

DYNAGEN[®]

power controls you can trust

TG350 User Manual



TOUGHSeries
Digital Generator Controllers



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1 Introduction

The TOUGH series controllers are designed to provide complete control, protection, AC metering, and engine instrumentation for both standard and electronic engines. The module is easily configured using either the front panel buttons or our DYNAGEN Configurator software. TOUGH series controllers are ideally suited for severe duty applications where reliability is critical such as mobile and stationary generators.



Features and Functions:

- 5 Year Warranty
 - SAE J1939 CAN Bus Protocol
 - RPM via J1939, Magnetic Pickup, or Generator
 - Speed control offset for electronic engines
 - Autostart on low battery and other sensors
 - Trim feature for AC monitoring and sensors
 - Maintenance counter
 - Exerciser Clock
 - 150 Event Log
 - Conformally coated for protection against moisture
- Gasket for water ingress protection IP65
 - Free DYNAGEN Configurator Software
 - Fast and rugged installation clips
 - Passcode protected
 - Automatic shutdowns and warnings
 - Manual and Remote start
 - Momentary Start / Stop inputs
 - Pre-heat and many other configurable timers
 - Accepts common senders (VDO, Datcon)
 - Custom senders configurable with DYNAGEN Configurator

Displays:

- Engine Temperature
 - Oil Pressure
 - Fuel Level
- Engine Speed
 - AC Metering
 - Battery Voltage
- Real Time Clock
 - Engine Hours
 - Time to Maintenance
- J1939 DTCs + Custom Text
 - Custom Senders
 - Warnings and Failures

Feature	Included
J1939 CAN Bus	✓
Magnetic Pickup Input	✓
150 Event Log	✓
Clock / Exerciser	✓
Generator Metering	Single, 3-Phase
Configurable Switched Inputs (+Battery, Ground, Open)	5
Resistive Sensors (1 High Ω , 2 Low Ω)	3
Universal Sensor (Resistive, 0-5V, 4-20mA)	1
Configurable Switched Outputs	6

1.1 Specifications

The TOUGH Series controllers were rigorously tested to ensure durability, reliability and functionality. The following specifications are a brief summary of the standards to which the controller has been tested. For complete details on the testing performed please contact DYNAGEN.

Testing Specifications

Specification	Rating
Electrical Transients	SAE1113-11
Thermal Shock and Cycling	SAE1455
Vibration Profiles	SAE1455
Electric Static Discharge	SAE1113-13

Physical Specifications

Specification	Rating
Operating Temperature	-40 to +158°F (-40 to +70°C)
LCD Viewing Temperature	-4 to +158°F (-20 to +70°C) (Optional heater available, call factory)
Weight Weight w/ RelayPak	0.83lb (0.38kg) 1.32lb (0.60kg)
Dimensions Dimensions w/ RelayPak	4.17" x 6.50" x 1.38" (10.59cm x 16.51cm x 3.51cm) 4.41" x 6.79" x 3.33" (11.20cm x 17.25cm x 8.46cm)

Electrical Specifications

Specification	Rating
Operating Voltage	5.5 ~ 36VDC
Standby Current	60mA @ 12V 38mA @ 24V
Switched Inputs	+Battery, Ground, Open
Switched Outputs	+Battery @ 1A Max
Low Resistance Sensors	0 ~ 750Ω
High Resistance Sensors	0 ~ 7,500Ω
Universal Sensors	0 ~ 750Ω, 0 ~ 7,500Ω, 0 ~ 5VDC, 4 ~ 20mA
Magnetic Pickup	10 ~ 10,000Hz at 1 ~ 50VAC
AC Voltage (Line-To-Line)	50 ~ 575VAC True RMS, Accuracy: 1% Full Scale
AC Current (TG410 only)	0 ~ 5A (Current Transformer), Accuracy: 1% Full Scale
Communications	SAE J1939 (Tier II, III, IV)

2 Installation

Generator systems contain high voltage circuitry and precautions to protect against it should be taken. Failing to power down and lock out equipment can cause damage, injury or death.



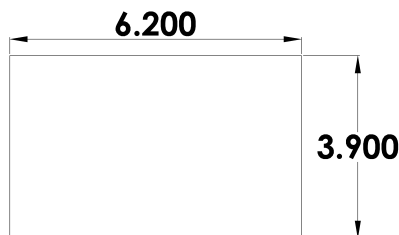
WARNING: Wiring of this controller should be performed by qualified electricians only.

The following general electrical safety precaution should be followed:

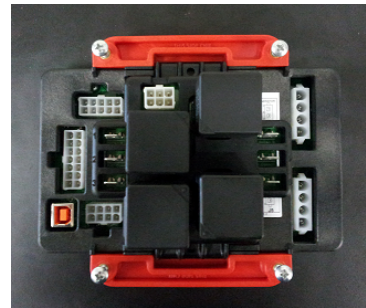
- Do a thorough inspection of the area before performing any maintenance.
- Keep fluids away from electrical equipment.
- Unplug connectors by pulling on the plug and not the cord.
- Use fuses where appropriate.
- Ensure all equipment is properly grounded.
- Provide support to wires to prevent stress on terminals.

To ensure proper and safe operation, caution must be taken at the installation site to make sure it is free from excessive moisture, fluctuating temperature, dust and corrosive materials. Choose a mounting surface with the least amount of vibration and not more than **0.125"** thick.

- 1) Choose a suitable mounting location based on the criteria above.
- 2) Create a rectangular cutout in the panel that is minimum 3.9" high and 6.2" wide.
- 3) Place the controller into the panel cutout so that the LCD screen and buttons are facing out.
- 4) Place the mounting clips into the designated slots on the top and bottom of the controller.
- 5) Tighten the screws on the clips until controller is snug against the panel. Do not over tighten, the bottom of the screws should angle very slightly away from the controller.
- 6) If applicable, snap the RelayPak (RP100) to the back of the controller. Place one side of the RP100s tabs into the slot on the back of the controller and without pushing on the relays, snap the other tab into place.



Dimensions are in inches. Not to scale.



2.1 Terminal Descriptions

Main Connector (J4)

Terminal	Name	Description
J4-1	+Battery	Provides power to the controller from the battery
J4-2	+Battery	Provides power to the controller from the battery
J4-3	Ground	Provides ground return for the controller
J4-4	Ground	Provides ground return for the controller
J4-5	Switched Input A	Configurable to detect +Battery, Ground, or Open
J4-6	Switched Input B	Configurable to detect +Battery, Ground, or Open
J4-7	Switched Input C	Configurable to detect +Battery, Ground, or Open
J4-8	Switched Output A	Outputs +Battery voltage when active (Max Current: 1A)
J4-9	Switched Output C	Outputs +Battery voltage when active (Max Current: 1A)
J4-10	Switched Output B	Outputs +Battery voltage when active (Max Current: 1A)
J4-11	Sensor Ground	Provides ground return for 2-wire sensors.
J4-12	Sensor Input A	High impedance sensor input (0 - 7,500Ω)
J4-13	Sensor Input B	Low impedance sensor input (0 - 750Ω)
J4-14	Sensor Input C	Low impedance sensor input (0 - 750Ω)

Expansion Connector (J3)

Terminal	Name	Description
J3-1	Switched Input D	Configurable to detect +Battery, Ground, or Open
J3-2	Switched Input E	Configurable to detect +Battery, Ground, or Open
J3-3	Switched Output D	Outputs +Battery voltage when active (Max Current: 1A)
J3-4	Switched Output E	Outputs +Battery voltage when active (Max Current: 1A)
J3-5	Switched Output F	Outputs +Battery voltage when active (Max Current: 1A)
J3-6	No Connection	No Connection
J3-7	Sensor Ground	Provides ground return for 2-wire sensors.
J3-8	Sensor Input D	Universal sensor input (0 - 750Ω, 0 - 7,500Ω, 0 - 5VDC, 4 - 20mA) See Universal Sensor section for more information.

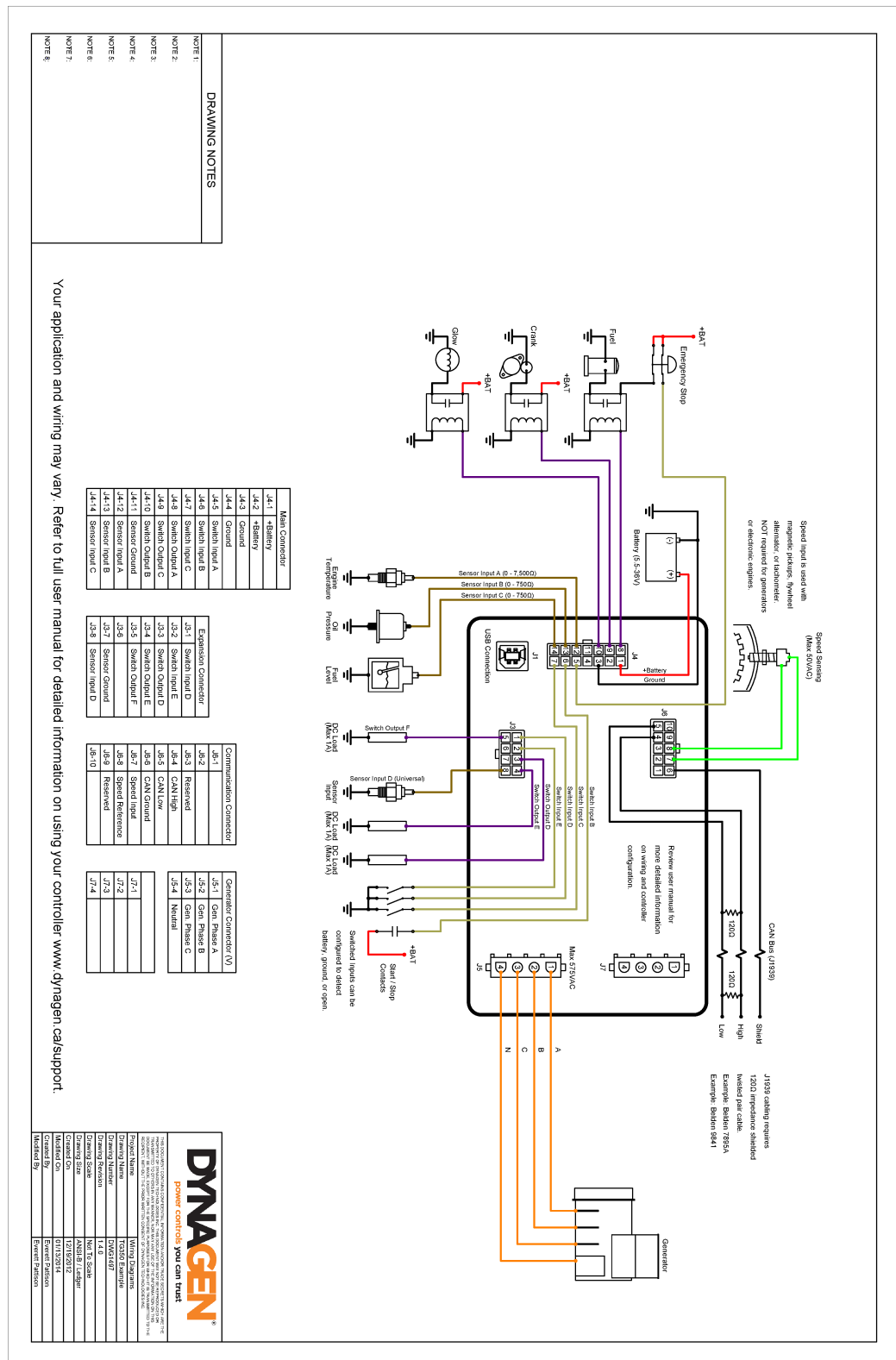
Communications Connector (J6)

Terminal	Name	Description
J6-1	No Connection	No Connection
J6-2	No Connection	No Connection
J6-3	No Connection	No Connection
J6-4	CAN-L	Communications line for CAN Bus (J1939)
J6-5	CAN-H	Communications line for CAN Bus (J1939)
J6-6	CAN-Shield	Connect the shield of the twisted pair cable to this terminal.
J6-7	Speed Sensing A	Connect to a magnetic pickup, tachometer, or a flywheel alternator. Not polarity sensitive and not required if using AC voltage terminals for speed sensing.
J6-8	Speed Sensing B	Connect to a magnetic pickup, tachometer, or a flywheel alternator. Not polarity sensitive and not required if using AC voltage terminals for speed sensing.
J6-9	No Connection	No Connection
J6-10	No Connection	No Connection

Generator AC Voltage (J5)

Terminal	Name	Description
J5-1	Phase A	Connect to Phase A of the generator.
J5-2	Phase B	Connect to Phase B of the generator.
J5-3	Phase C	Connect to Phase C of the generator.
J5-4	Neutral	Connect to neutral of the generator.

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TOUGH Series Manual



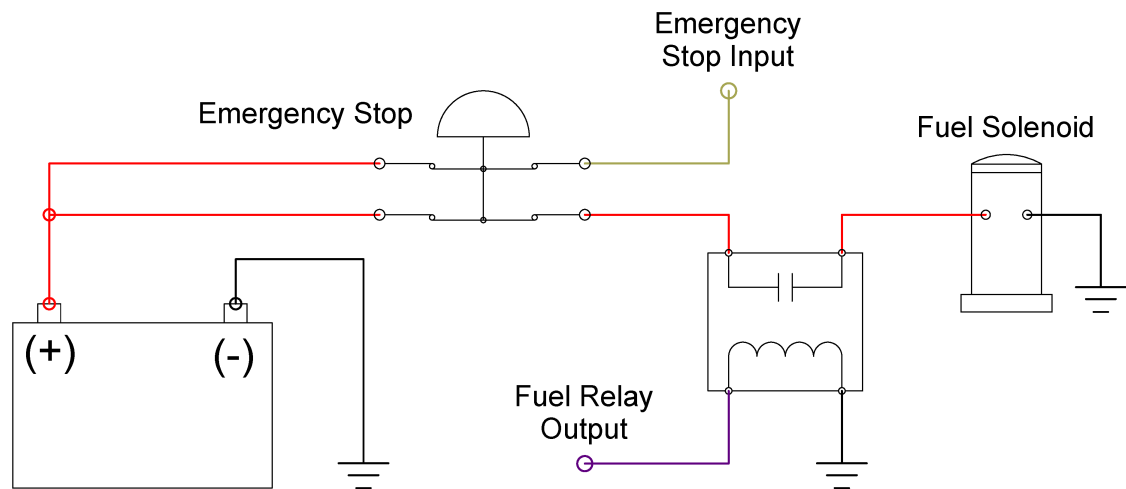
2.4 Wiring Considerations

The following sections are meant to describe certain wiring configurations for illustrative purposes. Not all applications are the same and make sure to modify these examples to better fit your system.

2.4.1 Emergency Stop Wiring

If Emergency Stop functionality is required, it is mandatory to install an external mushroom style switch wired in series with the fuel or ignition supply to ensure reliable and immediate shutdown upon activation.

Shown below is an example wiring diagram of a double pull single throw switch being use to activate the e-stop input and cut power to the fuel solenoid. In this configuration, the e-stop is activated when there is an open circuit to the switched input and inactive when the input detects +Battery voltage.



2.4.2 Universal Sensor

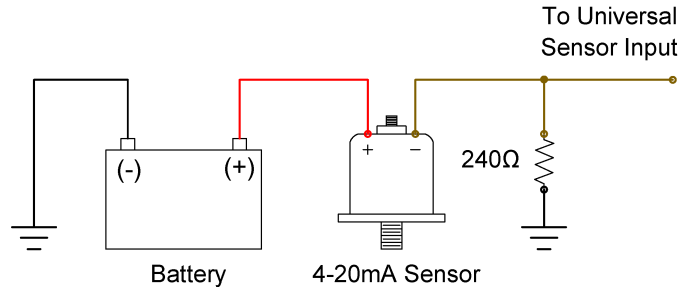
Universal Sensors have the ability to be configured to detect different sender types (0 - 750Ω, 0 - 7,500Ω, 0 - 5VDC, 4 - 20mA). The examples shown below are advanced applications of the universal sensor.



NOTE: Custom Sender tables are required for the universal sender to work with these examples. See the [Custom Sender Table](#) section for more information.

Example #1: The following example shows the correct way for wiring a 4-20mA sensor. The 240Ω resistor is required to change the 4-20mA current into a 0-5V voltage level that the controller can understand.

4-20mA Wiring Example



Example #2: Sometimes it is required to measure voltages outside the 0-5V range allowed by the controller. To do this you must use a voltage divider with appropriate scaling resistors. The equation to calculate the resistor values is as follows:

$$V_{out} = \left(\frac{R1}{R1 + R2} \right) \times V_{in}$$

$V_{out} = 5V$

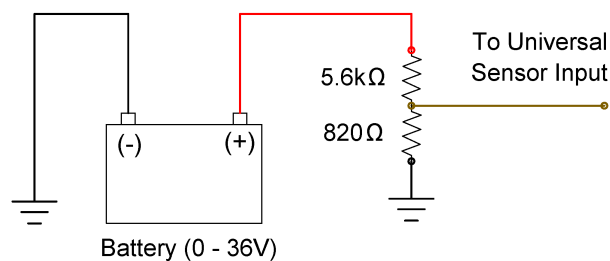
V_{in} = Maximum Voltage to Read

$R1$ = Common Resistor Value > 10kΩ

$R2$ = Calculated Resistor Value (Select closest common resistor value)

The following diagram shows the typical wiring of a voltage divider. The resistors values have been selected to allow the controller to read up to 36V from an external battery bank.

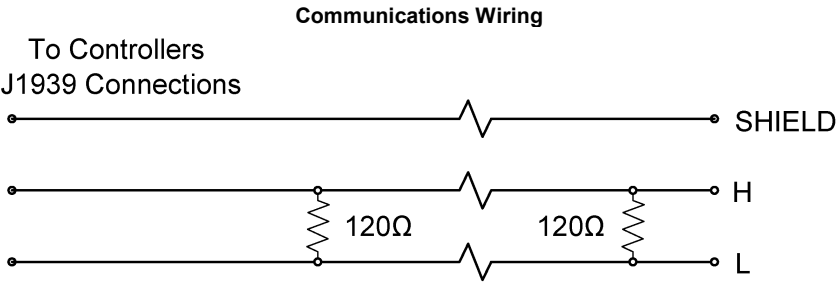
0-36V Wiring Example



2.4.3 CAN Bus Wiring

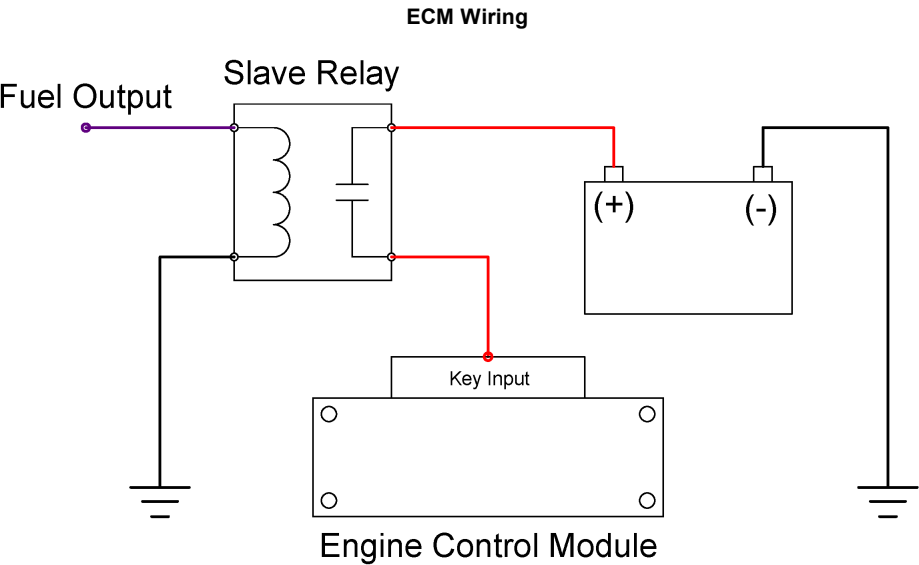
The following table outlines some items that must be taken into consideration when connecting to a CAN bus engine.

Consideration	Description
Bus Termination	Each end of the bus must be terminated from H to L with 120 Ω resistors. If the controller is a device that is not at the end of the bus, it does not require a terminating resistor.
Cable Selection	A J1939 twisted pair 120 Ω cable is required for communications. Possible options are: 1. Belden 9841 - One twisted pair, 24AWG 2. Belden 7895A - Two twisted pair, 20AWG, second pair can be used for power
Shielding	When using a Belden style cable, the shield must be grounded on one end of the bus. This prevents loss of data from electromagnetic interference.



For the ECM to function, it must first receive power for a short time before cranking to allow it to boot up. It is common practice to use the fuel relay output connected to a relay to trigger the key input of the ECM. There are two ways to configure this:

- The fuel relay is on during Preheat therefore increasing the Preheat time in the Engine Logic menu will allow longer time for the ECM to boot up before cranking.
- Turning on the Auto Power ECM setting in the Communications -> CAN Bus (J1939) menu enables the fuel relay to be on when controller is in Auto mode. This way the ECM will be always be on except when in OFF mode.



2.4.4 RelayPak (Optional)

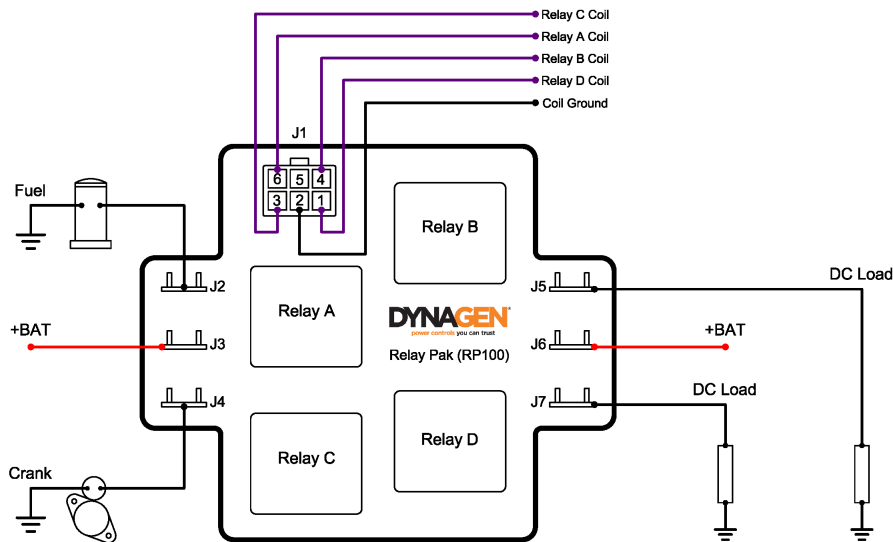
The RelayPak is used to provide built-in slave relays in a compact and easy to wire package. This allows the low current outputs of the controller to switch high current relays on the RelayPak.

Electrical Specifications

Specification	Rating
Operating Voltage	12V / 24V
Output Pilot Duty Rating	5.83A Per Relay @ 12V
Output Resistive Rating	10A Continuous Per Relay @ 12V 40A Momentary Per Relay @ 12V
Relay Style	Automotive Cube

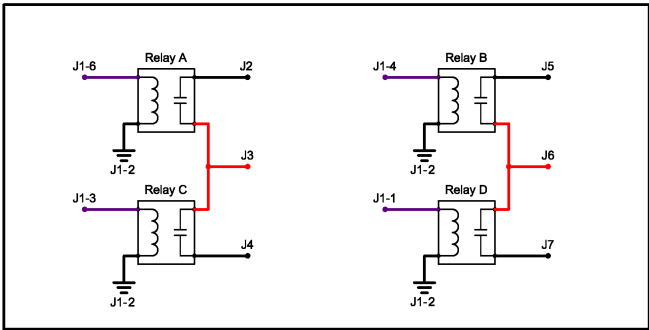


WARNING: You must use relays in the RelayPak that are suitable for the system voltage. Example: 12V relays in a 12V system and 24V relays in a 24V system.



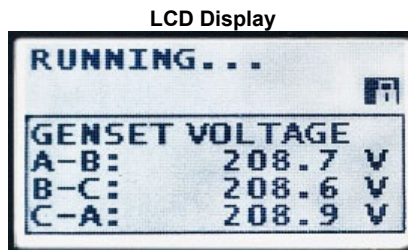
Schematic Representation

Relay Pak Connector	
J1-1	Relay D Coil
J1-2	-Battery
J1-3	Relay C Coil
J1-4	Relay B Coil
J1-5	
J1-6	Relay A Coil
J2	Relay A Contact
J3	A and C Common
J4	Relay C Contact
J5	Relay B Contact
J6	B and D Common
J7	Relay D Contact



3 Using the Controller

The LCD display is the primary source of information of the controller. The LCD allows you to view/change settings and monitor the status of sensors and other engine peripherals.



Using the Menu System

Task	Description
Entering Menu	When in the OFF mode, press the enter button to bring up the menu.
Navigating Menu	Once in the menu, use the up and down arrows to navigate. Pressing enter will move you into that menu.
Change a Setting	Scroll to the desired value and press enter to select. A check mark should now be beside that item. Press enter again to save the setting and return to the previous screen.
Scroll Parameters	When in Auto or Running mode, pressing the up and down arrows will scroll through the parameters pages.
Lock Screen	When in Auto or Running mode, you can lock the screen onto a certain parameter page by pressing enter. You can unlock the screen by pressing enter again.
Events History	Once in the menu, select Events History to view the most recent controller event. Use the up and down arrows to navigate to other events. The controller can store up to 150 events. If more than 150 events occur, the oldest event is deleted to make room for the next event.

Front Panel Items

Item	Name	Description
	Off Button	Used for turning off the engine or exiting out of Auto mode. This is not intended to function as an Emergency Stop as there are conditions in which it will not shutdown the engine. See the OFF Button Function section for more information
	Auto Button	Used for placing the controller into Auto mode. Once in Auto the controller waits for a start command to be received.
	Run Button	Used to start the engine manually. Must use the Off button to shutdown the engine if started from front panel.
	Up Button	Used for moving around in the menu, changing a settings value, or changing the currently displayed parameter page.
	Enter Button	Used for entering the menu system, accepting settings, or locking the LCD screen when viewing parameters.
	Down Button	Used for moving around in the menu, changing a settings value, or changing the currently displayed parameter page.
	Generator LED	Green = Engine running with no issues Amber = Engine running with warnings Red = Engine shutdown on failure

3.1 Modes, Starting and Stopping

The following table describes the different operating modes of the controller:

Modes

Mode / State	Description
OFF	When in the OFF mode, the engine cannot be remotely started.
Auto	When in the Auto mode, the engine waits to receive a start command.
Running	When engine is Running, the controller monitors engine parameters and waits to receive a stop command.
Failure	When a failure occurs, the controller shuts down the engine and displays reason for failure. The unit must be reset using the front panel OFF button with the exception of Modbus.
Menu	When in the menu you can change settings and view the events history.

The following table describes the different methods in which a controller can start. The controller *must* be in the AUTO mode in order to start for all methods with the exception of Manual Run.

Starting Methods

Methods	Description
Manual Run	Pressing the Run button will start the engine. You must press the OFF button to shutdown the engine.
Start / Stop Switched Input	When this input is active the engine will start. When the input becomes inactive the engine will shutdown.
Momentary Switched Inputs	Switched inputs Momentary Start and Momentary Stop can be used for starting and stopping of the engine. Unlike other inputs, they only have to be activated for a short period of time.
Battery Recharge	When the battery voltage drops below a certain level the engine will start and run for a predetermined amount of time.
Exerciser	When the scheduled exerciser interval occurs the engine will start and run for a predetermined amount of time.
Auxiliary Sensors	When a properly configured Auxiliary sensor falls below / rises above a certain point the engine will start as determined by the Auxiliary Sensors -> Mode Select settings.
Loss of Mains (TG350AMF only)	When loss of mains power is detected the engine will start to provide power to the load. All the appropriate settings in regards to Auto Mains Failure must be set properly.
Modbus Start (TG410 only)	When a certain command is sent to the controller over Modbus the engine will start. See the Modbus Reference Manual for more information.



WARNING: See the [Using Cooldown Mode](#) section for more information on how it affects starting and stopping.

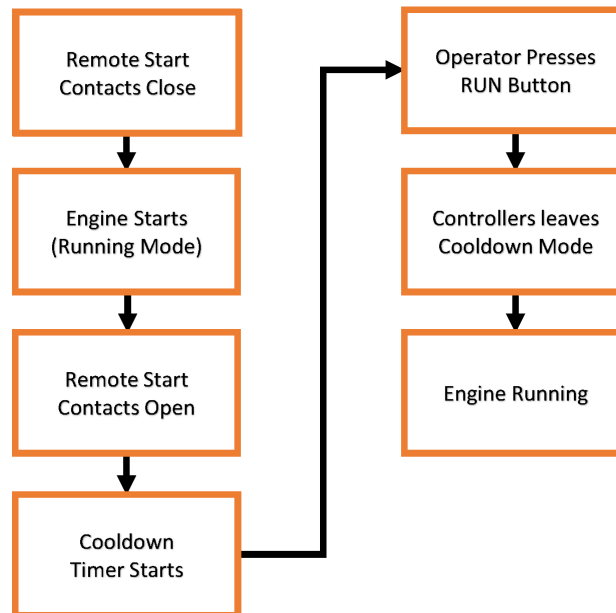
3.2 Using Cooldown Mode

When the controller is configured to have a cooldown period (See [Engine Logic](#) section) for the engine, there is some special functionality that must be considered.

The cooldown period is special in that during this time, it will accept a Start Command. This means that if the engine is cooling down and a start command is received, the controller will be placed back into a running mode and will not shutdown.

Example: The following is an example of how the cooldown functionality works.

1. Remote Start contacts close
2. Engine starts and is in the running mode
3. Remote Start contacts open
4. Engine starts cooldown period
5. User presses RUN button on the front panel
6. Engine moves back into running mode and does not shutdown
7. Engine can now only be shutdown by the OFF button or Emergency Stop input



4 Settings

The following section relates to settings that can be changed to alter the way the controller performs its functions. Read and review these sections carefully to ensure your settings are set correctly for your engine.

4.1 Operator Setup

The following settings are used to change the way the user interacts with the controller. They are not password protected and can be changed by anyone from the front panel.

Name	Range	Description
Lamp Test	Function	Performs a lamp test on the LED's when selected.
Display -> LCD Reverse	Function	Reverses the white and black pixels when selected.
Display -> LCD Contrast	5 ~ 95%	Changes the contrast of the LCD.
Display -> Page Scroll	1 ~ 10 seconds	Amount of time between each auto scroll of the parameter pages.
Display -> Message Pop-Up	1 ~ 10 seconds	Amount of time each message is displayed on the screen before displaying next message in buffer.
Display -> DPF/DEF Display Time	0 ~ 10 seconds	See the J1939 Reference Manual for more information.
Display -> LCD Backlight Timeout	10 ~ 600 seconds	Amount of time the LCD Backlight stays on after button activity stops.
Date / Time -> Date Change	1 ~ 31 days 1 ~ 12 months 2000 ~ 2099 years	Sets the date.
Date / Time -> Time Change	0 ~ 23 hours 0 ~ 59 minutes 0 ~ 59 seconds	Sets the time.
Date / Time -> Daylight Savings	Enable ~ Disable	Turns Daylight Savings Time on or off.
Units -> Temperature Unit	°F or °C	Selects the units in which temperature is displayed.
Units -> Pressure Unit	PSI or kPa	Selects the units in which oil pressure is displayed.
Run from OFF	Enable ~ Disable	When enabled, allows user to start engine using the run button while in the OFF mode. When disabled the controller must be placed in AUTO mode before the run button can start the engine.

4.2 Switched Inputs

The controller has switched inputs which when activated, cause the controller to perform a function.

Settings

Name	Range	Description
Functions	List - See Below	The function that the switched input performs when active.
Active Modes	List - See Below	Determines under which operating conditions the switched input can be active. Multiple selections are allowed.
Trigger	List - See Below	The state of the input that determines if it is active or inactive.

Functions

Name	Active Mode	Description
Disabled	N/A	Input is disabled and has no function.
Start / Stop	Auto, Running	Starts the engine when active, stops the engine when deactivated. WARNING: The Triggers are different from the regular triggers for this function. See the Start / Stop (Momentary Function) section for more information.
Emergency Stop	Global	Shutdown the engine when active and displays 'Emergency Stop.'
Idle Mode	Running	Controller ignores under speed, voltage and frequency warnings and failures when active. If using J1939, the controller will broadcast TSC1 as the Idle Speed parameter found in the Engine Speed section.
Voltage Select 1	Auto	Used for changing the systems voltage configuration. See Voltage Select for more information.
Voltage Select 2	Auto	Used for changing the systems voltage configuration. See Voltage Select for more information.
Battery Charger Fault	Global	Controller displays 'Charger Fault' warning when active.
Momentary Start	Auto	Starts the engine when momentarily active (Approximately 2 seconds).
Momentary Stop	Running	Stops the engine when momentarily active (Approximately 2 seconds).
Configurable Warning 1	Configurable	Controller displays a warning with configurable text when active. The DYNAGEN Configurator must be used to change the text.
Configurable Warning 2	Configurable	Controller displays a warning with configurable text when active. The DYNAGEN Configurator must be used to change the text.
Configurable Failure 1	Configurable	Controller displays a warning with configurable text and shutdown engine when active.
Configurable Failure 2	Configurable	Controller displays a warning with configurable text and shutdown engine when active.
Configurable Failure 3	Configurable	Controller displays a warning with configurable text and shutdown engine when active.
Air Pressure Failure	Cranking	Controller displays 'Air Pressure Failure' and shutdown engine when active.
Hydraulic Pressure Failure	Cranking	Controller displays 'Hydraulic Pressure Failure' and shutdown engine when active.
Low Oil Pressure Warning	Running	Controller displays 'Oil Pressure Warning' when active.
Low Coolant Level Failure	Global	Controller displays 'Coolant Level Failure' and shutdown engine when active.
High Fuel Warning	Global	Controller displays 'High Fuel Level' warning when active.
Lamp Test	Global	Controller performs lamp test when active.
Fuel In Basin	Global	Controller displays 'Fuel In Basin' warning when active.
Battle Mode	Running	Controller ignores all warnings and failures when active. If a failure occurs during Battle Mode it is 'latched' and the engine will shutdown on failure

		when the controller leaves Battle Mode.
Start Inhibit	Auto	Controller ignores all start commands and engine cannot start when active. Once Start Inhibit becomes inactive starting is enabled again. If the engine is running, activating this input will shutdown the engine.
Primary RPM / 60Hz - Secondary RPM / 50Hz Select	Auto	Used for changing between Primary and Secondary RPM for an engine or 50Hz / 60Hz for a generator. See RPM / Frequency Select for more information.
Preheat Signal	Cranking	When the Preheat Mode setting in the Engine Logic menu is set to Switched Input. It uses this input to determine to control the preheat time.

Active Modes

Name	Description
Disable	Input cannot be triggered.
Global	Input can be triggered at any time.
OFF Mode	Input can be triggered while in the OFF mode.
AUTO Mode	Input can be triggered while in the AUTO mode.
Running	Input can be triggered after a start command is received until shutdown.
Cranking	Input can be triggered during cranking.
After Cranking	Input can be triggered after engine has started until shutdown.
Cooldown	Input can be triggered while cooldown timer is active.



NOTE: More than one Active Mode can be selected.

Triggers

Name	Description
Close +BAT	Input is active when +Battery is present at the terminal.
Close GND	Input is active when Ground is present at the terminal.
Close +BAT/GND	Input is active when either +Battery or Ground is present at the terminal.
Open	Input is active when neither +Battery or Ground is present at the terminal.



NOTE: When running wires over long distances (100+), it is recommended to use +BATTERY as the trigger method.

4.2.1 Voltage Select

The controller has the ability to automatically change its AC voltage display mode and it's associated warnings and failures through use of switched inputs. The AC Metering -> Generator Voltage -> Voltage Configuration setting **must** be set to Auto Selection. When using voltage select, the controller will continue to monitor the inputs for 10 seconds after crank success, once that time expires the controller will then display the selected voltage configuration.

Use the table below to see how the switched inputs status correspond to the voltage configuration:

Volt Select 1 Input	Volt Select 2 Input	Voltage Configuration
Inactive	Inactive	3-Wire Single Phase
Active	Inactive	3-Phase (1)
Inactive	Active	3-Phase (2)
Active	Active	3-Phase (3)



NOTE: Both Voltage Select 1 and Voltage Select 2 must be assigned to switched inputs for the feature to function properly.

The following settings are affected by the Voltage Select Inputs:

1. AC Monitor -> Generator Voltage -> Auto Nominal
2. AC Monitor -> Generator Voltage -> Auto Scaling Factor
3. AC Monitor -> Generator Current -> Auto Rated Amps
4. AC Monitor -> Generator Current -> Auto Scaling Factor

4.2.2 RPM / Frequency Select

The controller has the ability to change between Primary RPM / 60Hz and Secondary RPM / 50Hz through use of a switched input. The AC Metering -> Generator Frequency -> Frequency Source setting must be set to RPM Switch for this feature to work. This setting can only be changed when the controller is not in running mode.

The following settings must be set in order for this feature to function:

- Switched Input X -> Primary RPM / 60Hz - Secondary RPM / 50Hz Select
- AC Metering -> Generator Frequency -> Frequency Source -> RPM Switch
- Sensors -> Engine Speed -> Auto RPM Nominal -> Primary RPM / 60Hz
- Sensors -> Engine Speed -> Auto RPM Nominal -> Secondary RPM / 50Hz

Use the table below to see how the switched input status corresponds to the RPM / Frequency:

Switched Input	Frequency
Inactive	Primary RPM / 60Hz
Active	Secondary RPM / 50Hz



NOTE: If enabled, the TSC1 PGN will be broadcasted according to the selected speed. Otherwise only the warning and failure set points are affected by this function.

4.2.3 Configurable Inputs

These inputs are used to create custom warnings and failures. Using the DYNAGEN Configurator you can change the text that is displayed when the warning or failure occurs. If you select one of these inputs without changing the text it will default to 'Config Warn X' and 'Config Fail X.'

There are also timers associated with which can be found in the menu under *Timers -> Trigger Delays*. These timers change the amount of time the input has to be active before the controller registers the warning or failure.



NOTE: If the switched input becomes inactive before the trigger delay time expires, the warning or failure will not occur.

Example: The user wants a pump to turn on 30 seconds after a high water level switch is tripped and remain on until the level switch turns off.

The level switch is connected to Switched Input C and closes to ground when the water level is too high. The words 'Water Pumping' are also required to be displayed on the controllers LCD screen. The pump is connected to a slave relay which is controlled by Switched Output D on the controller.

Relevant Settings

Setting	Value
Switched Input C -> Function	Configurable Warning 1
Switched Input C -> Active Mode	Global
Switched Input C -> Trigger	Close GND
Configurable Warning 1 Custom Text	Water Pumping
Switched Output D -> Warnings	Configurable Warning 1

4.2.4 Start / Stop (Momentary Function)

When a switched input is configured to **Start / Stop**, the trigger modes have different meanings than other inputs. The following table describes the trigger mode functionality.

Trigger	Description
Close to +Battery	Input active when +Battery is applied.
Close to Ground	Input active when ground is applied.
Close to +Battery / Ground	Input active when +Battery or ground is applied for approximately 2 seconds then deactivated.
Open	Input active when neither +Battery or ground is applied for approximately 2 seconds then deactivated.

The reason for changing these trigger mode is to allow the user to wire a single push button to be used for both starting and stopping the engine. Holding the button for too long will cause the engine to shutdown immediately after starting and vice versa.

4.3 Switched Outputs

The controller has switched outputs that are turned on under certain conditions to perform a function. The outputs turn on to +Battery voltage to drive the load when active. The following items are the available functions for switched outputs.



WARNING: Switched outputs have a floating voltage of approximately 8V when off. If using the outputs for digital logic, it will be necessary to put a pull down resistor (1kΩ) from the output to ground to ensure a low logic level when output is off.

Event Functions

Name	Active Mode	Description
Pull Coil	Cranking	See Pull and Hold Coil section for more information.
LCD Backlight	Global	Active when LCD Backlight is active.
Voltage Regulator	Running	Active when engine is starting/running and is not in Idle Mode.
Energize to Stop	ETS Timer	Active during Energize to Stop timer.
Fuel	Cranking, Running	Active during cranking and running to supply fuel to engine.
Crank	Cranking	Active during cranking to start the engine.
Glowplug	Preheat, Midheat, Postheat	Active during the Preheat, Midheat and Postheat timers.
Not In Auto	Off	Active when the controller is in the OFF mode.
Idle Mode	Idle Mode	Active when Idle Mode switched input is active.
Warmup	Warmup Timer	Active after Warmup timer has expired to apply load to engine.
Cooldown	Cooldown Timer	Active when Cooldown timer is active.
Engine Running	Cranking, Running	Active when engine is cranking or running.
Exercising	Exercise Timer	Active during the engine exercising cycle.
Battery Recharge	Battery Recharge Timer	Active during the battery recharge cycle.
Maintenance Required	Global	Active when Maintenance timer has expired.
Low Battery During Cranking	Cranking	Active when Low Battery During Cranking warning is displayed.
Auxiliary Sensor 1	Auxiliary Settings Dependent	Active dependent upon settings in the Auxiliary sensor section.
Auxiliary Sensor 2	Auxiliary Settings Dependent	Active dependent upon settings in the Auxiliary sensor section.
Auxiliary Sensor 3	Auxiliary Settings Dependent	Active dependent upon settings in the Auxiliary sensor section.
Auxiliary Sensor 4	Auxiliary Settings Dependent	Active dependent upon settings in the Auxiliary sensor section.
System Ready	Auto	Active when controller is in Auto mode and no warnings or failures are present.
Delay to Start	Delay to Start Timer	Active when the Delay to Start timer is active.
Battle Mode	Battle Mode	Active when Battle Mode switched input is active.
Force Regeneration	User Controlled	When user triggers a Force Regeneration, output is active for 20 seconds then switches off.
Regeneration Inhibit	User Controlled	When user triggers a Regeneration Inhibit, output is active for 20 seconds then switches off.
Common Failure	Any Failure	Active when any failure occurs.
RPM Increment	Running	Output is used to to trigger inputs on an ECM to control speed. See Front Panel Speed Control section for more information.
RPM Decrement	Running	Output is used to to trigger inputs on an ECM to control speed. See Front Panel Speed Control section for more information.

DEF Fluid Level	Running	Active when DEF Fluid Level falls below the DEF Low Level and stays active until the level rises above the DEF High Level. See CAN Bus (J1939) section for more information.
Generator Coil (TG350AMF only)	Global	Active when transfer switch is to be switched to the generator position.
Mains Coil (TG350AMF only)	Global	Active when transfer switch is to be switched to the mains position.

Warning Functions

Functions			
Low Engine Temperature	High Engine Temperature	Low Oil Pressure	Under Speed
Over Speed	Low Fuel Level	High Fuel Level	Low Battery Voltage
High Battery Voltage	Under Frequency	Over Frequency	AC Under Voltage
AC Over Voltage	Over Current	Fuel In Basin	Battery Charger Fault
Configurable Warning 1	Configurable Warning 2	Auxiliary Sensor 1	Auxiliary Sensor 2
Auxiliary Sensor 3	Auxiliary Sensor 4	---	---

Failure Functions

Functions			
Overcrank	Engine Failed to Stop	DM1 Stop Lamp	High Engine Temperature
Low Oil Pressure	Low Fuel Level	Under Speed	Over Speed
Low Battery Voltage	High Battery Voltage	Low Coolant Level	Low Air Pressure
Low Hydraulic Pressure	Under Frequency	Over Frequency	AC Under Voltage
AC Over Voltage	Over Current	ECM Communication Failure	Configurable Failure 1
Configurable Failure 2	Auxiliary Sensor 1	Auxiliary Sensor 2	Auxiliary Sensor 3
Auxiliary Sensor 4	---	---	---

4.3.1 Group Outputs

Group functions are designed so that multiple output functions can be bundled together and assigned to a single switched output pin. The definition of a group output is as follows:

-When any of the functions in a group is active (OR logic), the assigned switched output will be active.

Group Functions

Name	Active Mode	Description
Group #1	Group Dependent	Must be set from DYNAGEN Configurator software.
Group #2	Group Dependent	Must be set from DYNAGEN Configurator software.
Group #3	Group Dependent	Must be set from DYNAGEN Configurator software.
Group #4	Group Dependent	Must be set from DYNAGEN Configurator software.

Example: Low AC Frequency, High AC Frequency are bundled in 'Group #1' and assigned to Switched Output D. This output is connected to an external indicator lamp labeled 'AC Frequency Warnings.' This allows one output to indicate there is a warning with the AC frequency. The following table shows the output state based on the warnings status.

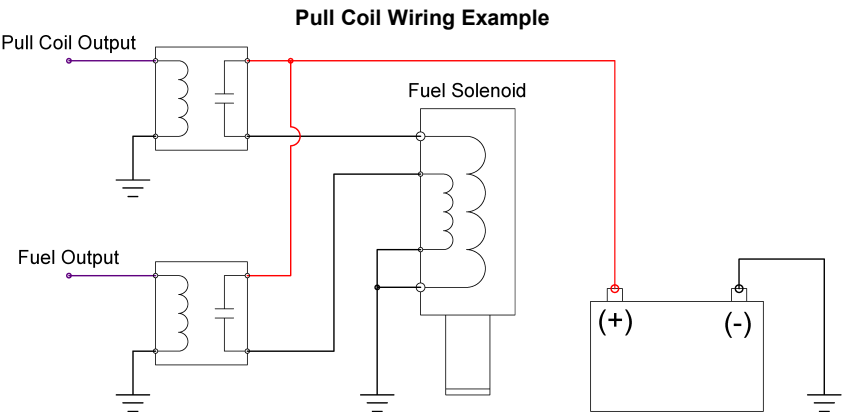
Low AC Frequency Warning	High AC Frequency Warning	Switched Output State
Inactive	Inactive	OFF
Inactive	Active	ON
Active	Inactive	ON
Active	Active	ON

4.3.2 Pull and Hold Coil

On some engine systems the fuel pump has two coils. The reason for this is that the initial power on of the fuel solenoid requires substantial current (Pull Coil), but only needs a small amount of current to hold it in place (Hold Coil).

- 1. Hold Coil (Fuel) is energized.
- 2. Pull Coil is energized for 2 seconds before cranking.
- 3. Repeat if engine cranking failed.

Configuring a switched output to Pull Coil automatically configures the engine logic necessary for a Pull Coil system.



4.4 Sensors

The controller has sensor ports which can be connected to a variety of different sensor types (Temperature, Pressure, Level, etc). See the [Terminal Descriptions](#) section for more information on which terminals your sensor is compatible with (Low Ω , High Ω , 0-5V or 4-20mA).

Most sensors are used to monitor for warnings and failures but the [Auxiliary](#) sensors can be used to perform special functions (Example: Starting engine on low temperature).

4.4.1 Engine Temperature

The following settings are used to configure how the controller reads and interprets data from the engine temperature sender.

Name	Range	Description
Signal Source	Sensor Port X J1939 Bus	The source from which the sensor data is attained.
Sensor Type	Sender Table X Close = Warning Open = Warning Close = Failure Open = Failure	Select one of the pre-configured sender tables or one of the switch functions. A custom table can also be created using the DYNAGEN Configurator. Close = Ground Open = Open Circuit
Trim Offset	-50.0 ~ 50.0°F	Calibrate a sensor by using the offset to correct errors.
Setpoints -> Bypass Time	0 ~ 90 seconds	Amount of time to bypass warnings and failures after engine has started.
Setpoints -> Low Warning	32 ~ 200°F	Reading at which a warning occurs.
Setpoints -> High Warning	50 ~ 300°F	Reading at which a warning occurs.
Setpoints -> High Failure	50 ~ 300°F	Reading at which a failure occurs.

4.4.2 Oil Pressure

The following settings are used to configure how the controller reads and interprets data from the oil pressure sender.

Name	Range	Description
Signal Source	Sensor Port X J1939 Bus	The source from which the sensor data is attained.
Sensor Type	Sender Table X Close = Warning Open = Warning Close = Failure Open = Failure	Select one of the pre-configured sender tables or one of the switch functions. A custom table can also be created using the DYNAGEN Configurator. Close = Ground Open = Open Circuit
Trim Offset	-50.0 ~ 50.0 PSI	Calibrate a sensor by using the offset to correct errors.
Setpoints -> Bypass Time	0 ~ 90 seconds	Amount of time to bypass warnings and failures after engine has started.
Setpoints -> Low Warning	0.1 ~ 99.0 PSI	Reading at which a warning occurs.
Setpoints -> Low Failure	0.1 ~ 99.0 PSI	Reading at which a failure occurs.

4.4.3 Fuel Level

The following settings are used to configure how the controller reads and interprets data from the fuel level sender.

Name	Range	Description
Signal Source	Sensor Port X	The source from which the sensor data is attained.
Sensor Type	Sender Table X Close = Warning Open = Warning Close = Failure Open = Failure	Select one of the pre-configured sender tables or one of the switch functions. A custom table can also be created using the DYNAGEN Configurator. Close = Ground Open = Open Circuit
Trim Offset	-50.0 ~ 50.0%	Calibrate a sensor by using the offset to correct errors.
Setpoints -> Bypass Time	0 ~ 90 seconds	Amount of time to bypass warnings and failures after engine has started.
Setpoints -> Low Warning	1 ~ 90%	Reading at which a warning occurs.
Setpoints -> Low Failure	1 ~ 90%	Reading at which a failure occurs.
Setpoints -> High Warning	1 ~ 125%	Reading at which a warning occurs.

4.4.4 Engine Speed

The following settings are used to configure how the controller reads and interprets speed sensing data.

Name	Range	Description
Signal Source	J1939 Bus Mag Pickup Genset Voltage	The source from which the sensor data is attained.
Speed Settings -> Rated RPM	500 ~ 4000	Speed at which the engine runs under normal operating conditions. Warning and failure setpoints are calculated from this setting.
Speed Settings -> Idle RPM	300 ~ 2000	Speed at which the engine runs when it is idling.
Speed Settings -> Tooth Count	1 ~ 600	Number of teeth on the flywheel (Mag Pickup only).
Setpoints -> Low Warning	50 ~ 99%	Reading at which a warning occurs.
Setpoints -> Low Failure	50 ~ 99%	Reading at which a failure occurs.
Setpoints -> High Warning	101 ~ 150%	Reading at which a warning occurs.
Setpoints -> High Failure	101 ~ 150%	Reading at which a failure occurs.
Front Panel Speed Control Settings	N/A	See Front Panel Speed Control section for more information on these settings.
RPM Switch -> Secondary RPM / 50Hz	500 ~ 4000	The Rated RPM when the Secondary RPM / 50Hz is selected. See RPM / Frequency Select section for more information.
RPM Switch -> Primary RPM / 60Hz	500 ~ 4000	The Rated RPM when the Primary RPM / 60Hz is selected. See RPM / Frequency Select section for more information.



NOTE: When using J1939 or Genset Signal as a signal source, connections to the speed sensing terminals are not required.

4.4.4.1 Front Panel Speed Control

The controller is able to adjust the speed of the engine through use of the front panel. This section will describe the 2 methods in which speed control is implemented, the settings, the parameters, as well as the steps the operator must take in order to control the speed.

Speed Control Methods

Setting	Description
J1939 (TSC1 Speed Command)	The controller can instruct the ECM of an electronic engine to adjust its speed by broadcasting the the TSC1 command.
Switched Outputs	The controller can instruct the ECM of an electronic engine to adjust its speed by using switched outputs on the controller set to RPM Increment and RPM Decrement to interface with digital inputs on the ECM. When the speed is changed, the corresponding switched output will be on for 1 second each time increment or decrement is pressed.



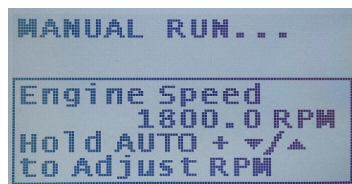
WARNING: Switched outputs have a floating voltage of approximately 8V when off. If using the outputs for digital logic, it will be necessary to put a pull down resistor (1kΩ) from the output to ground to ensure a low logic level when output is off.

Speed Control Settings

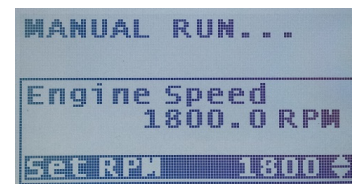
Name	Range	Description
Speed Control Enable	Enable ~ Disable	Enables or disables front panel speed control.
RPM Display	Nothing / Blank AC Frequency Auxiliary Sensor 1 Auxiliary Sensor 2	Parameter to display when adjusting speed from front panel. This is used to provide operator feedback in the case that the engine RPM affects another parameter such as AC Frequency or an Auxiliary Sensor (Example: Flow rate of pump).
RPM Control -> Limit Method	Speed Bias Min RPM / Max RPM	The method in which the minimum and maximum speeds the operator is allowed to adjust is determined.
RPM Control -> Speed Bias	0 ~ 600	The minimum or maximum RPM that the engine speed can be adjusted around the Rated RPM. Example: Rated RPM is 1800 and Speed Bias is 150. The minimum RPM will be 1650 and maximum RPM will be 1950. Only valid when the correct limit method is chosen.
RPM Control -> Minimum RPM	500 ~ 4000	The minimum RPM that can be set using speed control. Only valid when the correct Limit Method is chosen.
RPM Control -> Maximum RPM	500 ~ 4000	The maximum RPM that can be set using speed control. Only valid when the correct Limit Method is chosen.

Speed Control Instructions

When the controller is running and there is other functions occurring the controller will scroll through its display parameters as usual. When the speed control page is displayed, it will show the Engine Speed as well as the following instructions Hold AUTO + Up/Down to Adjust RPM.



Speed Control Parameter Page



Speed Control Adjust Page

Pressing and holding the AUTO button will display the screen to the right. If a 'Display Adjust Parameter' is set, it too will be displayed underneath the Engine Speed. While still holding the AUTO key, press the up or down arrows to adjust the RPM. The Engine Speed display should update as the engine physically changes its speed to accommodate the speed request.



NOTE: When using switched outputs for speed control, the Set RPM will display '---' instead of the set speed.

4.4.5 Battery Level

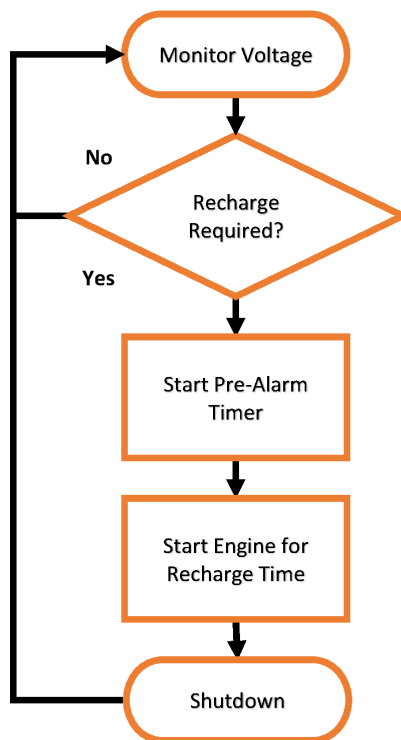
The following settings are used to configure how the controller reads and interprets the battery voltage level.

Name	Range	Description
Battery Recharge	Enable ~ Disable	Enables or disables the ability to have the engine start on low battery voltage in order to charge it.
Recharge Setup -> Level	6.0 - 30.0V	Voltage level at which the controller starts the engine to recharge the battery.
Recharge Setup -> Pre-Alarm	1 ~ 20 minutes	Amount of time to display a warning before starting the engine.
Recharge Setup -> Duration	10 ~ 900 minutes	Amount of time to run the engine.
Setpoints -> Low Warning	6.0 ~ 24.0V	Reading at which a warning occurs.
Setpoints -> Low Failure	6.0 ~ 24.0V	Reading at which a failure occurs.
Setpoints -> High Warning	12.0 ~ 32.0V	Reading at which a warning occurs.
Setpoints -> High Failure	12.0 ~ 32.0V	Reading at which a failure occurs.
Crank Low Batt	6.0 ~ 24.0V	Screen displays a 'Low Voltage During Cranking' warning if voltage dips below this level during cranking.



NOTE: When the engine is running, the battery voltage will equal the alternator charging voltage. The actual open-circuit battery voltage may be lower than displayed.

Battery Recharge Sequence



4.4.6 Auxiliary

The Auxiliary sensors on the controller are used for performing functions based on sensor readings. There are 2 different ways in which the auxiliary sensors can be utilized:

Scenario #1 - Custom Sensors

Use the auxiliary sensors to create custom sensors (Current, Voltage, etc.) that are not supported by the controller by default (Engine Temperature, Oil Pressure, Fuel Level).

Scenario #2 - Add-On Functionality

Double up the auxiliary sensor onto the same Sensor Port that is currently being used by one of the other sensors (Engine temperature, Oil pressure, Fuel level). This allows you to use the special functions (Start on Low, Output on High, etc.) in conjunction with those sensors.



NOTE: You must set the auxiliary sensor port and sender table to the same values as the other sensor.

Name	Range	Description
Signal Source	Sensor Port X	The source from which the sensor data is attained.
Display	Enable ~ Disable	Determines if the sensors value is displayed on the screen when the engine is running.
Active Modes	Disable Global Not In Auto Auto State Running Cranking After Cranking Cooldown	Determines under which operating conditions the Auxiliary Sensor is monitored. Multiple selections are allowed. Refer to the Switched Inputs section for more information on the Active Modes.
Mode Select	Fault Monitor Output on Low Output on High Start on Low Start on High	Determines how the controller responds to the readings of the auxiliary sensor. Refer to the examples in the following pages for more information on how each mode functions.
Trim Offset	-50.0 ~ 50.0 units	Calibrate a sensor by using the offset to correct errors.
Mode Settings -> Bypass Time	0 ~ 90 seconds	Amount of time to bypass warnings and failures after engine has started.
Mode Settings -> Active Time ¹	1 ~ 600 minutes	The amount of time to turn on the auxiliary switched output or engine before turning off.
Mode Settings -> Start Level ¹	Sender Table Dependent	The level at which the auxiliary switched output or engine turns on.
Mode Settings -> Stop Level ¹	Sender Table Dependent	The level at which the auxiliary switched output or engine turns off.
Setpoints -> Low Warning	Sender Table Dependent	Reading at which a warning occurs.
Setpoints -> Low Failure	Sender Table Dependent	Reading at which a failure occurs.
Setpoints -> High Warning	Sender Table Dependent	Reading at which a warning occurs.
Setpoints -> High Failure	Sender Table Dependent	Reading at which a failure occurs.

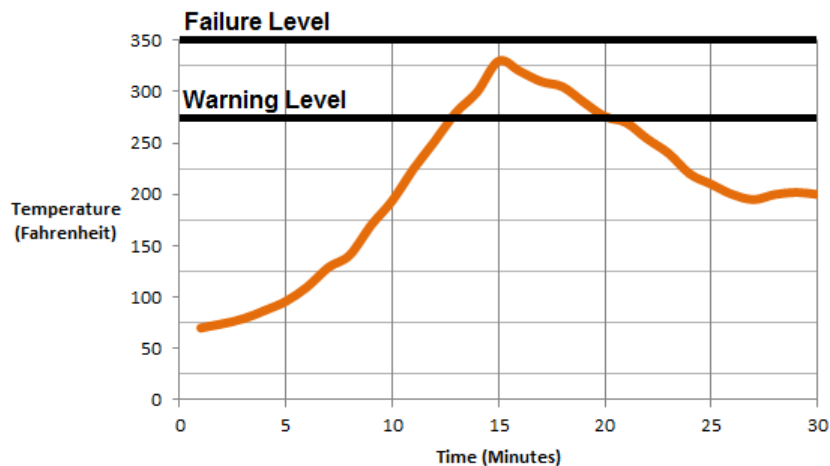
¹ Refer to the sections below for more information on how these settings affect the auxiliary sensors.

4.4.6.1 Fault Monitor Example

In this example, a sensor is monitoring the temperature of an engine block. If the temperature rises above 275°F a warning message is displayed. If the temperature rises above 350°F the engine shuts down and a failure message is displayed.

Relevant Settings

Setting	Value
Signal Source	Same as Engine Temperature
Display	Disable (If enabled, controller will display Engine Temperature twice)
Sensor Type	Same as Engine Temperature
Sender Table Name	Engine Temp.
Active Range	Running
Mode Select	Fault Monitor
Setpoints -> Low Warning	Disabled
Setpoints -> Low Failure	Disabled
Setpoints -> High Warning	275°F
Setpoints -> High Failure	350°F



The chart above shows the connection between engine temperature and time. At approximately 13 minutes run time the temperature rises above the 275°F warning threshold so a warning is displayed. The engine continues to run because it does not reach the 350°F failure threshold. At 20 minutes run time the temperatures falls below the warning threshold and the warning disappears.

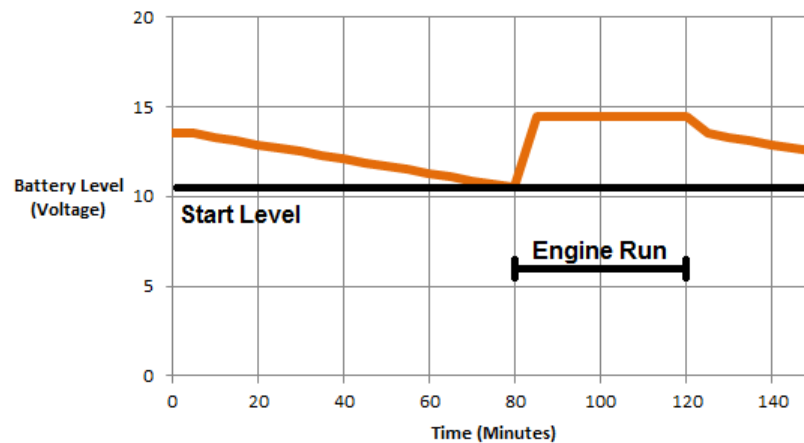
4.4.6.2 Start on Low / High Example

In this example, a sensor is monitoring the voltage of an external battery bank. If the voltage falls below 10.5V, the engine will start and run for 40 minutes to charge the battery.

Relevant Settings

Setting	Value
Signal Source	Sensor Port X
Display	Enable
Sensor Type	Custom
Sender Table Name	Battery Bank
Active Range	N/A (These ranges are fixed for Start on Low / High)
Mode Select	Start on Low
Mode Settings -> Active Time	40 minutes
Mode Settings -> Start Level	10.5V
Mode Settings -> Stop Level ¹	Disabled

¹ Stop Level is disabled because when the engine is running, the battery voltage will equal the alternator charging voltage. Having this disabled will force the engine to run for the entire duration of the active time.



The chart above shows the connection between a battery bank and time. At approximately 80 minutes time the voltage falls below the 10.5V start threshold causing the engine to start. The engine runs for the 40 minutes active time regardless of the voltage reading and the shuts down.

4.4.6.3 Output on Low / High Example

In this example, a sensor is monitoring the temperature of an engine. If the temperature rises above 325°F a fan will turn on to cool the engine. Once the temperature drops to below 200°F the fan will turn off.

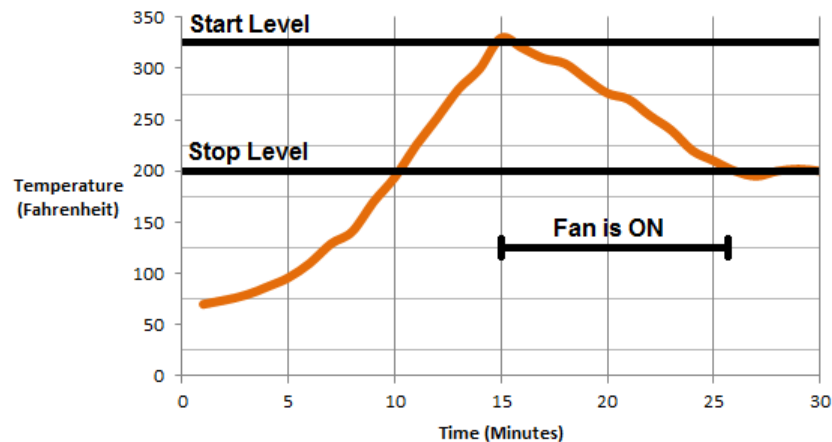
Relevant Settings (Auxiliary Sensor)

Setting	Value
Signal Source	Same as Engine Temperature
Display	Disable (If enabled, controller will display Engine Temperature twice)
Sensor Type	Same as Engine Temperature
Sender Table Name	Engine Temp.
Active Range	Global
Mode Select	Output on High
Mode Settings -> Active Time ¹	Disabled
Mode Settings -> Start Level	325°F
Mode Settings -> Stop Level	200°F

¹ Active time is disabled because the fan needs to stay on indefinitely or until 200°F is reached.

Relevant Settings (Switched Outputs)

Setting	Value
Switched Output X	Auxiliary Sensor X (Choose based on which Auxiliary Sensor is being used)



The chart above shows the connection between engine temperature and time. At approximately 10 minutes run time the temperature rises above the 325°F start threshold and the fan turns on. The fan continues to run as the temperature declines. When the temperature falls below the 200°F stop threshold the fan turns off.

4.4.7 Custom Sender Tables

Custom Sensor Tables are created using the DYNAGEN Configurator when using a sensor that is not supported by DYNAGEN. The configurator has the ability to create these custom tables so that the controller can properly read the sensor data.

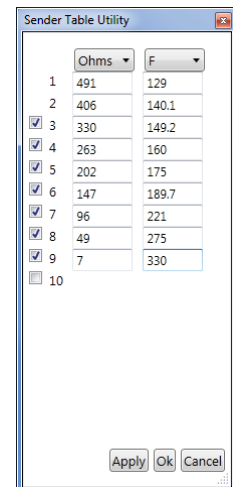
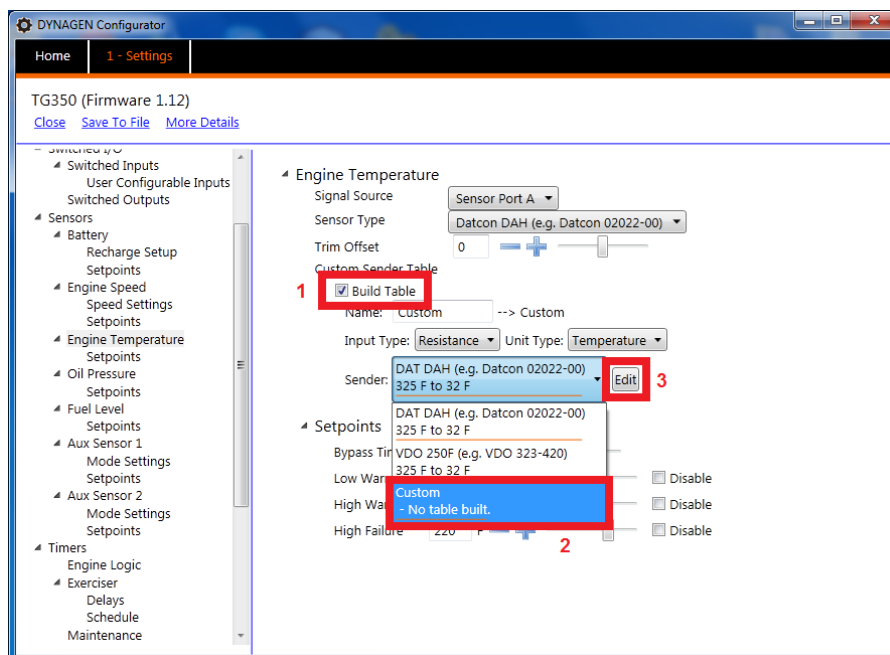


NOTE: Custom sender tables can only be created when using the configurator.

Parameter	Description
Name	The label that will be displayed in the controller (Engine Temp, Oil Pressure, etc.)
Input Type	Choose resistance, voltage or current based on the sensor type. Use the Terminal Descriptions section to determine if your sender is compatible with a sensor port.
Unit Type	Choose temperature, pressure, voltage, current or percentage based on the sensor. This defines what unit of measurement will be displayed on the front panel (F, PSI, V, A, %).

The following steps are an example of how to create a custom sensor table:

1. Navigate to the sensor input that will be using your custom sensor table.
2. Select a Name, Input Type and Unit Type for the controller (Definitions in table above).
3. Click the check box next to 'Build Table' (Image Step 1).
4. From the 'Sender' drop down menu, select 'Custom' (Image Step 2).
5. Click the 'Edit' button next to the drop down menu (Image Step 3).
6. Enter the sensor values. Once entered, click Apply then OK.



4.5 Timers

The controller has an internal clock which is used not only to keep time, but to make sure certain events happen at the correct times. The following sections are used to configure settings associated with timing functions.



NOTE: The controller has an on-board backup battery to keep time even when main power is not supplied to the unit. This battery has an un-powered (no main power) lifetime of approximately five years.

4.5.1 Engine Logic

The following settings determine how the controller starts and stops the engine. It gives the user the functionality to add delays and timers to the sequences. Most of the settings have a switched output associated with them that must be set in the [Switched Outputs](#) settings.



NOTE: Setting a timers value to 0 seconds will disable the timer. Example: If Delay to Start is set to 0 seconds, the controller will not perform a Delay to Start when starting the engine.

Name	Range	Description
Delay to Start	0 ~ 90 seconds	Amount of time to delay the starting of the engine after receiving a command to start.
Delay to Start on Manual Run	Enable ~ Disable	Determines if the the Delay to Start timer is used when the front panel RUN button is used to start the engine.
Preheat Mode	Preheat Timer Switched Input J1939	Determines which method controls when the glowplug output should be enabled. See the Preheat Mode section for more information.
Preheat Time	0 ~ 90 seconds	Amount of time the Glowplug output is active before cranking the engine. Used on diesel engines to warm the engine before cranking.
Crank Time	3 ~ 30 seconds	Amount of time the Crank output is active before going to crank rest. This timer immediately expires upon successful cranking.
Midheat Time	0 ~ 90 seconds	Keeps Glowplug output turned on while cranking but not during crank rest. Output will turn off upon cranking failure, crank success or midheat time expiration.
Crank Rest Time	1 ~ 90 seconds	Amount of time to delay between each attempt to start the engine.
Crank Attempts	1 ~ 20	Number of attempts to start the engine before going to a overcrank failure.
Fuel Crank Rest	Fuel ON Fuel OFF	Determines if the fuel output stays on during the crank rest time.
RPM Disconnect	100 ~ 2000 RPM	Speed at which controller determines the engine has started successfully and turns off the Crank output .
Postheat Time	0 ~ 90 seconds	Amount of time the Glowplug output remains on after crank success and the engine is running.
Restart on False Start	Enable ~ Disable	Determines if the controller will monitor for false starts and attempt a restart. Controller will only attempt restarting the engine as many times as determined by Crank Attempts.
False Restart Detect Time	5 ~ 30 seconds	Amount of time after successful cranking to monitor for a false restart. If this time expires and the engines stalls out the controller will not attempt a restart.
Auto Idle	Enable ~ Disable	Determines if the controller will automatically enter Idle Mode during the Warmup and Cooldown delays.
Warmup Time	0 ~ 600 seconds	After successful cranking, engine delays this amount of time before turning on the Warmup output . This allows the engine to warmup before applying any load to it. The output will turn off when the controller enters the Cooldown Delay.

OFF Button Function	Cooldown Shutdown Force Cooldown	The function the OFF button on the front panel performs while engine is running. See the OFF Button Function section for more information.
Cooldown Delay	0 ~ 600 seconds	Amount of time to cooldown the engine after a stop command has been received. During this time the Warmup output turns off and the Cooldown output turns on. If another start command is received during cooldown, the controller will return to running mode.
Energize to Stop Duration	0 ~ 30 seconds	Amount of time the Energize to Stop output is on after the engine has shutdown. If controller still detects speed (RPM) after this time expires, it goes to a 'Failed to Stop' failure. Time must be greater than 0 seconds for the Energize to Stop function to work.

4.5.1.1 Preheat Mode

The controller has the ability to control the length of the preheat time through 3 different methods. The table below describes each method:

Mode	Description
Preheat Timer	This mode uses the Preheat Timer setting in the Engine Logic menu.
Switched Input	This mode uses a switched input set to Preheat Signal.
J1939	This mode uses commands sent from the ECM over J1939.



NOTE: During preheat the Glowplug switched output is on.

4.5.1.2 OFF Button Function

The OFF button on the front panel of the controller can be configured to function in 3 different ways while the engine is running. The table below describes each of these functions:

Function	Description
Cooldown	This function causes the controller to go into cooldown. Pressing the OFF button again will cause the engine to shutdown.
Shutdown	This function bypasses Cooldown and causes the engine to shutdown.
Force Cooldown	This function causes the controller to go into cooldown. Pressing the OFF button will have no affect as the controller is forcing the engine to perform a full cooldown.



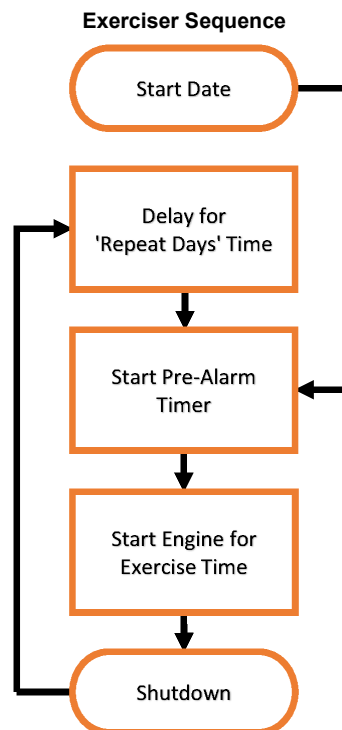
WARNING: If the controller receives a command to start while in Cooldown, it will leave the Cooldown mode and go back to Running mode.

4.5.2 Exerciser

The Exerciser function is used start and run the engine periodically. This is commonly used to make sure problems with the engine do not arise from sitting idle for too long. The following settings configure the Exerciser function:

Name	Range	Description
Enable	Enable ~ Disable	Determines if the engine is automatically exercised periodically.
Delays -> Pre-Alarm	1 ~ 20 minutes	Amount of time to display a warning before starting the engine.
Delays -> Run Time	10 ~ 1500 minutes	Amount of time to run the engine.
Schedule -> Start Date	1 ~ 31	The initial day of the month to run the exerciser.
Schedule -> Start Hour	0 ~ 23	The initial hour of the day to run the exerciser.
Schedule -> Repeat Days	1 ~ 28 days	Number of days between each exerciser cycle.

When configuring the Start Date and Hour, you must select a time in the future in which to run the initial exerciser sequence. After the initial sequence, the exerciser runs at an interval determined by 'Repeat Days.'



4.5.3 Maintenance

The controller has the ability to count down the time between scheduled maintenance by a technician. Once maintenance is required, the controller will alert the operator via the LCD screen and a switched output (if enabled) wired to a lamp / horn / buzzer. The following settings are used to configure the maintenance timer.

Name	Range	Description
Reset Counter	Enable ~ Disable	Once the maintenance count interval expires, use this setting to reset the time and turn off the switched output (if enabled).
Enable Counter	Enable ~ Disable	Determines the number of hours between required maintenance. A switched output can be configured to turn on once the count interval expires.
Counter Interval	10 ~ 9990 hours	Enables or disables the maintenance function.

To find out the amount of time until next maintenance, follow these menu steps:

Main Menu -> Device Info. -> Maintenance

Maintenance counter is disabled if '----' is displayed. A negative number indicates the amount of time since maintenance timer expired.

4.6 AC Monitor

The controller has the ability to monitor AC voltage from a generator. The following sections are used to configure settings associated with AC monitoring.

4.6.1 Generator Voltage

The following settings are used to configure how the controller responds to voltage measurements.

Name	Range	Description
Voltage Source	Disable 2-Wire Single 3-Wire Single 3-Wire 3-Phase 4-Wire 3-Phase 4-Wire Delta Auto Selection	The wiring configuration of the generator. Selecting Auto Selection will use the Voltage Select inputs to determine which wiring configuration is implemented and displayed.
Scaling Factor	0.500 ~ 2.500	Scaling factor at which the voltage is read into the controller. See below for more information.
Nominal Volts	50 ~ 800Vac	Voltage at which the generators runs at when operating under normal running conditions.
Auto Nominal -> 1-Phase 3-Wire	50 ~ 800Vac	Nominal Volts when using the Voltage Select inputs.
Auto Nominal -> 3-Phase (1)	50 ~ 800Vac	Nominal Volts when using the Voltage Select inputs.
Auto Nominal -> 3-Phase (2)	50 ~ 800Vac	Nominal Volts when using the Voltage Select inputs.
Auto Nominal -> 3-Phase (3)	50 ~ 800Vac	Nominal Volts when using the Voltage Select inputs.
Auto Ratios -> 1-Phase 3-Wire	0.500 ~ 2.500	Scaling Factor when using the Voltage Select inputs.
Auto Ratios -> 3-Phase (1)	0.500 ~ 2.500	Scaling Factor when using the Voltage Select inputs.
Auto Ratios -> 3-Phase (2)	0.500 ~ 2.500	Scaling Factor when using the Voltage Select inputs.
Auto Ratios -> 3-Phase (3)	0.500 ~ 2.500	Scaling Factor when using the Voltage Select inputs.
Auto Single	A-C Phase A-B Phase	For 1-Phase 3-Wire when using the Voltage Select inputs, this determines which phases the voltage is read from.
V Setpoints -> Low Warning	50 ~ 99%	Reading at which a warning occurs.
V Setpoints -> Low Failure	50 ~ 99%	Reading at which a failure occurs.
V Setpoints -> High Warning	101 ~ 150%	Reading at which a warning occurs.
V Setpoints -> High Failure	101 ~ 150%	Reading at which a failure occurs.

Application Note: Scaling Factor

The scaling factor setting can be used to calibrate the AC voltage if there is discrepancies between the reading and the actual value. It can also be used if transformers are used to step up / down the voltage. The scaling factor applies to all phases in a system.

Example: The voltage source is a 3-Wire 3-Phase system with a nominal voltage of 208V. The controller is reading 206.3V but a calibrated multimeter gives 208.3V. Use the formula below to determine the scaling factor.

1. Scaling Factor = Multimeter Reading / Controller Reading
2. Scaling Factor = 208.4V / 206.3V
3. Scaling Factor = 1.010

4.6.2 Generator Frequency

The following settings are used to configure how the controller responds to frequency measurements.

Name	Range	Description
Frequency Source	Nominal 50Hz Nominal 60Hz Auto Selection	The wiring configuration of the generator. Selecting Auto Selection will use the Frequency Select input to determine which frequency is used.
Hz Setpoints -> Low Warning	50 ~ 99%	Reading at which a warning occurs.
Hz Setpoints -> Low Failure	50 ~ 99%	Reading at which a failure occurs.
Hz Setpoints -> High Warning	101 ~ 150%	Reading at which a warning occurs.
Hz Setpoints -> High Failure	101 ~ 150%	Reading at which a failure occurs.

4.7 Communications

The controller has the ability to communicate with other systems over communication buses. The following sections relate to settings associated with communications.

4.7.1 CAN Bus (J1939)

For detailed information about J1939 settings and functions please use the J1939 Reference Manual. The manual can be found at www.dynagen.com/support.

Name	Range	Description
ECM Model	Generic J1939 John Deere JDEC Volvo EMS Cummins CM850 Yanmar ECO Detroit Diesel Volvo EMS2B Isuzu 4H GM PSI econtrol	Choose the one of the available ECM modules from the list.
ECM Communication Failure	Enable ~ Disable	If no CAN messages are received for more than 6 seconds, the controller shuts down the engine.
DTC Display	Enable ~ Disable	Enables or disables active fault messages (DM1) monitoring.
Active DTC Log	Enable ~ Disable	Enables or disables the storing of active faults (DM1).
Read Stored DTC	Enable ~ Disable	Enables or disables the ability to request stored fault codes from the ECM (DM2).
Auto Power ECM	Enable ~ Disable	When enabled, the fuel relay is enabled in Auto mode so that the ECM is already booted up and initialized before the user decides to start the engine.
ECM Power Delay	5 ~ 30 seconds	Used in conjunction with Auto Power ECM. When the engine shutdowns the controller waits the ECM Power Delay before turning on the fuel relay again. This is to prevent unwanted start ups due to the engine not being completely shut down.
Cummins PGNs	Enable ~ Disable	Enables or disables the broadcasting of PGNs required by Cummins engines.
SPN Conversion	Version 1 Version 2 Version 3	Select the SPN conversion method.
EMS2B Frequency Select	Primary Secondary	For Volvo EMS2B Engine Control Modules only.
EMS2B Accelerator Pedal	40.0 ~ 60.0%	For Volvo EMS2B Engine Control Modules only.

5 Troubleshooting

If you are having issues with your controller, please refer to the table below for a solution before contacting technical support.

Issue	Solution
Engine starts but the crank output does not turn off	The controller is not receiving a speed signal. 1. Verify the Sensors -> Engine Speed -> Signal Source setting is set correctly. 2. Verify the Timers -> Engine Logic -> RPM Disconnect setting is set correctly. 3. Ensure the correct wiring to the controller. For magnetic pickup, Speed Sensing A and B terminals are used. For generator voltage, the AC voltage connections are used.
Sender always displayed its lowest or highest value	The sender could either be open (not connected) or shorted to ground. Verify your connections and ensure the correct sender table is loaded.
Reserved	Reserved for future troubleshooting.
Reserved	Reserved for future troubleshooting.
Reserved	Reserved for future troubleshooting.

Contacting DYNAGEN can be done by any of the methods below. Technical support is offered Monday - Friday, 8:00am - 4:00pm (EST). If you are unable to get a hold of one of our engineers, please leave a message and they will return your call as soon as possible.

Type	Information
Website	www.dynagen.ca/support
Email	support@dynagen.ca
Phone Number	(902) 406-0133
Twitter	@DynaGenTech
Facebook	www.facebook.com/DYNAGEN
Address	3 Spectacle Lake Drive, Unit B105 Dartmouth, NS B3B1W8, Canada