

BEFORE BEGINNING INSTALLATION

! Disconnect all electrical power to the machine. Make sure the machine cannot operate during installation. Follow all safety warnings of the machine manufacturer. Read and follow instructions carefully.

INSTALLATION

Locate the **SDG Series** control a distance from extreme heat, wires or coils. Operating temperature range is from -40° to 85° C (-40° to 180°F).

To mount the **SDG** to a panel, drill 2 (Ø.181 / .176 [4.6 /4.5mm drill size) holes for mounting screws. Place module in front of the panel aligning with the pre-drilled holes. Secure the module in place with two M-4 screws. (see **Diagram 1.**)

Supplies Needed: 16 & 20 AWG Wire for Cable Harness (length amount based on need)

Optional for Use with Software GAC's CH1330 Cable Harness; DB9 Male/Female Serial Link Cable; USB/Serial Adapter

Software Operating Requirements: IBM compatible PC, 486DX2 or faster (66 MHz or higher microprocessor is 24 MB RAM is recommended) Microsoft Windows 98 or later Operating System One available RS-232 serial port or USB Port (*optional*)

WIRING

- For specific wiring instructions on Connector Pins 2 & 3 for the speed selects see TABLE 2.
- Battery connections to Connector Pins 1 & 5 should be 16AWG (18mm²) or larger. Long cables require an increased wire size to minimize voltage drops.
- Battery positive(+) input to Connector Pin 1 should be fused for 15A.
- The Magnetic Speed Sensor connections to Connector Pin 11 on the SDG514/SDG524 speed sensor cable shield should be connected to ground.
- The shield should be insulated to ensure that no other part of the shield comes in contact with engine ground, otherwise stray signals may be introduced into the SDG500 Series causing erratic operation.

TABLE 1.

SDG514/524 SERIES use the below listed DIAGRAMS & TABLES
GENERAL WIRING INSTRUCTIONS
DIAGRAM 2 & 3
TABLE 1 & 2
Deutsch Cable Connector DT06-12SA & W12S
Deutsch Pins 0462-201-16141

TABLE 2.

All SDG500 Series		Speed Select
Connector Pin 2	Connector Pin 3	
No Connect	No Connect	Variable Speed*
Battery -	No Connect	Fixed Speed 1
No Connect	Battery -	Fixed Speed 2
Battery -	Battery -	Fixed Speed 3

*SDG514 - 10K Variable Speed Potentiometer needs to be connected to activate
*SDG524- 0-5 VDC input Variable Speed

SOFTWARE

GAC's SMARTVU™ configuration software is available for download at www.Governors-America.com.

Connecting the SDG to the PC for Configuration

- Connect the CH1330 (SDG514/524) Cable Harness to the SDG and the engine's cable harness.
- Connect the DB9 connector to your PC and the CH1330. *Optional: Connect using an USB/Serial Adapter.*

Installing SDG Software

The software for the **SDG** does not affect the registry rights of your operating system and therefore is easy to install.

Establishing a Connection

- Double click on **GAC_SDG51X.exe** file to start the **SMARTVU™** Utility.
- If the software does not indicate **Connected** on the bottom left section of the screen, select **Configure** from the drop down menu and choose **Communications**. (see **Figure 1.**)
- Select the number of the **CommPort** used from the drop down list box, then select **OK**.



- Select 514 for both 514 & 524 from the **Configure** drop-down menu.

Working in Offline Mode

GAC's configuration software allows you to work offline to input/change parameters that you can save to file and use to load to multiple units. To work in this mode:

- Select **Configure** from the drop down menu and choose **Offline**.
- Enter desired configurations.
- Choose **Save** from the file menu to save to file.
- Select the **Save Offline Data to SDG** button to save the configurations to the **SDG**.

Changes made in offline mode must be saved before switching to **Instant Save** mode.

Working in Instant Save Mode

In **Instant Save** mode GAC's configuration software will update and save any changes made instantaneously to the **SDG**. To work in this mode:

- Select **Configure** from the drop down menu and choose **Instant Save**.

Speed Monitor

With GAC's configuration software.... To work in this mode:

- Select **Options** from the drop down menu and choose **Speed Monitor**. (see **Figure 2**.)

FIGURE 1. COMPUTER INTERFACE WITH COMM PORT CONFIGURATION

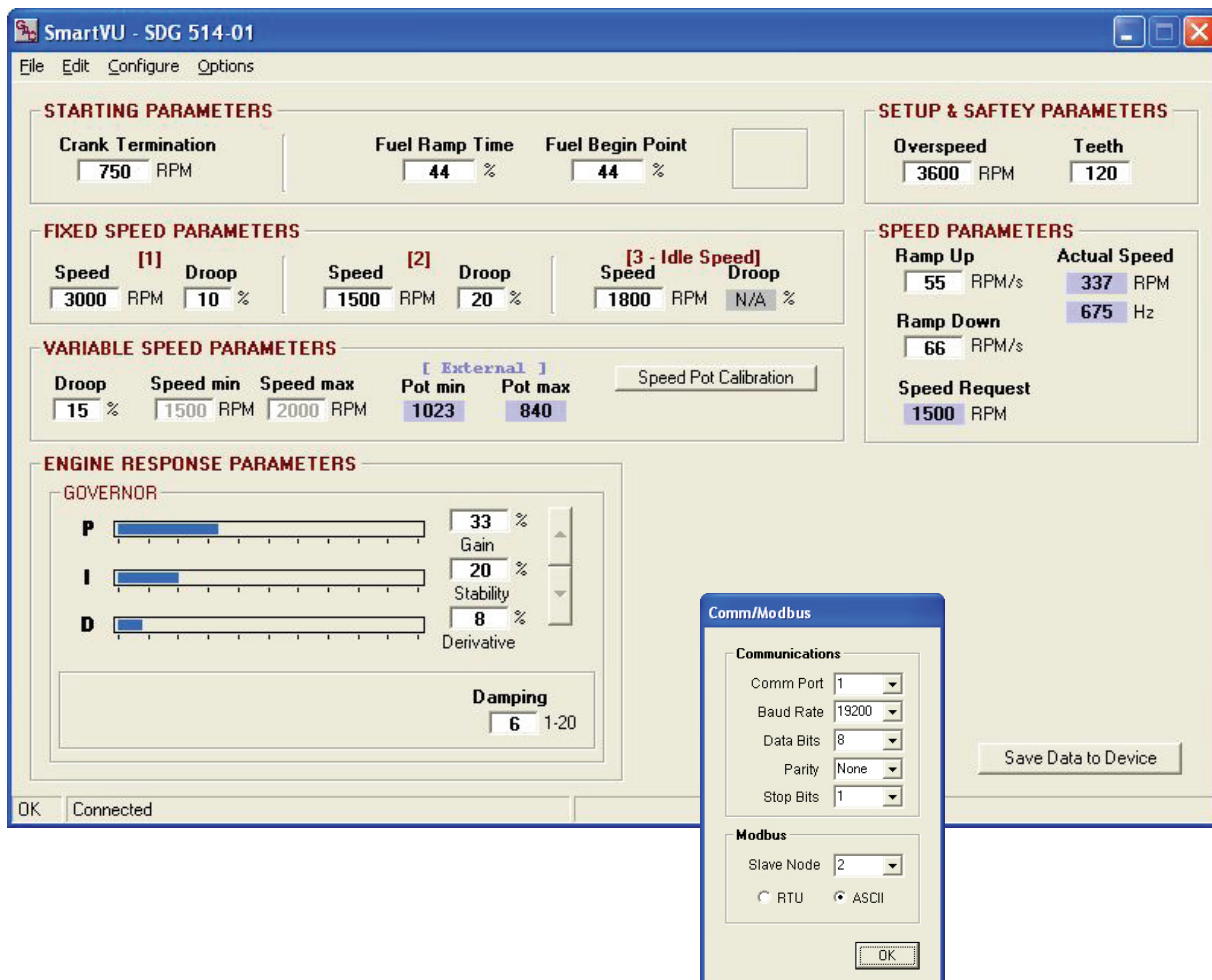


FIGURE 2. GRAPHIC INTERFACE

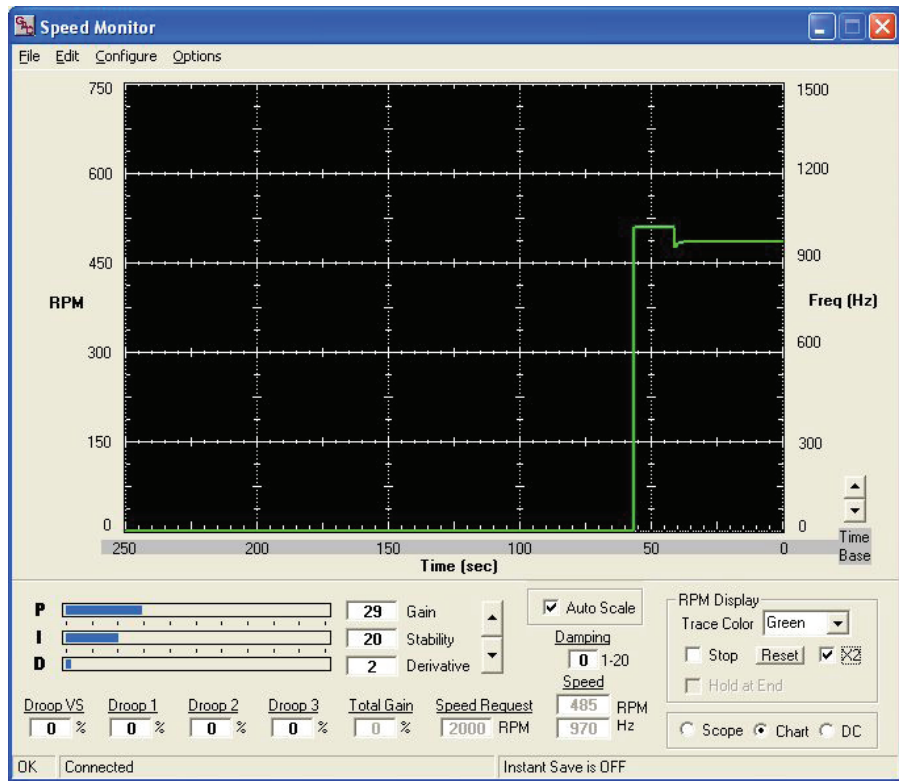


DIAGRAM 1. DIMENSIONS OF SDG514/524

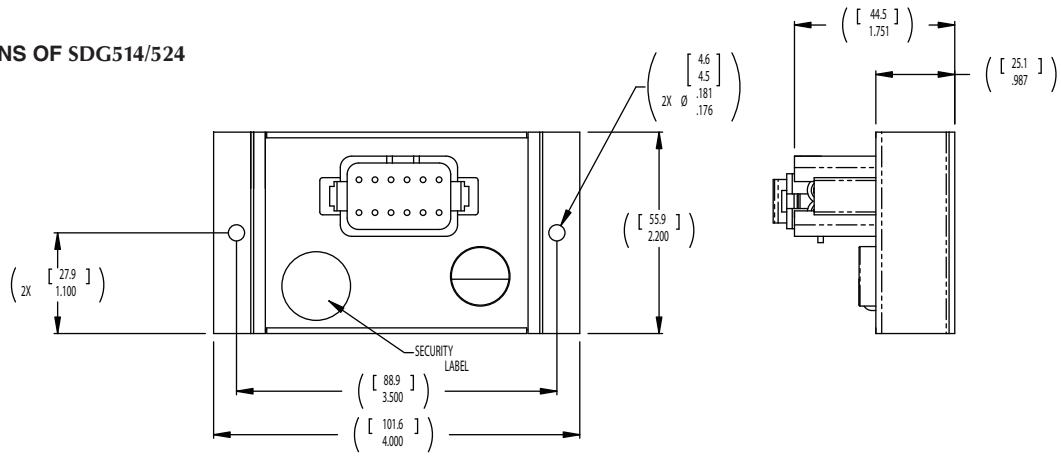


TABLE 3.

Connector SDG500 Series			
Connector Pin #	Description	Comment	Recommended Wiring
1	+12 / 24 VDC Input Power	Supplies power.	16 AWG
2	Speed Select 2	See TABLE 2. for Speed Select Settings	20 AWG
3	Speed Select 1	See TABLE 2. for Speed Select Settings	20 AWG
4	RS232	RS232	NC
5	Input Power Ground	Ground for the 12 / 24 VDC Input Power	16 AWG
6	RS232	RS232	NC
7	Actuator Low	Output to Actuator	16 AWG
8	Variable Speed Input	(514) Input for 10K Potentiometer for Variable Speed Control (524) 0-5 VDC Signal	20 AWG
9	No Connection	No Connection	NC
10	0-10 VDC Input	Input for communication of AUX	20 AWG
11	MPU +	MPU speed signal input	Shielded/Twisted Pair
12	Actuator High	Output to Actuator	16 AWG

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DIAGRAM 2 WIRING DIAGRAM SDG514

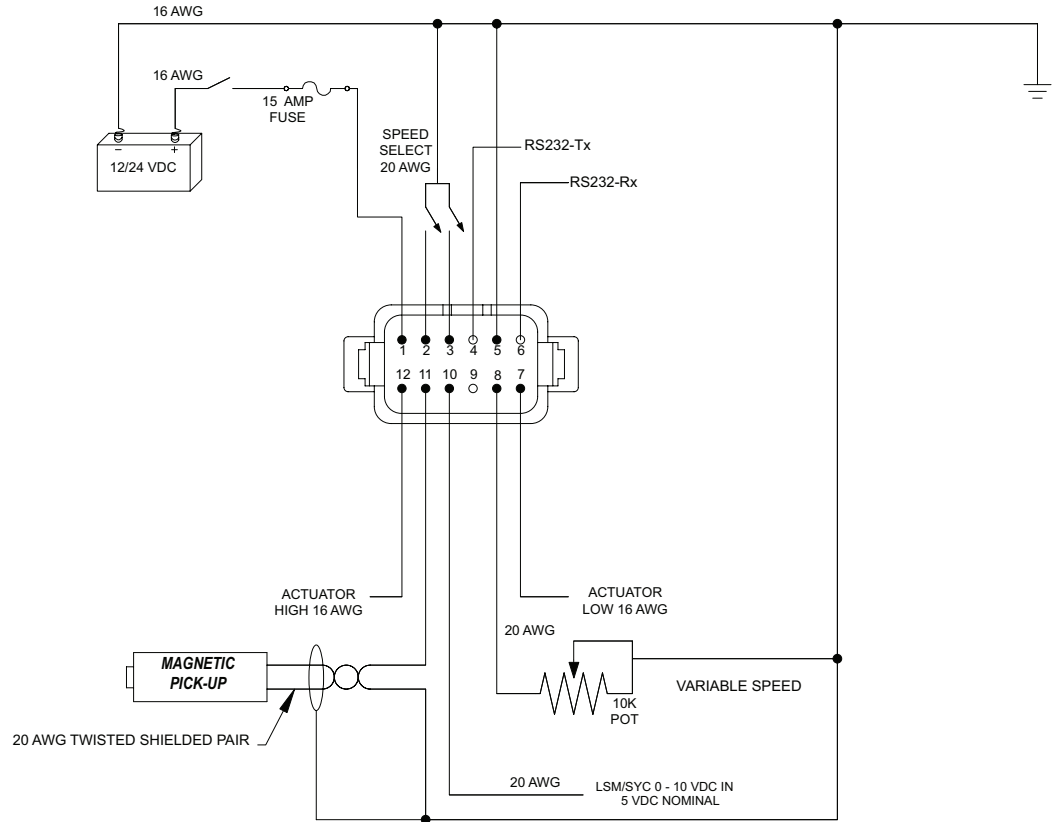
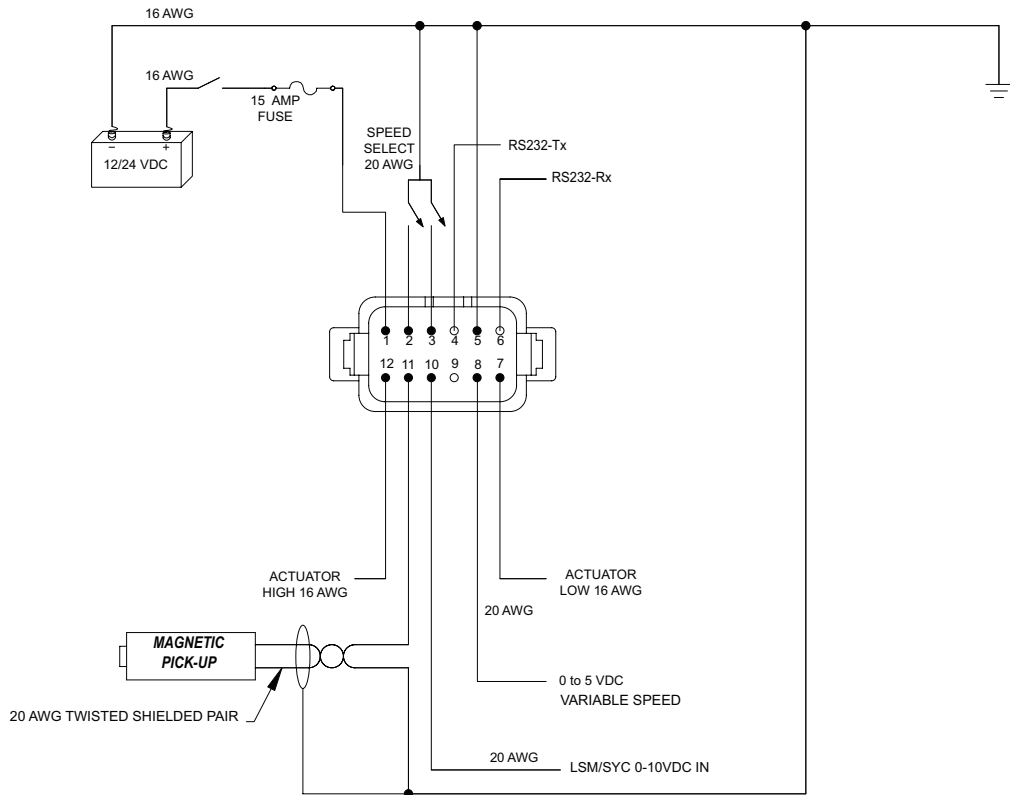


DIAGRAM 3 WIRING DIAGRAM SDG524



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TABLE 4.

Description of Configurable Parameters

Setting and values are based on number of teeth on the flywheel and therefore ranges may vary.

Critical Setting	Category Only	Parameter	Description	Configurable Parameters
	Variable Speed Application Parameters	POT min	Max RPM value from the SDG analog to digital converter.	Read only
	Variable Speed Application Parameters	POT max	Min RPM value from the SDG analog to digital converter.	Read only
	System Information	Build Date		Read only
!	Starting Parameters	Crank Termination	RPM set point for crank termination. When the engine RPM exceeds the crank termination set point, the SDG switches from start up cycle to PID loop control. This parameter must be set higher than the maximum cranking RPM.	yes
!	Engine Response Parameters	Derivative	One of the PID parameters. Derivative mode is a braking action to the controller response as the process variable approaches the set point.	yes
	Fixed Speed Application Parameters	Droop 1	The percent of compensation which reduces the governor's reference speed as fuel position or load increases in reference to Fixed Speed 1.	yes
	Fixed Speed Application Parameters	Droop 2	The percent of compensation which reduces the governor's reference speed as fuel position or load increases in reference to Fixed Speed 2.	yes
	Fixed Speed Application Parameters	Droop 3	The percent of compensation which reduces the governor's reference speed as fuel position or load increases in reference to Fixed Speed 3.	yes
	Variable Speed Application Parameter	Droop Variable Speed	The percent of compensation which reduces the governor's reference speed as fuel position or load increases in reference to Variable Speed.	yes
!	Fixed Speed Application Parameters	Fixed Speed 1	Desired RPM set point when the speed select input is set to 1.	yes
!	Fixed Speed Application Parameters	Fixed Speed 2	Desired RPM set point when the speed select input is set to 2.	yes
!	Fixed Speed Application Parameters	Fixed Speed 3	Desired RPM set point when the speed select input is set to 3.	yes
	Engine Response Parameters	Fuel Limit	The percentage limiter set point on the fuel demands that prevents the over fueling after the engine has started.	yes
!	Engine Response Parameters	Gain	One of the PID parameters. Proportional mode responds to a change in the process variable proportional to the current measured error value.	yes
	Engine Response Parameters	Dither	Imposes a random vibrating on the actuator drive.	yes
	Engine Response Parameters	Damping	Applies a damping variable to the Gain Function.	yes
!	Set Up & Safety Procedures	Overspeed	RPM Set Point for an Engine Shutdown Signal to the actuator.	yes
	Variable Speed Application Parameters	RPM max	Maximum RPM set point for Variable speed	Read only
!	Variable Speed Application Parameters	RPM min	Minimum RPM set point for Variable speed	Read only
!	System Information	Serial Number	System Information.	Read only
	System Information	Software Version	System Information.	Read only
	Speed Ramping	Speed Ramp Down	The % percent set point to decrease engine speed per second when changing speeds.	yes
	Speed Ramping	Speed Ramp Up	The % percent set point to increase engine speed per second when changing speeds.	yes
	Fixed Speed Application Parameters	Speed Request	Desired speed of engine at the current state.	yes
!	Engine Response Parameters	Stability	One of the PID parameters. In integral mode, the controller output is proportional to the amount and duration of the error signal.	yes
	Starting Parameters	Starting Fuel Ramp	Gradually increases the amount of fuel after the engine finishes cranking, which eliminates most unnecessary smoke. The higher the setting the quicker the engine comes to speed. The percent to increase the fuel flow per second until the engine reaches 100% or the governor takes control.	yes
	Starting Parameters	Starting Fuel Start Point	Determines how much fuel to begin with before fuel ramping engages. The minimum fuel required for starting the engine. Retards black smoke. The starting position of the actuator at engine start.	yes
!	Setup & Safety Parameters	Teeth	Number or teeth on the flywheel. Used to calculate speed settings and values.	yes
	Speed	RPM/HZ	Actual RPM/HZ of engine.	Read only

Parameters

TABLE 5. Before starting engine safety, basic parameters on the SDG must be configured.

Screen Section 1: Basic Parameters that must be configured before start.		
Configurable Parameters	Instruction	Critical Settings
Teeth	Configure first. Used to calculate values and settings.	!
Overspeed	Set typically 10% above desired governing speed.	!
Crank Termination	This parameter must be set higher than maximum cranking RPM. This set point helps the SDG determine if the engine is cranking or running.	!
Speed Select 1, 2, 3	Insure that the Speed Select is wired correctly (see TABLE 5). Set RPM in the appropriate Fixed Speed window.	!
Variable Speed Operation SDG514	Make sure the Variable Speed Potentiometer is connected correctly (see DIAGRAM 2) and Configuration Software (SmartVu) is open. In Instant Save mode, click on the Speed Pot Calibration button. Set the Minimum position on the potentiometer and then set the RPM min on the screen. Click on the Continue button. Set the Maximum position on the potentiometer and then RPM max on the screen click on the Continue button. Click OK on the popup window to calibrate.	!
Variable Speed Operation SDG524	Make sure the voltage source variable speed is connected correctly (see DIAGRAM 3) and Configuration Software(SmartVu) is open. In Instant Save mode, click on the Speed Pot Calibration button. Set the Minimum value to the lowest controlling voltage and set the RPM min on the screen. Click on the Continue button. Set the Maximum value to the highest controlling voltage, and then RPM max on the screen click on the Continue button. Click OK on the popup window to calibrate.	
POT min and max (meter)	Represents the min and max values set on the Variable Speed Input.	READ ONLY

TABLE 6.

Screen Section 2: Read Only Meters	
Meter	Description
Speed Request	Displays the speed requested for the current state.
RPM / Hz	Displays the SDG's reading of Actual RPM Engine.

TABLE 7.

Screen Section 3: Advanced configurations that do not need to be configured before starting the engine.	
Configurable Parameters	Instruction
Starting Fuel Ramp	Gradually increases the amount of fuel flow per second during the engine crank cycle, which eliminates most unnecessary smoke. The higher the setting the quicker the engine comes to speed.
Starting Fuel Begin Point	Determines how much fuel to begin with before fuel ramping begins.
Speed Ramp Up	The % percent set point to increase engine speed per second when changing speeds.
Speed Ramp Down	The % percent set point to decrease engine speed per second when changing speeds.
Fuel Limit	Adjusts maximum amount of fuel the SDG will command. During normal starting cycles and short step loads, this function will not engage. Only after a 1 second delay of the Fuel Limit exceeding it's configured value, then the fuel will roll back to the configured value. Helps to reduce engine smoke and prevents engine damage.
Droop 1, 2, 3	The % set point that reduces the governor's reference speed as fuel position or load for the corresponding fixed speed.
Droop Variable Speed	The % set point that reduces the governor's reference speed as fuel position or load when variable speed is selected.

TABLE 8.

Screen Section 4: PID Parameters. Must be adjusted after the engine starts for best performance.		
Configurable Parameters	Instruction	Critical Settings
Gain	The PID screens are adjustable by only increments of 1. Choose increments by selecting the appropriate option button. The use the UP and DOWN buttons for fine tuning.	!
Stability		!
Derivative		!
Dither	Imposes a random vibrating on the actuator drive. Available only in the SDG511/4	
Damping	Applies a damping variable to the Gain Function. Available only in the SDG514	

TABLE 9.

Screen Section 5: Read Only Meters	
Meter	Description
Serial Number	System Information.
Software Version	
Build Date	
Password	

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SYSTEM TROUBLESHOOTING

Engine will not start checklist after you stop cranking.

1. Check for battery connection, proper polarity, and proper charge.
2. Recheck **Flywheel Teeth**, **Overspeed Setting**, **Variable** and **Fixed Speed Settings**.

Engine will not start – checklist while cranking the engine.

1. Measure the battery voltage while attempting to start. If the voltage drops below 8 Volts then the battery is not sufficiently charged.
2. Check that the actuator voltage is no less than 2 volts below than battery voltage. If the actuator voltage checks then verify the proper connection of the actuator.
3. Check **Crank Termination** setting. Typically the **Crank Termination** should be set to at least 50RPM higher than the maximum cranking speed of the engine. If possible measure the cranking RPM of the engine. You can try increasing in 100RPM increments. If engine appears to start but cuts out then the **Fuel Limit** may be too low. Try increasing the **Fuel Limit** to 100% initially to disable the **Fuel Limiting**. If the engine starts, the **Fuel Limit** will have to be reduced from 100% to more optimum level.
4. Verify the **Mag Pickup** is properly connected. If possible measure the pickup signal while the engine is cranking. The voltage must be a minimum of 0.5VRMS for proper operation.
5. If possible through the configuration software check the **Starting Fuel Limit** and the **Starting Fuel Start Point**.
6. Via **SMARTVU™**, set the **Starting Fuel Start Point** to 10% and the **Starting Fuel Ramp Time** to 0%. This will program maximum fuel to the engine at the start.

Engine Starts but not running at proper speed.

1. Check to see if the **Fixed Speed** inputs are properly configured. If one or both of the **Fixed Speed** inputs are not connected to ground the **SDG** will operate in variable speed mode.
2. Make sure the correct number if **Flywheel Teeth** is set using the configuration software.
3. Make sure the proper **Fixed Speed** is set using the configuration software.
4. Check mag pickup signal.

Engine not running at the correct **Variable Speed**

1. Make sure the **Variable Speed Potentiometer or 0-5 VDC Voltage Source** is connected properly. Refer to the configuration section for proper setup. Verify, through the configuration software, that the MIN speed setting is less than the MAX speed setting.
2. Be sure the proper number of **Flywheel Teeth** are set.

Overspeed during load transient.

1. The **Overspeed** may be set too low. Recheck the overspeed setting.
2. The **SDG** is not tuned properly for the application. Try retuning the **SDG**.

Overspeed during speed changes.

1. **Overspeed** setting may be too low. Recheck the **Overspeed** setting.
2. **Speed Ramp** setting is set too low. Increase the **Speed Ramp** setting. This will cause the engine to accelerate more slowly reducing overshoot.

SPECIFICATIONS

Performance

Isochronous Operation/Steady State Stability	±0.25%
Speed Range/Governor	400-10KHz
Speed Drift w/Temp	< ± 1% Max.
Idle Adjust	Full Range
Droop Range	1-17% Regulation
Speed Trim Range	± 5% of Rated Speed

Environmental

Ambient Operating Temperature Range	-40° to +85°C (-40° to +180°F)
Relative Humidity	Up to 95%

Reliability

Vibration7G @ 20-100Hz
Testing	100% Functionally Tested
Agency	CE Compliant.

Input/Output Parameters

Supply	12 -24VDC Battery Systems (6.5VDC to 33VDC)
Polarity	Negative Ground (Case Isolated)
Power Consumption70 mA max. Continuous plus actuator current
Speed Sensor Signal	0.5-120VRMS
Actuator Current	7 Amps continuous max
Load Share/Synchronizer Input	0-10VDC

Configuration Parameters

Flywheel Teeth	50-250
Range (Gain/Stability multiplier)	1-10
Fixed Speed Settings*	0-max RPM
Variable Speed Settings*	0-max RPM
Overspeed Setting*	0-max RPM
Starting Fuel Preset*	0-max Fuel

* Maximum RPM is based on the Flywheel Teeth. RPM = Frequency x 60/Flywheel Teeth. Maximum Frequency is 10,000Hz.



Governors America Corp., 720 Silver Street Agawam, MA 01001
phone: 413.786.5600 fax: 413.789.7736
www.governors-america.com
info@governors-america.com

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