions.

- The SSW adjustment range is 100 to 6000 RPM. The default value is 1800 RPM and the default state (Mode) is NORMALLY OPEN.
- When NORMALLY OPEN is selected the SSW output on Pin 8 will energize at the set speed. When NORMALLY CLOSED is selected output from Pin 8 will de-energize at the speed setting.
- When the LATCHING box is checked the SSW output state is fixed until power to the unit is cycled. When the box is not checked the output state automatically resets at 0 RPM. The default is checked (ON).

PIN 9 - ANALOG VARIABLE SPEED

Analog variable speed is enabled when Pins 5 and 6 are **not** grounded. Connect a 5 kΩ potentiometer,0 - 5 V DC or 4 - 20 mA speed input signal,to Pin 9. The default setting is 0 - 5 V DC with variable speed available.

Variable Speed Analog 1 Mode in the GAConfig Tool must be set to 0-5 V DC or 4-20 mA to use this function.

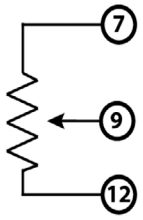
Setting variable speed requires a potentiometer, available from GAC. A potentiometer calibration within the GAConfig Tool characterizes the selected potentiometer.

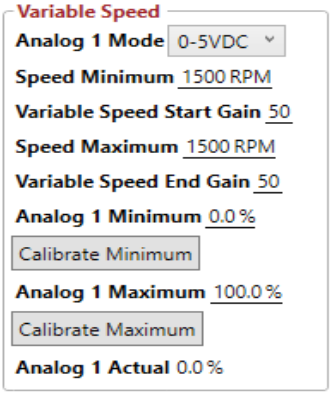
Variable Speed can be used as another fixed speed setting if both Speed Minimum and Speed Maximum parameters are set to the same RPM and no potentiometer is connected.

For more details on setting variable speed see Section 10, Setting Variable Speed Parameters.

NOTE Setting the Minimum Speed and Maximum Speed to the same value with no input on Pin 9 enables you to use Variable Speed as an additional fixed speed setting.

5K Potentiometer





PIN 9 - DIGITAL VARIABLE SPEED

Digital variable speed is enabled when Pins 5 and 6 are **not** grounded. Connect a 5 kΩ potentiometer,0 - 5 V DC or 4 - 20 mA speed input signal,to Pin 9. The default setting is 0 - 5 V DC with variable speed available.

Variable Speed Analog 1 Mode in the GAConfig Tool must be set to 0-5 V DC or 4-20 mA to use this function.

Setting variable speed requires a potentiometer, available from GAC. A potentiometer calibration within the GAConfig Tool characterizes the selected potentiometer.

Variable Speed can be used as another fixed speed setting if both Speed Minimum and Speed Maximum parameters are set to the same RPM and no potentiometer is connected.

For more details on setting variable speed see Section 10, Setting Variable Speed Parameters.

PINS 13 AND 14 - CAN H AND CAN L - RS-232

The CAN output supports J1939 protocol for basic engine speed and Diagnostic Trouble Codes (DTCs). More on the diagnostic trouble codes (DTCs) detailed in section 17 J1939 CAN Settings and Diagnostics in this bulletin.

- The CAN bus must be terminated at both ends by a 120Ω resistor.
- Use cable harness CH1520, 7 AWG, or EC1502 mating connector kit with twisted pair that meets SAE J1939 or SAE J1128 standards.

7 INSTALLING THE GACONFIG TOOL

EEG7000 speed controller uses the GAConfig Tool to update parameter values on the EEG7000, adjust performance settings, and view results. This PC tool provides a menu-driven user-friendly interface to update settings, and speed diagnostics and troubleshooting. The tool also allows you to set up multiple scenarios and save them for use later or for sharing with other sites using the EEG7000.

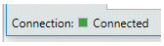
The GAConfig Tool is downloaded from GAC's website. A PC with at least Windows 7, one USB port and an internet connection is required.

A 14 pin connector (GAC EC1502) or cable harness assembly (CH1520) is also required. An RS-232 port connection is required, since many computers do not have this port, use a USB-to-RS-232 converter will be required. GAC recommends GAC part number EAM204.

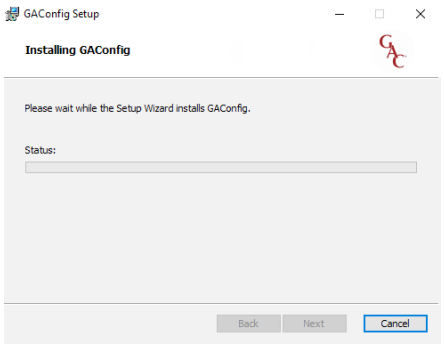
INSTALLING GACONFIG TOOL AND CONNECTING TO EEG7000

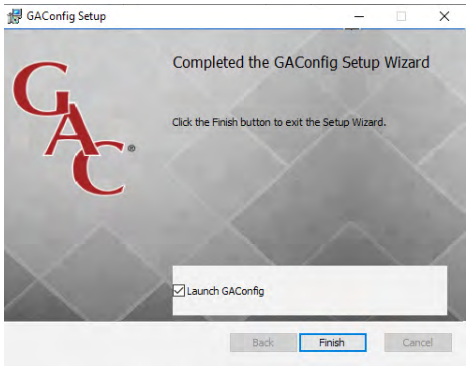
1. Download the GACConfigx.zip file from the governors-america.com software download page. Depending on your network, the installer may ask for additional information. After installation your PC will require a restart.
2. The zip file is saved to the PCs default download area, unless you tell it otherwise. Once downloaded, double-click the file name to start the installation. You may need to double click again on the EEG7000 IT setup.exe file to actually begin the installation.
3. The Welcome screen displays. Click Next. Note the default installation is in the Governors America Corp program files area.
4. Click Next. Allow the installation to create a desktop icon. You can also create a quick Launch icon.
5. Click Next. The installation will create a Governors America Corp startup folder location. Click Next. Click Install at the next screen. Click Finish when complete. The GAConfig icon is placed on the desktop.

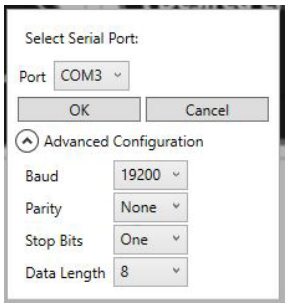
6. Connect the EEG7000 to the PC using a USB-A port and connect the USB-B port on the EEG7000. Power for the controller comes from the engine battery. Ensure the system is powered. Do not start the engine.
7. Double-click the GAConfig Tool icon on your desktop. On first use, when prompted, select EEG7000 from the drop-down list.
8. Click OK to launch the tool.
9. Connect the GAConfig Tool to the EEG7000 by clicking on the Connect icon on the top left of the GAConfig window.
10. A pop-up dialogue window displays a drop-down list of available comm ports. Select the appropriate port and click OK. If you are unsure of the comm port, use the Windows Device Manager to locate what device is plugged in to which USB port.
11. The Connection Status indicator on the lower left corner of GAConfig Tool window flashes yellow then turns green as the connection is completed. The status bar displays Connected. If the connection does not complete, a red Disconnected message displays. Check your connections and note any error messages on the PC and try again.



REMINDER Power for the EEG7000 comes from the engine battery.

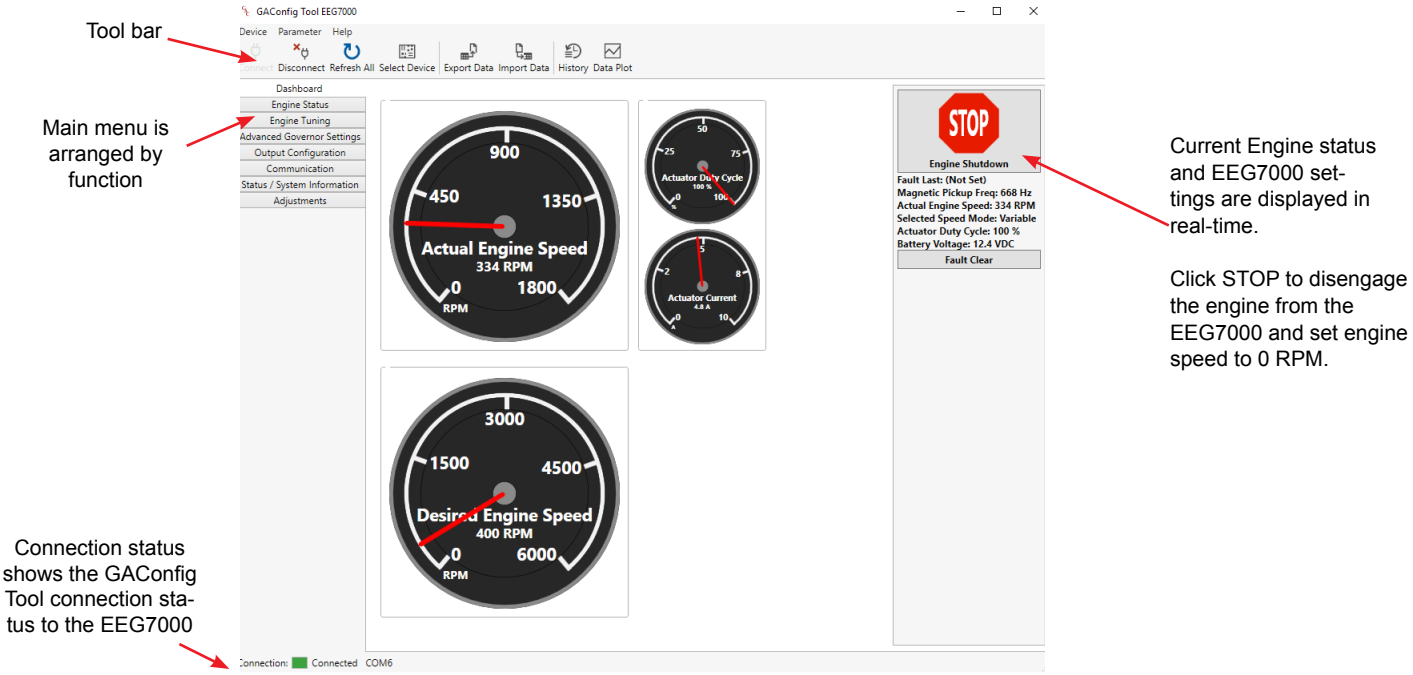






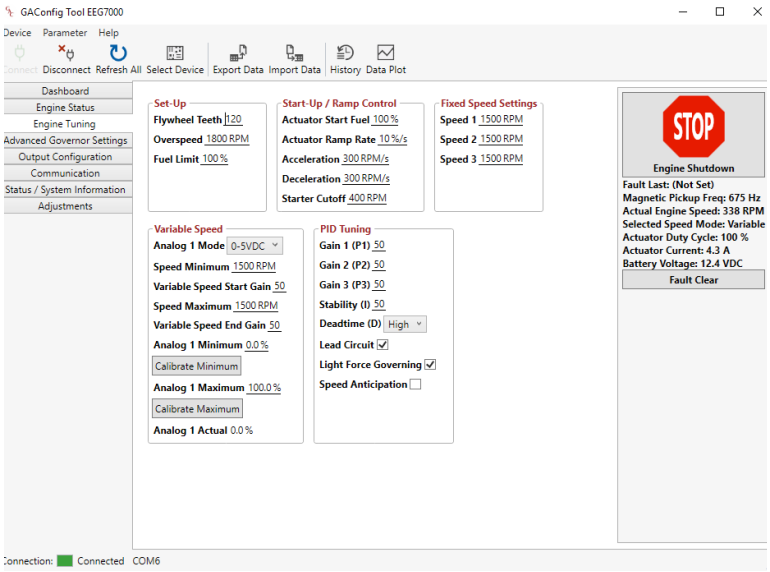
8 USING THE GACONFIG TOOL

EEG7000 speed controller uses the GAConfig Tool to set parameters on the EEG7000, adjust performance settings, and view results. Parameters are grouped by functionality at the Main menu. Parameters are grouped by functionality at the Main menu. Initial setup is completed from Engine Tuning on the main menu.



QUICK START RULES TO USING THE GAConfig TOOL

- Update parameter values by double-clicking the underline or existing value next to a parameter name. Type in the new value and click Enter to save the change. A green checkmark next to the change indicates the change was successful. No check or a red or yellow warning icon indicates the change was not saved or caused a conflict with another setting.
- For a short description of a parameter, hover the cursor over the parameter name and a description briefly displays, or reference the item in the Adjustment menu where a short description is available in its associated menu tab.
- Errors and parameter information display when you change a value. Read all RED warning boxes error information, yellow cautions, and other pop-up information. Setting some parameter values impact other parameter values, often displaying a caution.
- The GAConfig Tool windows automatically sizes windows to fit the window size.
- While using the tool, note the far right screen engine status bar, showing Engine Status information.
- Selecting STOP sets the engine speed to 0 RPM and shuts down the EEG7500 controller. It does not shut down the engine directly.



8 USING THE GACONFIG TOOL (CONTINUED)

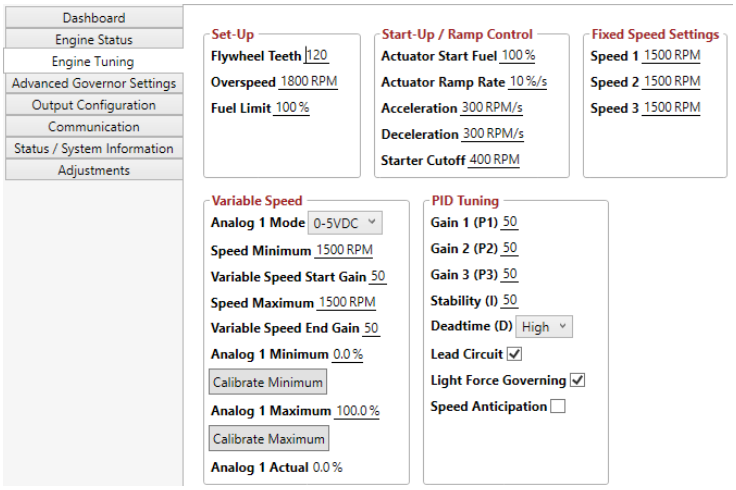
The Main menu is divided by function. The Dashboard and Engine Status as well as the right hand Engine Status panel show the engine status. The menus are:

- **Engine Tuning** includes basic setup of initial and system safety settings including control mode (based on actuator type) over-speed, flywheel, fuel settings and acceleration rates. Engine Tuning also includes fixed speed settings, PID (Gain, Stability, Dead-time) tuning, Variable Speed setup. A fuel limiting table can also be built here.
- **Position Feedback Calibration** allows for automatic or manual configuration of the feedback sensor.
- **Advanced Governor Settings** include the auxiliary settings, droop, and speed trim.
- **Output Configuration** assigns speed and position switches, and output devices.
- **Communication** connects with output routing, diagnostic messaging and TSC1/J1939.

ENGINE TUNING

Engine Tuning is the basic menu used to store your engine startup and tuning information.

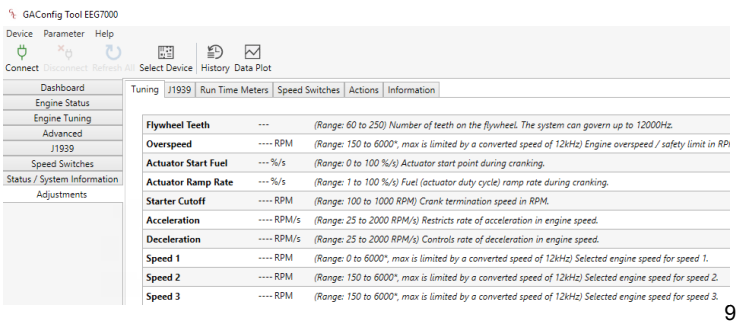
- Flywheel teeth, overspeed, fuel limit
- Start fuel rate, Fuel ramp rate, starter cutoff, acceleration and deceleration
- Fixed speeds
- Variable speed settings
- PID Tuning (Gain, Stability, Deadtime)
- Lead circuit, Lightforce Governing, Speed anticipation
- Fuel Limit Table



ADJUSTMENTS

The adjustments menu includes all the parameter settings for the EEG7000 available in the GAConfig Tool. This menu allows you to set all the parameter settings from one place. Parameters are on the following tabs:

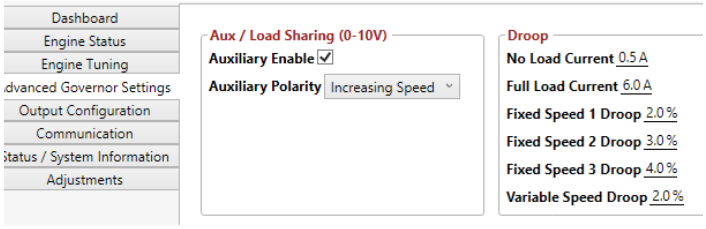
- Tuning
- J1939
- Run Time Meters
- Speed Switches
- Actions
- Information



ADVANCED GOVERNOR SETTINGS

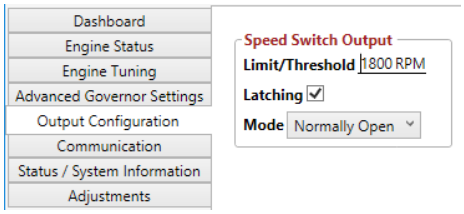
The Advanced Governor Settings menu lets you:

- AUX enable, aux polarity
- Droop



OUTPUT CONFIGURATION

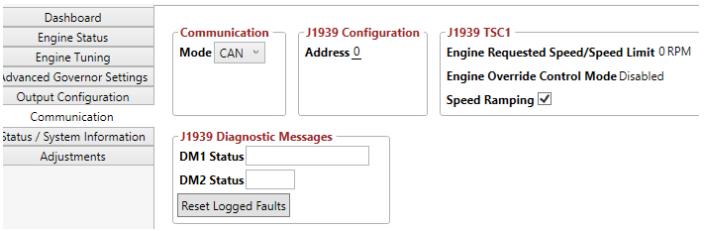
Output configuration allows the EEG7000 to connect to speed switches.



COMMUNICATION

The communication menu lets you:

- Set the base Internet address type, either CAN or RS232
- Set J1939 information and base settings
- Acknowledge error messages
- Map routing between the EEG7000 and the J1939 system



9 GETTING STARTED

The EEG7000 can be set up and used straight out of the box, with an actuator attached, using default settings. This section details the initial installation and setup using the default settings. Wiring between the engine and the EEG7000 is required, and reviewing this document and default settings is advised.

There are two sets of parameters to work with: basic engine performance and engine tuning. Getting Started gets your engine started. Engine Tuning improves performance.

Before you start your engine:

- Install the GAConfig Tool on a PC and connect the PC to the EEG7000 with the USB cable
- Provide power to the EEG from the battery.
- Install an actuator between EEG7000 and engine, following your actuators Installation Manual.
- Set the following minimum settings in the GAConfig Tool on the Engine Tuning menu:
  - Overspeed for automatic actuator shutdown
  - Number of engine flywheel teeth
  - Fuel Limit
  - Acceleration and Deceleration
  - Actuator Ramp Rate
  - Starter Cutoff

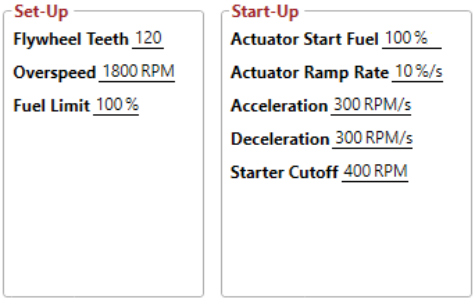
MINIMUM WIRING SETUP

Wiring between the engine, the EEG7000 speed unit, and the actuator should be completed before starting the engine. See Sections 5 and 6 for more wiring details. The following are the minimum wiring requirements:

- Connect Actuator to EEG7000 (Pins A and B)
- Connect Actuator to magnetic pickups (Pins 1 and 2)
- Connect EEG7000 to battery (Pins C and D)
- Connect USB from EEG7000 to PC

At the GAConfig Tool:

1. At the Main menu select Engine Tuning.
2. Note if the Flywheel Teeth value is correct for you engine. If not, double click on the value and change it. Click Enter.
3. Enter values for all the all Set-Up and Start-Up parameters.
4. In the same menu, enter the Fixed Speed Settings values for Speed 1, Speed 2, and Speed 3.
5. Gain, Stability, and Deadtime can also be set here.



Further descriptions on these and all parameters are in section 15, GAConfig TOOL - SETTING ALL PARAMETERS

FIXED SPEED SETTINGS

PARAMETER	RANGE	DEFAULT	DEFINITION
Speed 1	0 - 6000	1500	Selects one of three fixed speeds (RPM).
Speed 2 and 3	150 - 6000	1500	
Gain 1,2 and 3	1 - 100	50	Set one Gain value for each fixed speed.

START YOUR ENGINE

Do not rely exclusively on the governor system electronic actuator to prevent overspeed. A secondary shutoff device, such as a fuel solenoid must be used. STOP ENGINE shuts down the actuator, not the engine.

Once the parameter settings are reviewed and values updated as required, reconnect your fuel supply and start your engine.

1. Reconnect the fuel supply.
2. Crank the engine with DC power applied to the governor system. The engine should be at operating speed with no load.
3. The actuator/ fuel to the engine will be positioned to the level set by the Actuator Start Fuel (default is maximum fuel). Actuator Ramp Rate controls the rate at which fuel is increased to start the engine, 10% by default.
4. If the engine is unstable after starting, open the GAConfig Tool and adjust the Gain, Stability, and Deadtime in the Engine Tuning menu in the PID Tuning block, until the engine is relatively stable.
5. Once the engine is stable you can connect additional devices and further tune your engine.

9 GETTING STARTED (CONTINUED)

ADJUSTING BASIC STABILITY WITH FIXED SPEED

Once the engine is running at operating speed, with no load, use the GAConfig Tool to adjust the parameter values to increase engine stability. Each speed parameter, 1 through 3, has a separate Gain value. The speed selection number and active Gain are shown in the PID Tuning section.

Stability is achieved by balancing PID: Gain, Stability, and Deadtime.

- **Gain** (proportional) changes the initial response of the speed controller. Increasing gain makes the engine more responsive to load changes while decreasing gain makes it less responsive to load changes. Avoid engine instability due to high gain when adjusting this parameter.
- **Stability** (Integral) changes the steady state response of the engine. Increasing stability allows the system to come to steady state speed faster, while decreasing the stability results in a more gradual transition to steady state speed.
- **Deadtime** (Derivative) sets the transient response of the engine to high or low and affects stability during transient load changes. Increasing deadtime decreases the percent of overshoot and settling time during a transient load change while decreasing deadtime increases them. **Setting Deadtime to High can cause random speed instability during steady state since small speed errors are amplified by this parameter.**

To improve basic performance, with no engine load complete the following:

1. At the GAConfig Tool open the Engine Tuning menu, and at the PID Tuning block, perform the following:
   a. Increase the Gain by entering new value until instability develops. Gradually decrease the Gain until stability returns. Decrease the adjustment one count further to ensure stable performance.
   b. Increase Stability value until instability develops. Gradually decrease Stability value until stability returns. Decrease the value by one to ensure it is stable. If there is no instability leave set at 50.
   c. Set the DEADTIME to Low. If instability develops, change to High.

NOTE Additional adjustments may be required after engine load is applied. Normally, adjustments made at no load achieve satisfactory performance.

10 SETTING VARIABLE SPEED PARAMETERS

Variable speed parameters activate throttle or fuel control relative to the variable speed input signal. This requires a single remote speed adjustment potentiometer is installed to adjust the engine speed continuously over a specific speed range.

- Voltage Input: (Select 0 - 5 V / Resistive) Voltage to 5.0 V, above 5.0 V the variable speed function is clamped at 100%, RPM response to voltage is linear.
- Resistive Input: (Select 0 - 5 V / Resistive) Connect a 5 kΩ potentiometer between Pins 7, 9 and 12 as shown in Variable Speed. Maximum operating voltage is 5.0 V DC, response to resistive input is linear.
- Current Input: (Select 4 - 20 mA) SPEED MINIMUM sets the low speed at 4 mA. SPEED MAXIMUM sets the high speed at 20 mA. If the input current drops below 4 mA, variable speed is clamped at 0%. If the input current level exceeds 20 mA, variable speed is clamped at 100%. RPM response to current is linear.

VARIABLE SPEED PARAMETERS

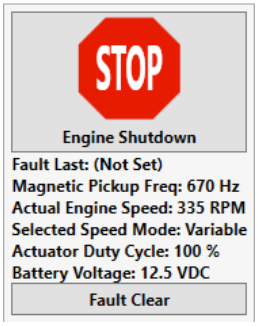
PARAMETER	RANGE	DEFAULT	DEFINITION
Analog 1 Mode	0 - 5 V DC or 4 - 20 mA	0 - 5 V DC	Sets the variable speed input for the analog device. Use 0 - 5 V DC for resistive.
Speed Minimum	150 - 6000 RPM	1500	Minimum speed setting
Variable Speed Start Gain	1 - 100	50	PID Gain to use when at the minimum speed while in variable speed.
Speed Maximum	150 - 6000 RPM	1500	Maximum speed setting.
Variable Speed End Gain	1 - 100	50	PID Gain to use when at the maximum speed while in variable speed.
Analog 1 Minimum (Calibrate button)	0 - 75 %	0*	Sets the range for the minimum variable speed. Range: 0 to 75 % and must be 25% apart from end position. This can be calibrated automatically by clicking Calibrate Minimum.
Analog 1 Maximum (Calibrate button)	25 - 100 %	100*	Sets the range for the maximum variable speed. Range: 25 to 100% and must be 25% apart from start position. This can be calibrated automatically by clicking Calibrate Maximum.
Analog 1 Actual	0 - 100 %	100	Status of the current variable speed input position.

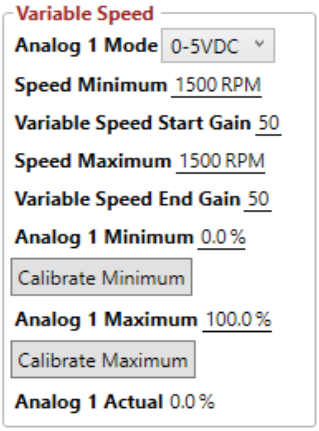
* Setting % RPM and 100 % RPM

SETTING VARIABLE SPEED SETTINGS

1. Review the Engine information block on the far right of the GAConfig Tool screen to make sure Selected Speed Mode displays as Variable. Variable Speed is set when Pins 5 and 6 are not grounded and a 5 kΩ potentiometer is available from Pin 9. See wiring table and diagram starting in Section 5 for details on potentiometer wiring.
2. Open the GAConfig Tool.
3. At the Engine Tuning menu, in the Variable Speed box, select the Analog 1 Mode from the dropdown menu (voltage, resistive, or current input) that corresponds to your actuators input signal.
4. If using resistive input, set the potentiometer in the full counter-clockwise position.
5. Set Speed Minimum.
6. Set Variable Speed Start Gain to optimize minimum gain.
7. Analog 1 Minimum and Maximum can be set manually or automatically using the calibrate buttons.
   a. To set automatically, select the Calibrate Minimum button.
   b. To set manually, set Analog 1 Minimum values between 0 to 75 %

   NOTE: The tool will reset any values that are not 25% apart to the closest valid number.
8. If using resistive input, set the potentiometer in the full clockwise position.
9. Set the Speed Maximum.
10. Set Variable Speed End Gain to optimize maximum gain.
11. To maintain engine stability at the minimum speed setting, add a small amount of droop using Droop in the GAConfig Tool Advanced menu. At the maximum speed setting performance will be near isochronous, regardless of the droop adjustment setting.

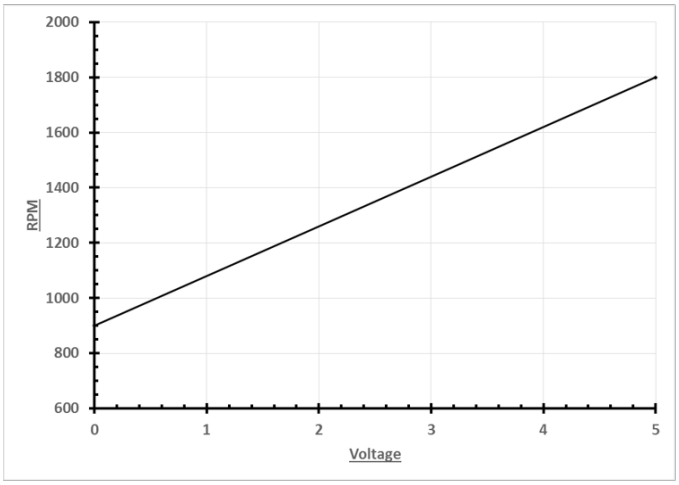




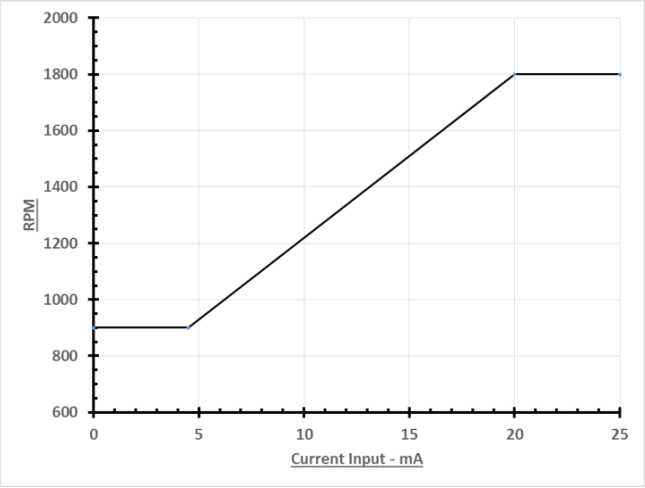
NOTE

- If the Minimum Speed setting is higher than Maximum Speed, increasing the speed input signal / potentiometer position will decrease RPM.
- Minimum Speed and Maximum Speed setting ranges are 150 to 6000 RPM with default value of 1500 RPM.
- Gain, Stability, and Deadtime values may need adjustment after engine load is applied.
- Normally adjustments made at no load achieve satisfactory performance.
- If further performance improvements are required, see Section 18, Troubleshooting, in this guide.

0 - 5V Input To Pin 9



4 - 20mA Input To Pin 9



Conversion Formulas:

NOTE

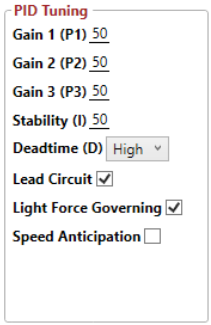
$$Hertz_{MAG\ PICKUP} = \frac{(RPM \times \#Teeth)}{60}$$

$$RPM = \frac{(Hertz_{MAG\ PICKUP} \times 60)}{\#Teeth}$$

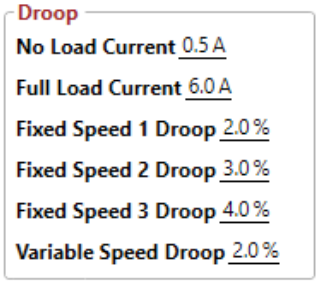
11 ADJUSTING FOR DROOP

Droop adjustments are made while the engine is running. Setting droop reduces the speed as fuel position (load) increases.

To maintain engine stability, at the minimum speed setting, add a small amount of droop. At maximum speed performance will be near isochronous regardless of the droop adjustment setting.



1. Open the GAConfig Tool on your PC. From the Main menu, select Engine Tuning and locate the PID Tuning box.
2. Check that Lead Circuit is set to Off. The default is On.
3. From the Main menu select Advanced Governor Settings and locate the Droop box.
4. Set No Load Current to the measured / displayed current value when operating at no load rated speed (default value is 0.5 A.).
5. Set Full Load Current to the measured / displayed current value when operating at full load rated speed (default value is 6.0 A.) (NFSC controller).
6. Set Droop to the desired settings for each of the three fixed speeds and one variable speed as needed.



NOTE

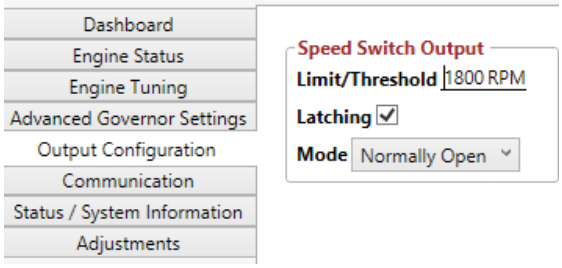
The No Load Current value must be set to less than Full Load Current and the difference between the two must be at least 0.5 A.

If an invalid combination is entered a warning message displays and the default to 0.5 A and 6.0 A.

12 SPEED SWITCH OUTPUT (SSW)

Use the Speed Switch Output parameters to receive information from sensors for low and high speed settings as well as other speed parameters.

The SSW's range of adjustment is 100 to 6000 RPM. The default value is 1800 RPM and the default state is NORMALLY OPEN.

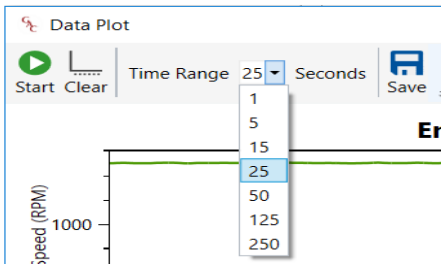


1. From the GAConfig Tool Main menu, select Speed Switches and navigate to the Speed Switch Output box.
2. At Limit / Threshold set the RPM limit for speed switch 1 output.
3. From Mode, select one of the following from the drop down menu:
   - NORMALLY OPEN output from Pin 8 energizes at the set RPM.
   - NORMALLY CLOSED output from Pin 8 de-energizes at set RPM.
4. Select LATCHING (On) to the SSW output state to fixed until power to the EEG7000 is cycled. When the box is not checked the output state automatically resets to the Limit/Threshold RPM to 0 RPM after power cycle to the system.

13 DATA PLOTTING

Data Plot displays real-time engine data with RPM and actuator duty cycle versus time. The cursor aligns the engine speed and duty cycle plots to display a time relationship.

1. In the GAConfig Tool tool bar, select Data Plot.
2. Set the Time Range (in seconds).
3. Click Start. The data displays similar to shown below. Note the time and RPMs display when you move your cursor over the green timeline.
4. To save the data, click the Save button. The file is saved as a printable graphic (*filename*.png) file.



14 FACTORY RESTORE OF SETTINGS

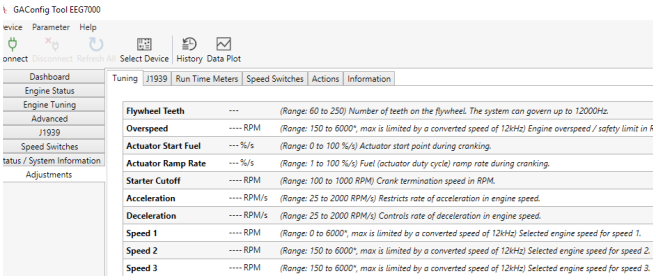
Factory default settings can be restored using the **Factory Restore** on the something tab of the Adjustments menu. The factory default settings are restored. Click **Refresh All** on the Main menu and the view screen will update with the factory default settings. Factory restore can be done when the engine is off but the GAConfig Tool is running.

To complete a Factory Restore, first export your current settings and save to a local computer to allow you to compare settings at a later date.

15 GACONFIG TOOL - SETTING ALL PARAMETERS

Selecting the **Adjustments** menu gives you access to all the parameters from one menu location. The parameters are grouped by function and relate directly to the GAConfig Tool groupings.

THe adjustments menu does not give you all the error messages the core menus do. Remember, parameter values may be updated by the software if they interfere with other related parameters.



ADJUSTMENTS			
PARAMETER	**MIN - MAX**	**DEFAULT**	**NOTES**
Set-Up			
Flywheel Teeth	60 - 250	120	Number of teeth on the flywheel. The system can govern up to 12000 Hz. $Hertz_{MAG\ PICKUP}$ = (RPM x #Teeth) ÷ 60
Overspeed	150 - 6000*	1800	RPM set to cause automatic actuator shut down. Set this value low enough to prevent mechanical damage but high enough to allow realistic load rejection speeds without stopping the engine. Begin by setting at no more than 25% above rated speed.
Fuel Limit	0 - 100 %	100	Maximum fuel (actuator duty cycle) allowed during governing. Use this parameter to prevent over fueling after the engine has started. During normal starting cycles and short load step the function will not engage since there is a 1 second delay.
Start-Up / Ramp Control			
Actuator Start Fuel	0 - 100 %	100	Actuator start point during cranking.
Actuator Ramp Rate	1 - 100 %/s	10	Fuel (actuator duty cycle) ramp rate during cranking.
Starter Cutoff	100 - 1000 RPM	400	Crank termination speed in RPM.
Acceleration	25 - 2000 RPM/s	300	Controls rate of acceleration in engine speed. A lower value RPM/s allows for a gradual increase in engine speed while a larger value of RPM/s provides faster acceleration
Deceleration	25 - 2000 RPM/s	300	Controls rate of deceleration in engine speed. Lower RPM/s allows for a gradual decrease in response to engine speed while higher RPM/s create more rapid deceleration.
Fixed Speed Settings			
Speed 1 Speed 2, 3	0 - 6000* 150 - 6000*	1500 1500	Set engine speeds.
Variable Speed			
Analog 1 Mode	4-20 mA or 0-5 V DC	0-5 V DC/ resistive	Sets variable speed input signal (Analog 1 Mode) to 0-5 V DC/Resistive or 4-20 mA
Speed Minimum Speed Maximum	150 - 6000* 150 - 6000*	1500 1500	Minimum and maximum speed settings.
Variable Speed Start Gain Variable Speed End Gain	1 - 100 0 - 100	50 50	PID Gain to use when at the minimum speed while in variable speed. PID Gain to use when at the maximum speed while in variable speed.
Analog 1 Minimum (Calibrate button)	0 - 75 %. Must be 25% apart.	0	Sets the variable input start position based on the current value. Range: 0 to 75 % and must be 25% apart from end position. Use the Calibrate button to set this automatically.
Analog 1 Maximum (Calibrate button)	25 - 100 %. Must be 25% apart.	100	Sets the variable end position based on the current value. Range: 0 to 75 % and must be 25% apart from end position. Use the Calibrate button to set this automatically.
PID Tuning			
Gain 1, 2, 3	1 - 100	50	Gain determines how fast the controller responds to transient load changes or when a load disturbance occurs.
Stability	0 - 100	50	Stability changes the steady state response of the engine. Increasing stability allows the system to come to steady state speed faster while decreasing stability results in a more gradual transition to steady state speed.
Deadtime	Low - High	High	PID deadtime
Lead Circuit	On-Off	On	Lead Circuit increases the range of Gain adjustment increasing the responsiveness of the governor. Select Lead Circuit with slow or moderate hunting at higher Gain settings.
Light Force Governing	On-Off	Off	Light Force Governor improves resolution when controlling small actuators and low current including GAC T1 ATB, ALR/ALN, 100/103/104 series and normally closed actuators. This feature can only be changed when the engine is not running.
Speed Anticipation	On-Off	Off	Speed anticipation set to ON reduces RPM recovery time during high load transients and requires both no load (NLCU) and full load current (FLCU) values are entered.

Other Adjustments			
PARAMETER	**MIN - MAX**	**DEFAULT**	**NOTES**
Aux / Load Sharing			
Auxiliary Enable	On-Off	Off	Controls auxiliary / load sharing function
Auxiliary Polarity	Decreasing - Increasing Speed	Decreasing Speed	Auxiliary Input Polarity is set to either increase speed with increased voltage or decreases speed with increased voltage. Aux input is nominally 5.0 V +/- 5.0V DC.
Droop			
No Load Current	0 - 5.5 A	0.5 A	Actuator current at rated speed, no load.
Full Load Current	0.5 - 6.0 A	6.0 A	Actuator current at rated speed, full load (NFSC controller).
Fixed Speed 1, 2, 3, Droop	0 - 25 %	0	Percent of droop (% RPM decrease at full load) to incorporate while associated fixed speed select 1, 2, or 3.
Variable Speed Droop	0 - 25 %	0	Percent of droop (% RPM decrease at full load) to incorporate while in variable speed mode.
Output Configuration - Speed Switch Output			
Limit/Threshold	100 - 6000 RPM	1800	Speed limit for speed switch 1 output.
Latching	On - Off	On	Latching set to ON sets the output state ON until power is cycled. With the Latch setting OFF, the output state of the pin automatically resets at 0 RPM.
Mode	Normally Open, Normally Closed	Normally Open	Mode sets the output polarity at either normally open or normally closed.
Communication			
Mode	CAN or RS232		Sets the input/output access to CAN or RS-232 communication.
Address	0 - 253	0	Sets the CAN address for J1939 communication
Engine Requested Speed	0 - 6000 RPM	1500	Sets Speed Limit
Engine Override Control Mode	Disabled-Enabled	Disabled	Currently unavailable. Will control PGN0 SPN695 Current Torque/Speed Control 1 - Engine Override Control Mode.
Speed Ramping	On-Off	Off	Current TSC1 speed command limit
J1939 Diagnostic Messages	---	---	DM1 and DM2 status and reset
Run Time Meters			
Service Timer Enable	0 = Disabled, 1 = Enabled	0*	Controls the service timer. *Transitioning from disabled to enabled automatically sets the service timer to +500 hours
Current Service Hours	1 - 2000	500	Setting service hours sets the hour meter for an alert at the selected service interval. Hours can be set from 1 to 2000 hours. If the service time is expired, the displayed number will be ‘0’ or negative.
Reset Service Hours	1 - 2000	500	When the service timer is enabled, resets the service counter to this value
Engine Runtime	0 - 65535.9		Current runtime hours
Actions			
System Reset	Button		Performs a software reset of the system. Engine speed must be 0.
Engine Shutdown	Button		Software commanded engine shutdown.
Factory Restore	Button		Restores factory default settings to GAConfig Tool and the speed controller.
Fault Clear	Button		Clears fault indicators.
Force DM3	Button		Clears all J1939 previously active faults as if a DM3 command was received.

Items in Gray are display only.

16 J1939 CAN SETTINGS AND DIAGNOSTICS

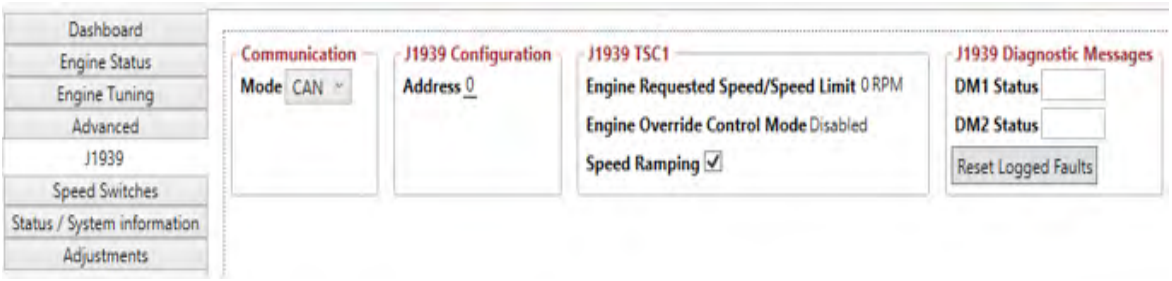
The EEG7000 is J1939 compatible. After initial configuration the CAN data is available on the J1939 Diagnostics Messages view on the GAConfig tool, or using a compatible controller. Sample PGN transmit and receive codes are shown in this section. This document does not instruct you on using J1939 and CAN.

J1939 CONFIGURATION

Use the GAConfig Tool to set the J1939 parameters.

1. At the GAConfig Tool, select the J1939 menu.
2. Choose CAN for the Communication mode
3. Enter the remaining required parameters.
4. Use the Reset Logged Faults button to clear current faults.

PARAMETER	VALUE	DEFAULT
Mode	CAN or RS232	Port enabled
Address	0 - 253	0
Engine Override Control Mode	Enabled	Enabled
Speed Ramping	On / Off	On

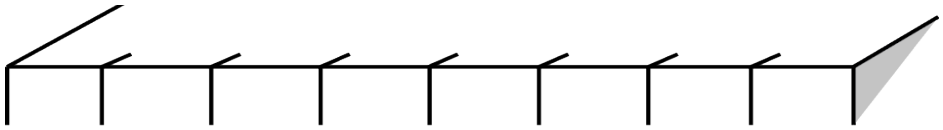


If signal is lost to J1939 the EEG7000 reverts to hardwired fixed speed settings (idle).

CREATING J1939 MESSAGING

J1939 messaging between the EEG7000 and the J1939 source is configured using these basics rules.

- J1939 indexing starts at 1, not 0.
- Timeout rate is 2X transmission rate. Transmission rate is configured using SPN3349 (PGN65251), part of the TSC1 message. Timeout rate defaults at the 5th byte (0xFE to 40ms). Other values including SPN3344 can be used to set longer timeouts.
- Speed Ramping is used under one of two conditions:
  - When not under TSC1 control
  - When under TSC1 control and CAN Speed Ramp Enable is set
- Supported PGNs are list in the following sections.



BYTE	1	2	3	4	5	6	7	8
MESSAGE	0xFD	0x00	0x00	0xFF	0xFE	0xFF	0xFF	0xFF
DEFINITION	Speed control mode	Low speed	High speed		Nominal rate 20ms, timeout 40ms			
EXAMPLE	1600 RPM at 20ms nominal (40 ms timeout)							
	0xFD	0x00	0x32	0xFE	0xFF	0xFF	0xFF	0xFF

DATA TRANSMITTED ON J1939 BUS

PGN	NAME	TRANSMIT RATE	VALID SPN's	NOTES
61444	Electronic Engine Control 1 (EEC 1)	20 ms	SPN190 - Engine Speed RPM	
61443	Electronic Engine Control 2 (EEC 2)	50 ms	SPN1 - Accelerator Pedal Position 1 (%) SPN2 - Percent Load at Current Speed (%)	SPN91 is sourced from the variable sped input position. SPN92 is calculated based on no load (NLCU) and full load (FLCU) parameters
64914	Engine Operating Information (EOI)	250 ms	SPN3543 - Engine Operating State SPN3607 - Engine Emergency Shutdown	
65252	Shutdown (SHUTDN)	1000 ms	SPN2814 - Engine Alarm Output SPN1110 - Engine Protection Shutdown	
65271	Vehicle Engine Power (VEP)	1000 ms	SPN158 - Battery Potential (Voltage), Switched (V DC)	Any system or shutdown condition
65253	Engine Hours, Revolutions (HOURS)	1000 ms	SPN247 - Total Engine Hours	
65216	Service Information (SERV)	1000 ms	SPN916 - Service Delay (Hours)	If the service timer is disabled, SERV will read 0 hours.
65226	Diagnostic Message 1 (DM 1)	1000 ms		Active diagnostic troubleshooting codes, detailed later in this section.
65227	Diagnostic Message 2 (DM 2)	On Request		Previously active diagnostic trouble-shooting codes, detailed later in this section.

DATA RECEIVED ON J1939 BUS

PGN	NAME	VALID SPN's	NOTES
0	Torque / Speed Control 1 (TSC1)	SPN695 - Engine Override Control Mode SPN898 - Engine Requested Speed / Speed Limit SPN3349 - TSC1 Transmission Rate SPN4206 - Message Counter SPN4207 - Message Checksum	Engine Override mode is not currently sup-ported (SPN695) system governs at selected speed. After inactivity of 2x transmission rate (SPN3349) the system will revert to governing at the selected speed.
59904	PGN Request	PGN65227 - DM2 (Previously Active Faults) Request PGN65228 - DM3 (Clear Previously Active Faults) Request	

J1939 CAN INFO / DIAGNOSTIC TROUBLESHOOTING CODES (DTC)

SYSTEM FAULTS / J1939 DTC'S

FAULT CODE	CONDITION	J1939 SPN	J1939 FMI	J1939 LAMP / LED DISPLAY	ACTION
1	Actuator Overcurrent	638 (Actuator)	Current High (6)	Protect / Blinking Red	Shutdown, retry 30 seconds
2	Loss of Speed Sensor	636 (Speed Sensor)	Abnormal Signal (8)	Stop / Shutdown	Shutdown
3	Overspeed	190 (Engine Speed)	Data Above Range (0)	Stop / Shutdown	Shutdown
4	User Shutdown	1110 (Eng. Shutdown)	Data Incorrect (2)	Stop / Shutdown	Shutdown
241	EEPROM Read	628 (CPU / Memory)	Out of Calibration (13)	Warning / Solid Yellow	None
285	TSC1 Unsupported Mode	695 (Override mode)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
286	TSC1 Message Rate Error	3349 (Message Rate)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
287	TSC1 Message Count Error	4206 (Message Counter)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
288	TSC1 Speed Request Invalid	898 (Requested Speed)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
289	TSC1 Invalid Checksum	4207 (Checksum)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
290	TSC1 Destination Address	1483 (Source Address)	Data Incorrect (2)	Warning / Solid Yellow	Revert to selected speed
305	Service Due	916 (Service Delay)	Data Incorrect (2)	Protect / Solid Yellow	None

17 ADDITIONAL EEG7000 CAPABILITIES

The EEG7000 offers a number of GAC specific capabilities as well as helpful tools.

Light Force Governing provides finer adjustment resolution for smaller actuators. It is designed to work with low current small actuators, like T1 ATB, ALR/ALN, 100/103/104 series and normally closed Cummins EFC actuators. Select the Light Force Governing block in the PID Tuning block when using small actuators to improve adjustments as they respond very quickly to input changes over a smaller range of operating current, using a fraction of the PID and current output of a normal actuator.

Lead Circuit (default is ON) enables the speed controller to be more responsive and typically increases the range of gain adjustment. This function allows for more active control to increase the performance in typically slow engines.

Idle is set with Speed 1 of the speed control settings on the Engine Tuning menu.

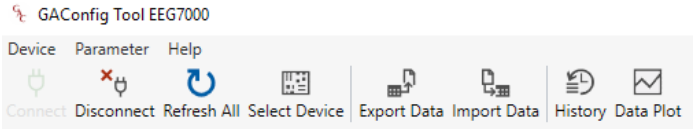
Smoke Reduction is an adjustment made using the Start Fuel parameter in the Engine Tuning menu. This sets the actuator % applied during crank in order to start easily but not too high to reduce black smoke.

Auxiliary Enable enables connections to synchronizing and load sharing equipment. This allows the adjustment of the speed requests through the auxiliary input voltage, accepting a 1-9 V DC signal, biased at 5 V, and selectable response polarity. In response the EEG can increase or decrease voltage but does not change engine speed.

CAN JS1939 bus device communication is supported to receive and display JS1939 messages.

IMPORTING AND EXPORTING SETTINGS

The GAConfig Tool allows settings in the tool to be stored, shared, and imported back into the tool for use on multiple EEG7000 units. Settings can be exported at any time while using the GAConfig Tool.



To export files:
1. EEG7000 must be turned on and connected to the GAConfig tool.
2. At the Tool bar click the Export button. The windows file explorer displays. Drill down to the location you want to save the file.

To import files:
1. EEG7000 must be turned on and connected to the GAConfig tool.
2. At the Tool bar click the Import button. The windows file explorer displays. Drill down to the location you want to save the file.

Best practice is to export engine settings information on a regular basis, at a minimum, monthly. Name the file with dates and intended use as part of the file name. These files can also be shared with the GAC support team to aid in producing the best results.

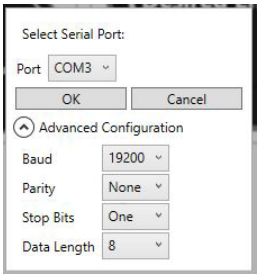
The system can also be restored to the original factory settings from the Adjustments menu in the Actions tab.

18 EEG7000 SYSTEM TROUBLESHOOTING

GACONFIG TOOL NOT CONNECTING

If the GAConfig Tool is not connecting check the following on your PC-Laptop:

1. Open the GAConfig tool.
2. Click Connect. The Select Serial Port window displays. Click Advanced Configuration arrow.
3. Select the number of the com port the EEG7000 is plugged into. If no com ports display call your GAC representative.
4. Check to make sure your baud rate is set to 19200 and all other settings are as show in this example.
5. If you made changes reboot the machine and try again.
6. If reboot does not see the EEG7000 please call your GAC representative.



SYSTEM INOPERATIVE

If the engine governing system does not function determine the fault using the following voltage tests as 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 actuator wiring.
- Perform test with battery power on and engine off, except where noted.
- See your actuator model's product bulletin for more information on testing the actuator.

VOLTAGE TESTING

STEPS	WIRES	NORMAL READING	ACTION
1	Power 10(-) & 11(+)	Battery Supply Voltage (12 or 24V DC)	1. DC battery power not connected. 2. Check for blown fuse 3. Low battery voltage 4. Wiring error
2	Pick-Up 3 & 12	1.0 V AC RMS min while cranking	1. Gap between speed sensor and gear teeth too great 2. Check Gap 3. Improper or defective wiring to speed sensor. 4. Resistance between 3 and Ground should be 300 to 1200Ω. See your specific magnetic pickup data for resistance settings. This could be a defective speed sensor.
3	Actuator & Battery 1(-) & 11(+)	1.0 - 2.0 V DC while cranking	1. SPEED value set too low 2. Short/open in actuator wiring 3. Defective speed control 4. Defective actuator. See the product bulletin for the specific actuator and review the Actuator Troubleshooting section.

INSTABILITY

INSTABILITY	SYMPTOM	ACTION
Slow Periodic	An irregularity of speed below 3 Hz. (Sometimes severe)	1. Adjust P, I, and D 2. Check fuel system linkage during engine operation for: • binding • high friction • poor linkage 3. Add a small amount of droop.
Non-Periodic	Erratic Engine Behavior	Increasing Stability reduces instability but does not totally correct it. If this is the case, there is most likely a problem with the engine itself. Check for: • engine mis-firings • erratic fuel system • load changes on the generator set voltage regulator

18 EEG7000 SYSTEM TROUBLESHOOTING (CONTINUED)

UNSATISFACTORY PERFORMANCE

SYMPTOM	RESPONSE	ACTION
Engine Overspeed	Do Not Crank. Apply DC power to the governor system.	After the actuator goes to full fuel, disconnect the speed sensor at Pin 3. If the actuator is still at full fuel-speed then the control unit is defective.
	Manually hold the engine at the desired running speed. Measure the DC voltage between Pins 1(-) & 11(+) on the speed control unit.	If the voltage reading is 1.0 to 2.0 V DC check for: • Speed set above desired speed • defective speed control unit If voltage reading is > 2.0 V DC check for: • Actuator binding • Linkage binding If the voltage reading is below 1.0 V DC check for Defective speed control unit
	Check Flywheel Teeth value.	Incorrect number of teeth entered.
Overspeed shuts down engine after running speed is reached	Examine the Speed and Overspeed values for the engine	Speed set too high. Overspeed set too close to Speed. Actuator or linkage binding. Speed Control unit defective.
Overspeed shuts down engine before running speed is reached	Check resistance between Pin 3 and Ground. Should be 30 to 1200 Ω. See your specific Magnetic Pick-up data for resistance details.	Overspeed set too low If the speed sensor signal is erroneous, then check the wiring.
Actuator does not energize fully	Measure the voltage at the battery while cranking.	If the voltage is less than: • 7 V DC for a 12 V DC system, or • 14 V DC for a 24 V DC system, Then: Check or replace battery.
	Momentarily connect Pins 1 and 11. The actuator should move to the full fuel position.	Actuator or battery wiring in error Actuator or linkage binding Defective actuator Fuse opens. Check for short in actuator or harness.
Engine remains below desired governed speed	Measure the actuator output, Pins 1 and 2, while running under governor control.	If voltage measurement is within 2 V 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. Speed set too low

Questions?
Contact GAC for assistance
GAC@governors-america.com
or call: 1-413-233-1888