



GSC300

Auto Start Engine Controller

Installation and User Manual for the GSC300 Auto Start Engine Controller

Full Version

File: GSC300rev2.3.doc
Jan. 27, 2005

Thank You For Purchasing This DynaGen Product

Please Read Manual Before Installing Unit

Receipt of Shipment and Warranty Return Information

Upon receipt of shipment, carefully remove the unit from the shipping container and thoroughly examine the unit for shipping damage. In case of damage, immediately contact the carrier and request that an inspection report be filed prior to contacting DynaGen.

All returned items are to be shipped prepaid and include a Return Material Authorization (RMA) number issued by DynaGen. RMA forms are available by contacting DynaGen Technical Support through the contact methods listed below.

Limited Warranty

DynaGen will repair or replace any GSC300 controller which proves to be defective under normal and proper use within **Three Years** from the date of shipment. This constitutes the only warranty and no other warranty shall be implied.

We welcome your comments and suggestions. Please contact us at:

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WEB SITE: www.dynagen.ca

SPECIFICATIONS FOR THE GSC300

Operating Voltage:	7 to 30VDC continuous, with zero volts cranking dropout protection
Operating Temperature:	-40 to +85°C
Physical Dimensions:	4.5"(H) x 5.5"(W) x 1.25"(D)
Actual Unit Weight:	0.458 lbs
Enclosure:	High Impact Resistant, Injection Molded Plastic Enclosure

Front Panel Indications

-High intensity LED's with regulated brightness

LCD Display:

-Ultra-bright, Backlight LCD display with optimum viewing angle of 0 to -25° from perpendicular

-Display Size (mm): 8 (W) x 32 (H) x 12.8 (D) x 16 characters

Adjustments

Warm-up:	0 - 200 seconds (After Oil Bypass Feature)
Cool-Down:	0 - 255 seconds
Crank Disconnect:	12 to 140Hz (Generator Output Version) 44 to 300Hz (Magnetic Pick-up Version)
Overspeed:	60 - 4156Hz (Generator Output Version) 300 - 8492Hz (Magnetic Pick-up Version)
Crank Rest:	3 - 32 seconds
Delay on Start:	0 – 59 seconds
Crank Tries:	1 to 10
Oil Bypass:	15 – 55 seconds
Low Battery Indication:	7 – 35 VDC

Timer adjustments

Glow Plug/Preheat:	0 - 255 seconds
Energize To Stop (ETS):	Energizes for 15 seconds on failures, or energizes until 5 seconds after engine speed goes to zero upon removing power from Start/Stop terminal or removing the unit from manual mode using the front panel buttons.

Inputs

Speed Sensing:

-Optional Generator Output Speed Sensing or Magnetic Pick-Up Model
(Specified by customer at time of order)

Maximum Input Voltage: 300Vrms

Minimum Input Voltage: 0.7Vrms(Generator Output Sensing),
0.1Vrms(Magnetic Pick-Up version)

-60Hz Rejection Filter Included

-Loss of Speed Signal Included

Sender/Failure Inputs:

-Oil Pressure, Coolant Temperature, Fuel Level/Auxiliary Input

-Accepts standard industry low impedance (0-500 ohm) sender inputs
(VDO, Stewart-Warner, Datcom, Murphy, etc.)

-Data entry available for custom sender inputs

-Can be configured to accept a switched gauge failure through the PC interface

-Failure points adjustable

Protection

- Three on-board replaceable 40A fuses protect Fuel, Crank, and Timer Outputs
- Reverse polarity protected
- Short circuit & overload protection on annunciation outputs
- Inputs are electrostatic discharge protected
- Maximum power supply surge before damage: 1500V for 250us

Outputs

- All outputs positive switched (sourcing)
- Fuel, Crank, and Timer Outputs: 40A each, using standard 40A automotive relays
- Annunciation Outputs: 300mA individually, 350mA combined

Connections

- Removable terminal block for annunciation outputs and low power connections
- 0.25" spade terminals for quick connections on all other connections

Programming

- Intuitive windows based software interface utilizing the parallel port of your PC
- Option of programming through 3-button interface (limited parameter adjustment) on the front panel or the PC Interface that has full parameter programming ability.
- Needs no power to program using the PC Interface –uses power from parallel port of PC

-Specifications May Change Without Notification

WIRING INSTALLATION GUIDELINES

Danger: Never work on the engine while its power is on. This controller does not generate a warning signal prior to automatic engine start. Warning signs should be placed on engine equipment indicating this important safety measure.

INSTRUCTIONS

Following these instructions will help avoid common installation problems during wiring and setup.

- Battery must be disconnected before any wiring connections are made.
- Wire length from the engine to the controller should not exceed 6 meters (20 feet).

Wiring size and type should be as specified below. Use **stranded wire**, since solid wire has a tendency to crack, break and loosen over time.

TYPES AND SIZES

Terminal	Wire Size (AWG)	Current max.	Function
1	12	40A	Fuel Output Terminal
2	12	40A	Auto(Battery +) Terminal Connection
3	12	40A	Auto(Battery +) Terminal Connection
4	12	40A	Crank Output Terminal
5	12	40A	Ground Terminal Connection
6	12	40A	Ground Terminal Connection
7	12	40A	Preheat/ETS Terminal
8	12	40A	Preheat/ETS Terminal
9	18	100mA	Speed Signal Connection
10	18	100mA	Speed Signal Connection
11	18	300mA	Overcrank Output
12	18	300mA	Overspeed Output
13	18	300mA	High Temp Output
14	18	300mA	Low Oil Output
15	18	300mA	Low Battery Output
16	18	300mA	Engine Run Output
17	18	100mA	Not in Auto Output
18	18	300mA	General Failure Output
19	18	7mA	Start/Stop Input
20	18	7mA	Oil Pressure Sender/Switch Input
21	18	7mA	Temperature Sender/Switch Input
22	18	7mA	Fuel Level/Auxiliary Sender/Switch Input

WIRING GUIDELINES

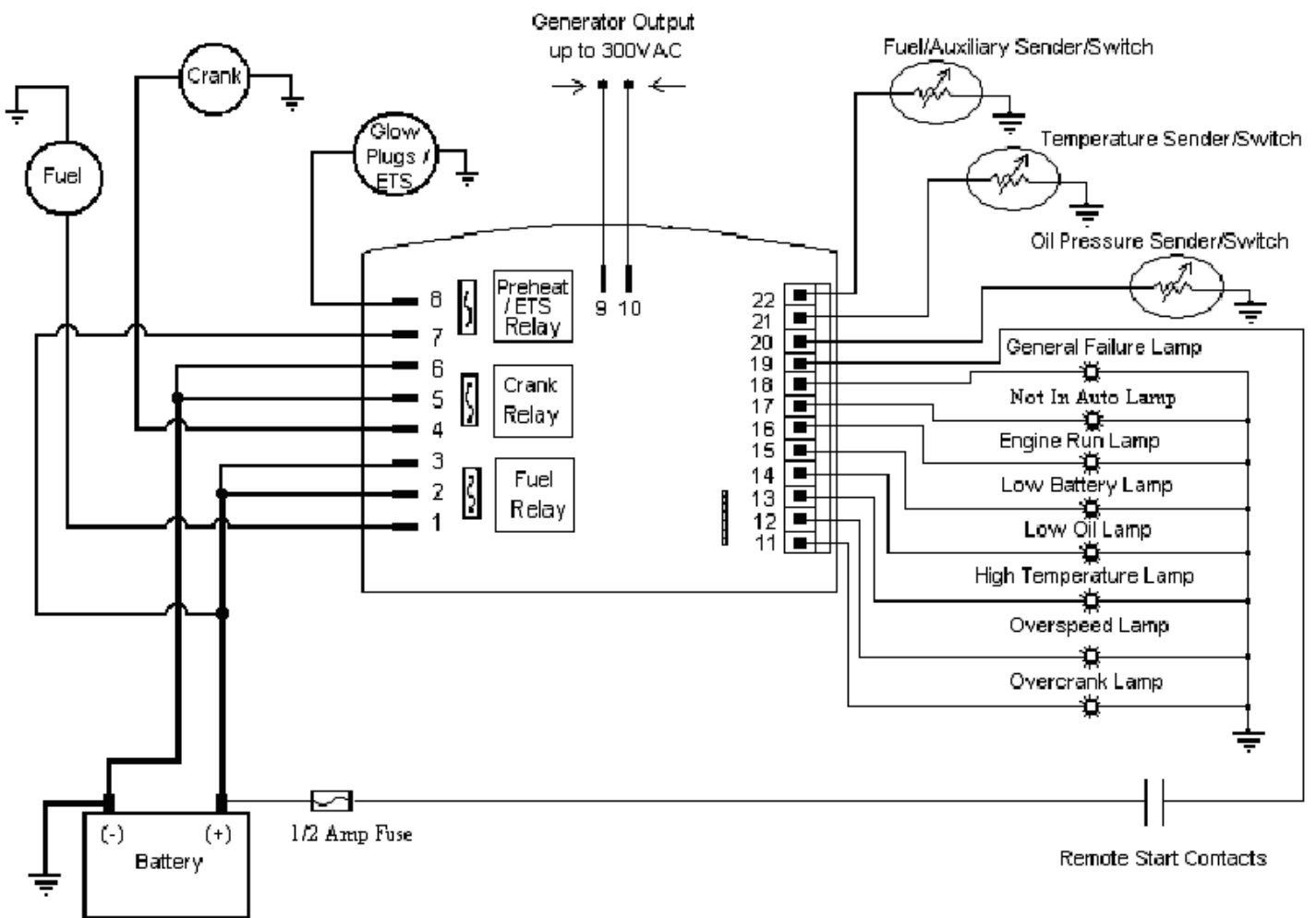
1. DO NOT use wire smaller than 18 AWG.
2. **IMPORTANT:** The connections supplying DC power to the GSC300 panel should preferably run directly from the battery posts with no splices or other connections. Avoid using chassis (aluminum or iron engine parts), as return conductor for battery negative voltage. Copper wiring is recommended. Failure to follow the above may result in erratic operation due to large voltage drops across wiring connections. A small fuse should be placed at the battery terminal to provide 12 volts to the Remote Start Contacts to ensure that a short along this line will not cause any damage.
3. DO NOT exceed the maximum rated current and voltage on each of the controller outputs. Do not exceed 40A each for the Fuel Output, Crank Output or Preheat Output. Do not exceed 300mA individually, or 350mA combined, for the General Fault Output or Annunciation Outputs.
4. DO NOT short Crank Output or Fuel Output to ground. **This will cause damage to the unit.**
5. To verify the operation of engine controller outputs, measure voltage (i.e. meter in volts) when outputs should be ON.
6. To verify the operation of the Preheat Output, measure the resistance between the Preheat terminals when the Preheat Output should be ON. At this time there should be a closed circuit. When the output is supposed to be OFF there should be an open circuit between the terminals.

TERMINAL DESCRIPTION

Term #	Description
1	Fuel Output provides 40A maximum. Fuel Output closes to +12/24 VDC when start signal is actuated, and opens when either an engine failure is detected or when Cool-Down period has ended.
2	Auto Terminal. Connection point on the unit for +V Battery power connection
3	Auto Terminal. Connection point on the unit for +V Battery power connection
4	Crank Output provides 40A maximum. Crank Output closes to +12/24VDC during cranking, and opens when the engine has started, or during Crank Rest.
5	Battery Ground connection for the controller module. A good ground connection, directly from the battery , is required for proper operation.
6	Battery Ground connection for the controller module. A good ground connection, directly from the battery , is required for proper operation.
7	Preheat/ETS Output closes to terminal 8 during Preheat or ETS period. (Dry contacts between terminals 7 & 8)
8	Preheat/ETS Output closes to terminal 8 during Preheat or ETS period. (Dry contacts between terminals 7 & 8)
9	Speed 1. Speed Signal Input for Crank Disconnect, Engine Run, and Overspeed sensing. 300 VAC max. input voltage.
10	Speed 2. Speed Signal Input for Crank Disconnect, Engine Run, and Overspeed sensing. 300 VAC max. input voltage.
11	Overcrank Annunciation Output closes to +12/24VDC on Overcrank Failure. 300mA max.
12	Overspeed Annunciation Output closes to +12/24VDC on Overspeed Failure. 300mA max.
13	High Temp Output closes to +12/24VDC upon High Temp Failure. 300mA max.
14	Low Oil Output closes to +12/24VDC upon Low Oil Failure. 300mA max.
15	Low Battery Output closes to +12/24VDC on Low Battery Condition. 300mA max.
16	Engine Run Output closes to +12/24VDC on Engine Run Condition. 300mA max.
17	Not In Auto Output closes to +12/24VDC when unit is not in auto. 300mA max.
18	General Failure Output closes to +12/24VDC on a General Failure. 300mA max.
19	Start Stop Input. Apply +12/24VDC to this terminal while unit is in Auto Mode to start engine. Remove +12/24VDC to stop engine or enter Cool-Down mode.
20	Oil pressure sender/switch. This oil pressure sender/switch can be N.O. or N.C., meaning that for N.O., ground is a failure while +Vbatt is Engine OK, for N.C., ground means engine OK, and +Vbatt means failure. The operation (failure point) of the output in response to the sender can be set using the PC Interface.
21	Temperature sender/switch. For proper operation, this input must be connected to ground via a sender/switch. The operation (failure point) of the output in response to the sender can be set using the PC Interface.
22	Fuel Level/Auxiliary Failure Input. For proper operation, this input must be connected to ground via a sender/switch. The operation (failure point) of the output in response to the sender can be set using the PC Interface.

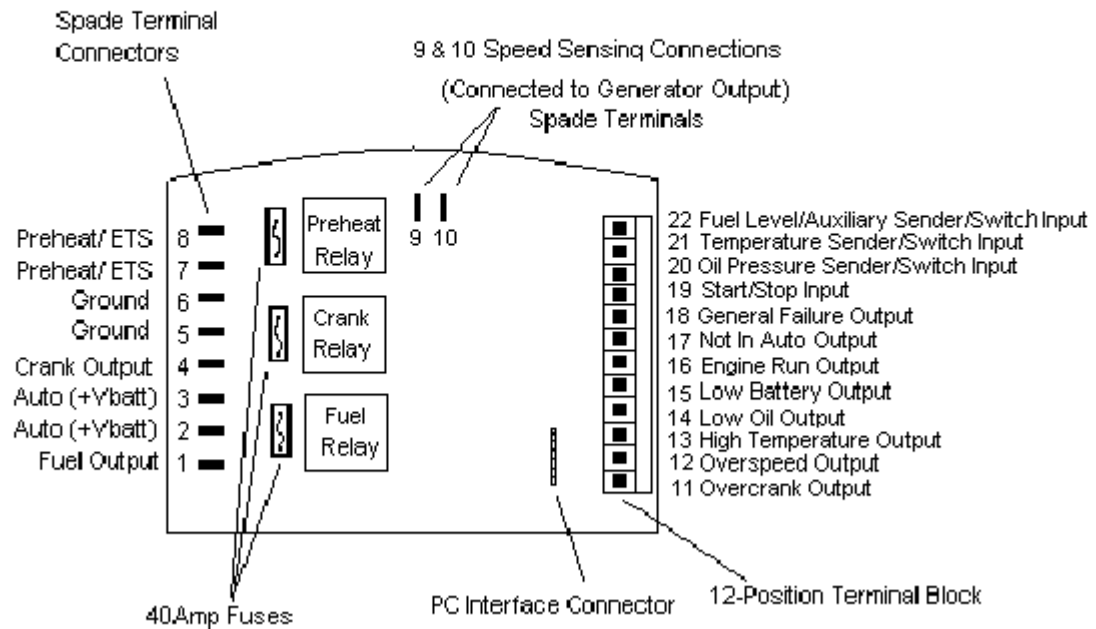
Wiring Connection Diagram

Wiring Connections For The GSC300



Back Panel Layout

GSC300 Back Panel Layout and Connections



CONTROLLER OVERVIEW

The GSC300 Features the Following Functions:

1. Controller Programming Adjustability
2. General Fault Conditions
3. Not In Auto
4. Low Battery Voltage Alarm
5. Oil Pressure Input
6. Coolant Temperature Input
7. Fuel Level/Auxiliary Input
8. Speed Signal Sensing
9. Adjustable Input Programming
10. Magnetic Pick-Up Capability Option

1: CONTROLLER PROGRAMMING ADJUSTABILITY:

Adjustable Parameter Ranges:

Crank Disconnect: 12 to 140Hz (Generator Output Version)
44 to 300Hz (Magnetic Pick-up Version)

Overspeed: 60 - 4156Hz (Generator Output Version) **-OR DISABLED BY PC INTERFACE**
300 - 8492Hz (Magnetic Pick-up Version) **-OR DISABLED BY PC INTERFACE**

Crank Tries: 1 to 10

Crank/Rest: 3 to 32 seconds

NOTE: If the engine speed seen by the controller does not go to zero during Crank Rest, the controller will wait until the speed goes to zero before re-initiating the cranking sequence.

2: GENERAL FAULT CONDITIONS: The following scenarios can cause the unit to enter the general fault condition:

Low Fuel/Auxiliary Failure (“XTR_FAIL”)

Low Oil

High Coolant Temperature

Overcrank

Overspeed

Loss of Speed (“SPDLOSS”)

The General Fault output is rated 300mA Max.

3: NOT IN AUTO: When the controller is in the OFF Mode, the NOT IN AUTO LED will illuminate and the NOT IN AUTO Output will close to +V_{batt}, indicating the controller is not in the AUTO Mode. The LCD display will read “OFF”, however the backlight on the LCD display will not be ON.

NOTE: + *Battery must be permanently connected to the AUTO terminal for the NOT IN AUTO condition and LED indications to function properly.*

4: LOW BATTERY VOLTAGE ALARM: In the event the battery voltage drops below the user defined set point which can be between 7 and 35VDC, the engine controller displays a Low Battery Condition. The Low Battery Voltage condition can occur when the controller is in the AUTO or MANUAL/TEST Mode, but will only occur in the running state or while in standby in AUTO. The LCD display will show the message: “LOW_BATT”

5: LOW OIL INPUT: The Low Oil Input can accept data from a sender or signal from a N.O. or N.C. type switch. N.O. means that ground would be a failure, +5V would be “Engine OK”. N.C. means that ground would be “Engine OK”, and +5V would be a failure. The operation of the oil input is set in PSI by the PC Interface and is the only input which has selectable operation in this manner.

Note: *The oil input failure is disabled during the Oil Bypass time.*

6: HIGH TEMPERATURE INPUT: For proper operation this must be of the standard N.O. type where with a switch or sender, a ground would be seen as a failure, and a +5V would be seen as “Engine OK”. This can be used with a sender or switch and when using a sender the failure point in degree Fahrenheit can be adjusted using the PC Interface.

7: FUEL LEVEL/AUXILIARY INPUT: For proper operation while using a switch, the switch must be the N.O. type which closes to ground upon failure. If this input is used as a sender, no failure will be indicated. The sender option is solely for Fuel Level/Auxiliary Level Display on the LCD.

8: SPEED SIGNAL SENSITIVITY: The controller will accept to a maximum of 300 VAC, 60 Hz from direct generator output for speed sensing. The following values are minimal recommended voltages for speed signal sensing:

20 HZ - .075 V (75mV)

60 HZ - .6V (600mV)

9: HOUR METER: The controller can display a log of generator run times. Run times will be displayed on the controllers display screen. The display represents both hours and minutes in the form 123456:7. The last digit on the hour meter will represent the time in 1/10 of an hour. Each increment would represent 6 minutes. For example if the hour meter displays 000010:5 than the generator had ran for 10 hours and 30 minutes. Please note that although the hour meter displays time in hours and minutes, it will record up to the nearest second. If the generator was operated for only 3 minutes, the display may not increment but this time would be stored and added to the next generator run time.

10: MAGNETIC PICK-UP CAPABILITY OPTION: The Magnetic Pick-Up Capability Option can be provided on the GSC300 upon request. Frequency will not be displayed on the LCD if this option is chosen.

LED LAYOUT

Front View of GSC300



LED INDICATIONS

FRONT PANEL LED INDICATIONS

LED Appearance	Condition/Failure
Not in Auto LED is ON.	Unit is in OFF state.
No LED's ON	“OFF”, no +12/24VDC to “Auto” terminal.
Steady Low Oil LED	Low Oil Pressure Failure
Flashing Low Oil LED	Auxiliary Input Failure
Steady High Temperature LED	Over Temperature Failure
Steady Overcrank LED	Engine would not start after specified Crank tries.
Steady Overspeed LED	Speed Signal present above Overspeed setting
Flashing Overspeed LED <i>Was Engine Cranking?</i> <i>Was Engine Running?</i>	No speed signal available while Cranking The speed signal was Zero while running. The engine has stalled, or the speed signal has been lost.
Steady Engine Running LED	Engine Controller is in running mode of operation.
Flashing Engine Running LED	Crank Rest period. Cranking will resume soon.

Programming The GSC300 Settings

Using the Front Panel Interface:

The following table shows the LED's that correspond to the various settings of the various parameters. To enter the controller into Program Mode, you need to turn the small switch at the bottom edge of the controller to the program position. This Mode Switch can be set using a ballpoint pen or such to allow the controller to be put into Program Mode. The first three LED's (3, 2 & 1) correspond to which parameter is being adjusted, and the next three (6, 5 & 4) LED's show the setting for that particular parameter. The picture on the next page shows the LED numbering and the location of the Mode Switch.

Parameter	LED's 3, 2 & 1 ▼	▼ LED's 6, 5 & 4 ▼							
		○○○	○○●	○●○	○●●	●○○	●○●	●●○	●●●
Crank Tries	○○○	1	2	3	4	5	6	7	8
Crank Time	○○●	5	10	15	20	25	30	35	40
Rest Time	○●○	0	5	10	15	20	25	30	35
Preheat Time	○●●	0	5	10	15	20	25	30	35
Cool-Down	●○○	0	32	64	96	128	160	192	224
Preheat/ETS/ Warm-Up	●○●	Preheat	ETS	Warm-Up	N/A	N/A	N/A	N/A	N/A
Warm-Up	●●○	0	28	56	84	112	140	168	196

To scroll through the parameters simply press the Auto button on the front panel of the GSC300. To scroll through the range of values for that parameter simply press the Manual Start button. To set the value into the controller's memory, press the OFF button. In this manner the settings of the controller can be adjusted by simply using the three buttons on the front panel of the controller. Be sure to press the OFF button when you have selected the parameter value wanted. By not pressing the off button to set the value, the value of that parameter will not be stored into memory and remain at it's previous setting.

Numbering Of LED's and Location of Mode Switch




Programming Using the PC Interface

The GSC300 can also be programmed using the PC interface. Detailed instructions on the PC interface are included with the GSC300 Configurator software. A sample interface screen is illustrated on the following page.

Sample Screen From PC Interface

GSC300 Configurator
File About Help



Switch/Sender

OIL
 Switch Sender
 NO NC

TEMPERATURE
 Switch Sender

FUEL
 Switch Sender

GSC CONTROL

Crank Disconnect (Hz) <input type="text" value="22"/>	Overspeed (Hz) <input type="text" value="69"/> <input type="checkbox"/> Disable	Crank Tries <input type="text" value="3"/>
High Temp Setpoint (degF) <input type="text"/>	Low Oil Setpoint (psi) <input type="text"/>	Battery Voltage (VDC) <input type="text" value="10.9"/>
Delay To Start (sec) <input type="text" value="0"/>	Preheat Time (sec) <input type="text" value="0"/>	Oil Bypass Time (sec) <input type="text" value="10"/>
Crank Time (sec) <input type="text" value="10"/>	Cooldown Time (sec) <input type="text" value="6.4"/>	Warmup Time (sec) <input type="text" value="0"/> <input type="checkbox"/> Enable
Rest Time (sec) <input type="text" value="3"/>	Speed Sensing <input checked="" type="radio"/> Gen o/p <input type="radio"/> MPU	Extra Relay <input type="radio"/> ETS <input checked="" type="radio"/> Preheat
Restart On False Start <input checked="" type="radio"/> Enable <input type="radio"/> Disable	Postheat <input type="radio"/> Enable <input checked="" type="radio"/> Disable	Fuel During Crank Rest <input checked="" type="radio"/> On <input type="radio"/> Off

CONTROL

Progress

Feedback

TROUBLESHOOTING GUIDELINES

TROUBLE	POSSIBLE CAUSE	SUGGESTED ACTION
Unit does not operate when powered to test mode	Power leads to unit are reversed	Confirm correct wiring for ground and +bat, and re-attempt testing.
	Bad ground connection from engine to controller unit.	Run wire directly from battery - to the ground terminal #11 on controller unit.
Engine starts and immediately goes into Overspeed shutdown	Improper speed range	Check to ensure that the speed sensing wires of the controller are connected to the generator output.
Engine does not crank	Battery is low or terminals are dirty	Clean terminals and re-charge battery
	Crank circuitry wiring improperly connected	Refer to engine control wiring section and check crank connections
	Bad ground connection from engine to controller	Run wire directly from battery - to the ground terminal #5 & 6, on controller unit.
	Crank relay damaged. Or on board fuse is blown	Check wiring, in line fuse and slave relay. Replace fuse, relay and re-test controller again
Engine cranks but does not start	Out of fuel	Check fuel level, add fuel if necessary
	Ignition control wiring not installed properly	Refer to engine control wiring section and check ignition connections
	Fuel relay damaged	Check fuel relay and replace if damaged.
Engine starts but shuts down after "Oil Bypass TM period" due to low oil/high temp/Aux input	Oil/Temp/Auxiliary input wiring improperly connected.	Check wiring for proper connections.
Fault LED works OK, but general fault output does not activate	Fault (short or overload) on general fault output.	Check for fault, once fault is corrected then output operation resumes.
Flashing Overspeed LED	Speed signal improperly connected, missing, or damaged.	Check speed signal wiring; replace damaged speed signal source.
	Crank output damaged, not working	Check wiring and replace controller if necessary
	Starter or starter solenoid damaged	Replace/repair damaged starter or starter solenoid.
Flashing Run LED & Solid Oil LED	Oil switch not closed as it should be	Check oil switch wiring and switch to make sure the switch is closing when there is no oil pressure
Solid Oil LED immediately on start-up, without engine actually cranking or starting.	False speed signal being detected by controller. This problem can sometimes occur in installations where there is AC power from inverters near generator output lines connected to the speed signal cable.	Install a small step down transformer between the speed sensing wires and the generator output.
		If the neutral from the generator output is not grounded, attach it to ground
Display Parameter for Temperature, Oil or Fuel displayed as >>> or <<<	Parameter is >>> ABOVE or <<< BELOW specified manufacturer sender range.	Install sender with proper range specifications.
Warm-Up Feature appears longer then time setting.	Warm-Up Feature time setting does not begin until the Oil Bypass Time has expired.	Re-adjust Oil Bypass and/or Warm-Up timing.

TECHNICAL NOTES ON FREQUENTLY ASKED QUESTIONS

1. Controller Memory Clear Time

The GSC300 needs 10 seconds for its memory to clear. When the power to the controller is turned off and then back on again without waiting a few seconds to clear the memory, a loss of speed will be indicated by the GSC300 because the controller remains in run mode and senses that the generator has stopped. This would be indicated by a Flashing Overspeed LED. By leaving the GSC300 OFF for 10 seconds before it is returned to the Auto setting the memory will be cleared and it will function as intended.

2. Step-Down Transformer Use On Speed Sensing Cable With Inverter Systems

In some applications engine controllers are used on generators where there is no utility connection and inverters are used to provide AC power instead of a utility. Inverters can produce harmonics that can cause small AC signals to appear on wires that are near any power lines being fed by the inverter. If the generator output wires are located close to a line being powered by an inverter, a small AC signal can appear on the generator output lines when the inverter is on. This signal can cause the engine controller to react as if the generator is running if the speed sensing wires are connected to the generator output lines. This small AC signal can cause the controller to appear to have a Low Oil Failure when the remote start contacts are closed or the controller is put in the manual/test mode. The controller may think the generator is already running and immediately check to make sure there is oil pressure. Since the engine really hasn't started yet, there is no oil pressure and the controller sees a low oil fault. This is seen as the Oil LED turning on solid even before the engine starts to engage the starter.

Without this false speed signal the controller will not look for oil pressure until the engine has started to run and the crank disengages if oil verification is disabled. Simply installing a small transformer between the generator output and the speed sensing terminals on the controller can eliminate this false speed signal. This transformer should be rated for 120 or 240 volts on the input or primary coil (depending on the generator output voltage you are using for speed sensing), and have an output voltage of around 12VAC on the secondary of the transformer. The two wires from the secondary of the transformer are connected to the two wires of the speed sensing terminals on the GSC300 controller. The step-down transformer acts to reduce the false speed signal on the line to a level that the engine controller will not recognize as the engine running. A common size transformer that would serve this purpose would be 24VA.

