



# OS-TSCM

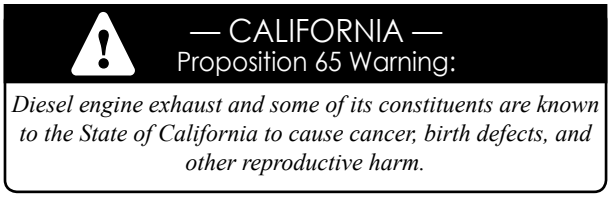
TSC Marine Panel User Manual

# OPERATOR'S MANUAL

Marine Generators | Marine Diesel Engines | Land-Based Generators

NORTHERN LIGHTS

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NORTHERN LIGHTS

# OPERATOR'S MANUAL

## OS-TSCM User Manual

***Read this operator's manual thoroughly before starting to operate your equipment.***
***This manual contains information you will need to run and service your new unit.***

### Table of Contents

# 1 Specifications

**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 ) |
| Weight | 0,83lb (0.38kg) |
| Dimensions | 4.17" x 6.50" x 1.38" (10.59cm x 16.51cm x 3.51cm) |

**Electrical Specifications**

| Specification | Rating |
|---|---|
| Operating Voltage | 5.5 ~ 36VDC |
| Standby Current | 60mA @ 12V<br>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 | 0 ~ 5A (Current Transformer), Accuracy: 1% Full Scale |
| Communications | SAE J1939 (Tier II, III, IV)<br>Isolated RS485 (Slave Modbus RTU) |

## 1.1 Introduction

The TOUGH series controllers are designed to provide complete control, protection, AC metering, and engine instrumentation for both standard and electronic engines. Your S-TSCI Panel has been configured by Northern Lights to work with your genset. TOUGH series controllers are ideally suited for severe duty applications where reliability is critical.

Features and Functions:

- SAE J1939 CAN Bus Protocol
- RPM via J1939, Magnetic Pickup, or Generator
- Trim feature for AC monitoring and sensors
- Maintenance counter
- 150 Event Log
- Conformally coated for protection against moisture
- Gasket for water ingress protection IP65
- Passcode protected
- Automatic shutdowns and warnings
- Manual and Remote start

## 1.1 Introduction (Continued)

Available Displays:

- Engine Temperature
- Oil Pressure
- Engine Speed
- AC Metering
- Battery Voltage
- Real Time Clock
- Engine Hours
- Time to Maintenance
- Text
- Warnings and Failures

## 1.2 This Manual

This manual is divided into two sections:

1. Hardware Installation
2. Operation / Configuration

## 1.3 Receiving, Handling & Storage

**Receiving:**

Every effort is made to ensure that your S-TSC gen-set controller arrives at its destination undamaged and ready for installation. The packaging is designed to protect the S-TSC internal components as well as the enclosure. Care should be taken to protect the equipment from impact at all times. Do not remove the protective packaging until the equipment is at the installation site and ready to be installed.

When the S-TSC reaches its destination, the customer should inspect the shipping box and controller for any signs of damage that may have occurred during transportation. Any damage should be reported to a Northern Lights representative after a thorough inspection has been completed.

A shipping label affixed to the shipping box includes a variety of product and shipping information, such as items and Customer numbers. Make certain that this information matches your order information.

**Handling:**

As previously mentioned, each S-TSC gen-set controller is packaged in its own individual box. Do not discard the packing material until the controller is ready for installation. Protect the equipment from impact at all times and do not carelessly stack. Once the controller is at the installation site and ready to be installed, the packaging material may be removed.

**Storage:**

Although well packaged, this equipment is not suitable for outdoor storage. S-TSC is to be stored indoors for any period of time, it should be stored with its protective packaging in place. Protect the controller at all times from excessive moisture, dirty conditions, corrosive conditions, and other contaminants. It is strongly recommended that the package-protected equipment be stored in a climate-controlled environment of -20 to 65°C (-4 to 149°F), with a relative humidity of 80% or less. Do not stack other equipment on top of the stored controllers.

## 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:

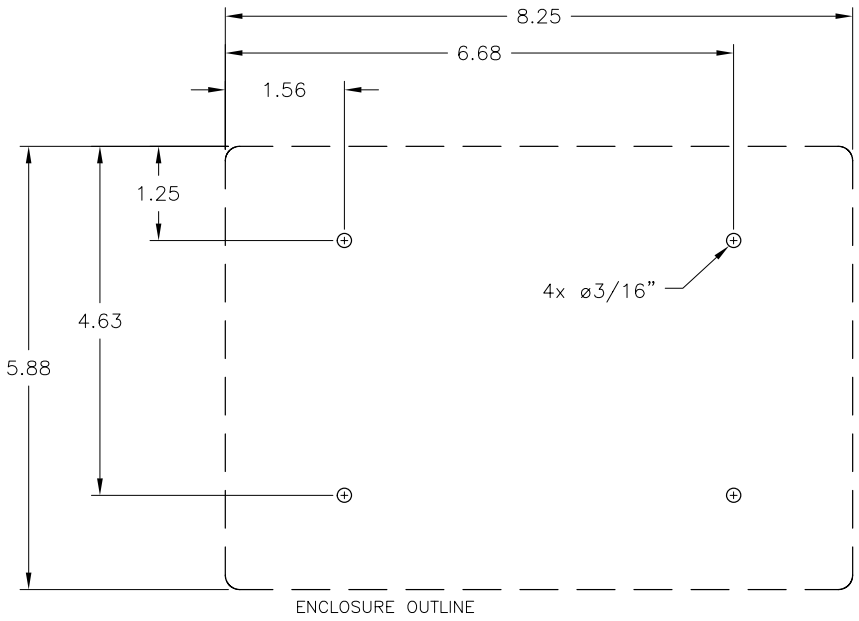
- Do a thorough inspection of the area before performing any maintenance.
- Keep fluids away from electrical equipment.
- Unplug connectors by pulling on the plug and not the cord.
- Use fuses where appropriate.
- Ensure all equipment is properly grounded.
- Provide support to wires to prevent stress 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, within reach of the cables connecting the unit to the generator set. There are two ways to mount the local (or remote) control panel.

**Surface Mounting**

The rear wall of the S-TSC enclosure has four, 3/16" diameter holes for mounting to a flat surface.

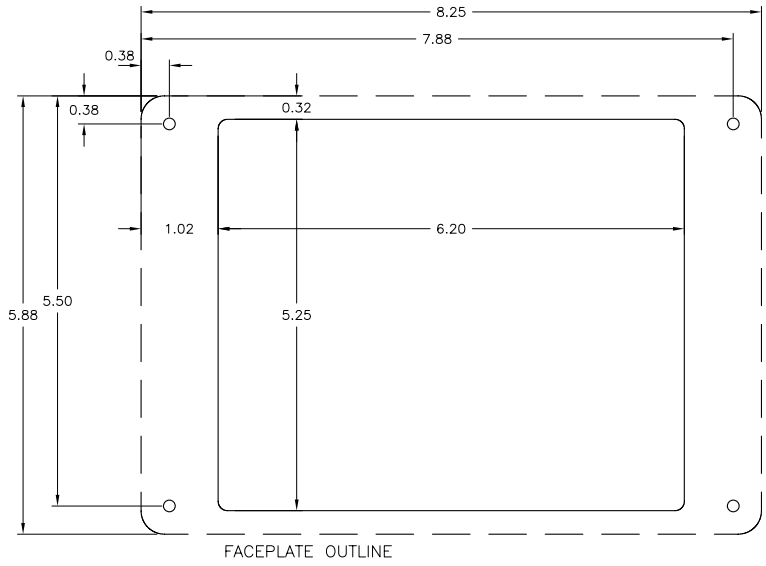
1. Choose a suitable location based on the criteria above, with adequate space for the S-TSC enclosure.
2. Using the dimensions below, drill pilot or through holes for the enclosure, depending on your mounting method.
3. Remove the four screws holding the S-TSC faceplate to the enclosure.
4. If desired, the connectors to the back of the S-TSC controller can be (carefully!) removed for enclosure installation. They will only plug in to the correct receptacles.
5. Secure the enclosure to the mounting surface.
6. Plug in the panel connectors if necessary, and secure the faceplate to the enclosure with the original screws.



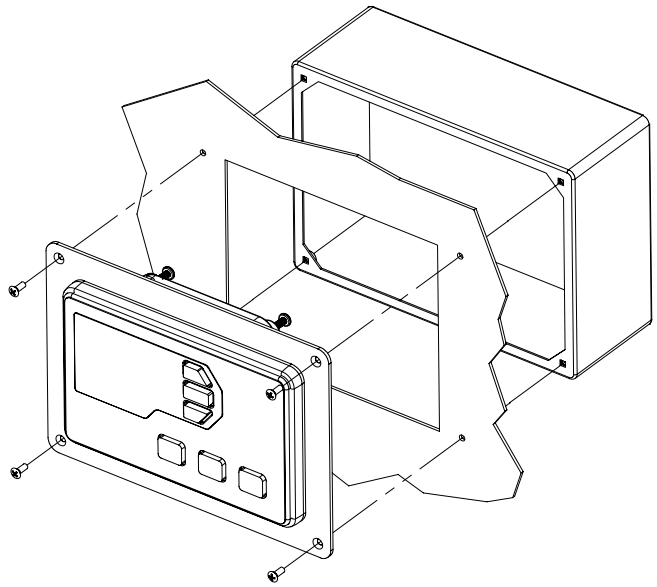
**Flush Mounting**

If low profile mounting is desired, the S-TSC faceplate and enclosure can be mounted on opposite sides of an existing panel.

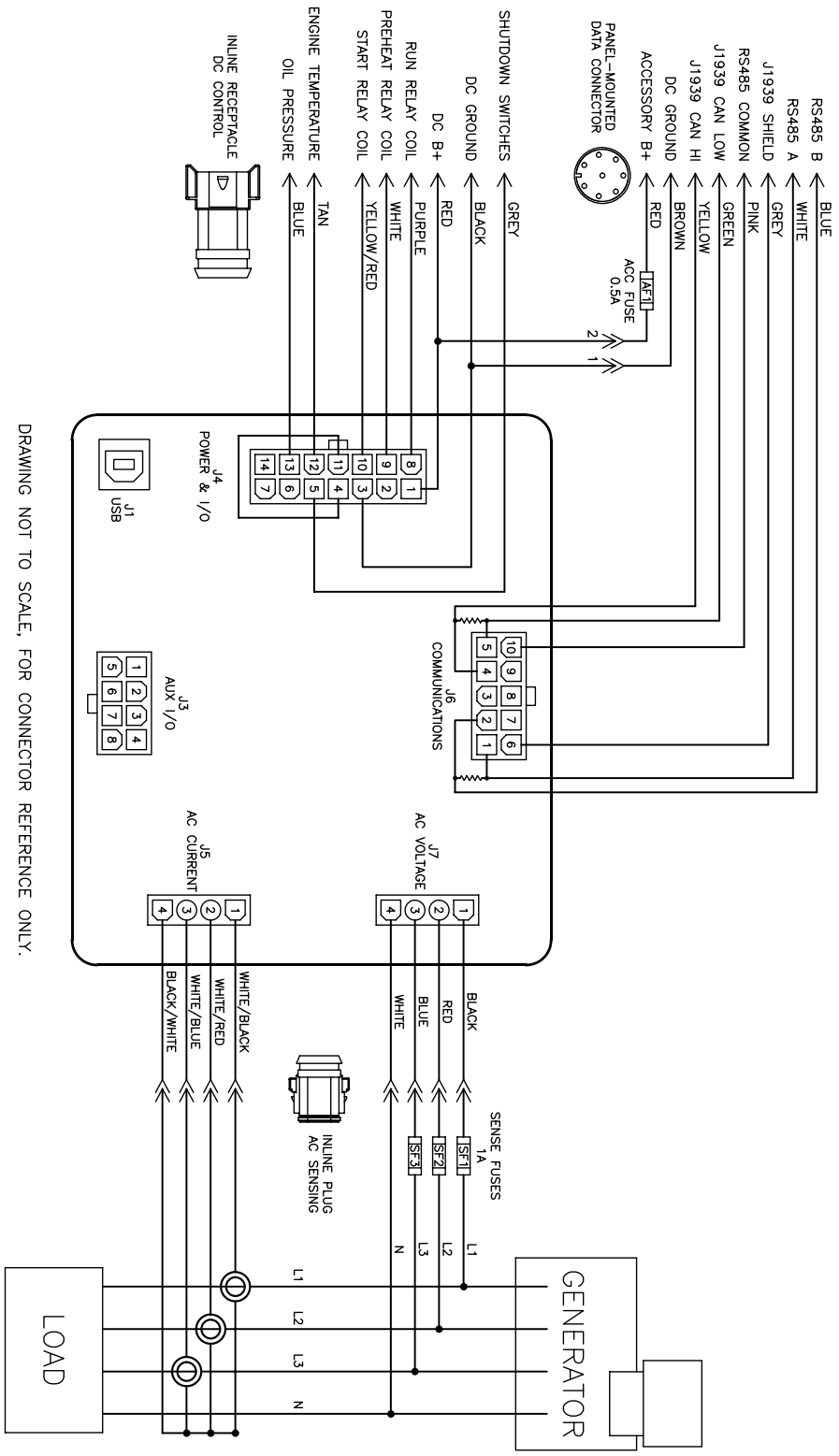
1. Choose a suitable location based on the criteria above, with adequate area for the S-TSC faceplate and adequate depth behind the panel for the enclosure body.
2. Drill four mounting holes and create a rectangular cutout in your panel to the dimensions shown below.
3. Remove the four screws holding the S-TSC faceplate to the enclosure.
4. If desired, the connectors to the back of the S-TSC controller can be (carefully!) removed for enclosure installation. They will only plug in to the correct receptacles.
5. Place the controller and faceplate on the front surface of your panel. Insert one of the faceplate screws in a mounting hole to maintain location if necessary.
6. Bring the enclosure close to the rear side of the panel, and plug the connectors into the back of the S-TSC.
7. Secure the enclosure to the rear of your panel by inserting the faceplate screws through the faceplate, through the holes in your panel, and threading into the enclosure.



FACEPLATE OUTLINE



## 2.1 Typical Wiring Diagram

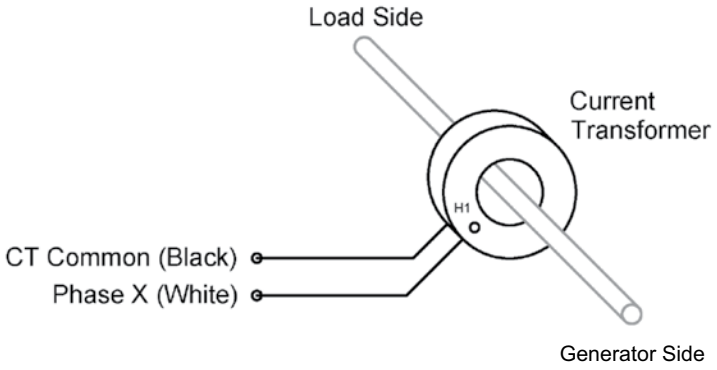


## 2.2 Electrical Installation

Wiring required for S-TSC controllers is installed by Northern Lights, and your controller has been configured for and tested with your generator set at the factory. Minimal installation, if any, is required.

**Control Connections**

1. Plug the smaller rectangular connectors together between the S-TSC panel and the generator set. These connectors provide AC sensing signals. UNDER NO CIRCUMSTANCES is the generator set to be run with these connectors disconnected. Dangerous voltages could result.
2. Plug the larger rectangular connectors together between the S-TSC panel and the generator set. These connectors interface the S-TSC controller to the generator set's DC logic relays.
3. A single set of AC and DC extension harnesses may be used to locate the S-TSC further from the generator set. ONLY ONE SET OF EXTENSIONS MAY BE USED. Use of additional extensions will cause errors in the AC sensing circuits. If a longer run is required, a remote S-TSC must be used in conjunction with the local panel.
4. Whenever possible, the factory will install the current transformers on the fixed output leads of the generator. If the current transformers are installed, the load lines may be connected to the generator output terminals, and no further installation is necessary. If the current transformers are NOT already installed and are loose in the junction box, the installation leads will need to be run through them when the electrical installation of the generator is completed. All of the CTs must face the same direction, and the side marked "H1" must face the generator as shown in the diagram below. Do not make more than one pass through the CT, or disturb any other generator winding wires.
5. When making AC output connections in the junction box, you may have noticed that one of the relay bases is empty. DO NOT insert a relay in this base. If your generator set came with a loose relay, it is a spare and can be set aside.




**Data Connections**

The circular connector on the bottom of the S-TSC enclosure provides power and data to an S-TSC remote panel, or RS485 interface device. If one of these accessories was ordered, connect the associated extension cable to this connector, and the other end to the remote panel or network interface.

Refer also to the electrical drawings that were supplied with your unit for further information.

## 3 Using the Controller

**NOTE** Note! Before starting the generator set, make sure that the AVR circuit breakers are in the the closed (up) position.

**Running the Generator**
With the generator set fully installed, connected to the starting battery and ready to run, the S-TSC will power on and the LCD display will show the status of the generator.

**Manual Run**: Press the Run button. The controller will enter preheat mode for ten seconds, and then engage the starter. The starter will crank for a maximum of ten seconds. If the generator fails to start in that time, the controller will repeat the preheat/crank cycle for a total of three times. If the generator still fails to start after the third attempt, the S-TSC will display a failure message and return to stopped mode.

**Press the Stop button to stop the generator.**
**Remote Run:** From Off mode, press the Auto button to place the S-TSC into autostart mode. The generator set can then be run by pressing the Run button on the local or remote panel. Likewise, the generator can be stopped by pressing the Stop button on the local or remote panel.
Pressing the Stop button at the local panel will also revert the S-TSC from Auto to Off mode.

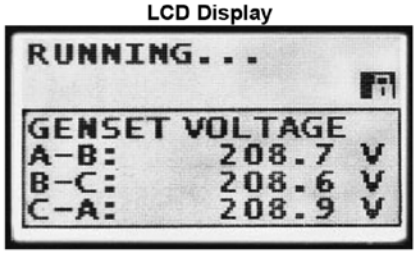
**WARNING** Warning! Placing the S-TSC in Off mode is not an adequate method of disabling the generator for service. The starting battery cables MUST be disconnected before attempting to adjust or service the generator set.

When the generator is running, the S-TSC display will scroll through AC electrical and engine information. Refer to the tables below for further information about display and control functions.

**Warnings and Failures**
The S-TSC is programmed with a number of warnings and shutdowns (failures). These include high engine temperature, low oil pressure, overspeed, underspeed, and other parameters specific to your generator. When a warning threshold is reached, a warning message will show on the display and be added to the event log. The generator will continue to run, and if the problem is remedied, the warning will turn off. If a failure threshold is exceeded, the generator will shut down. The failure will be displayed on the screen and recorded in the event log.

As a backup to the oil pressure and coolant temperature shutdowns based on engine sensor readings, Northern Lights generators include fixed-value shutdown switches. If the low oil pressure or high coolant temperature switch is tripped (or high exhaust elbow temperature on models so equipped), the failure message will display "NLI Shutdown."

**LCD Display**




**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<br>Amber = Engine running with warnings<br>Red = Engine shutdown on failure |

## 3.1 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.<br>1. Verify the Sensors -> Engine Speed -> Signal Source setting is set correctly.<br>2. Verify the Timers -> Engine Logic -> RPM Disconnect setting is set correctly.<br>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. |
| Engine cranks, controller shows "Locked Rotor" failure and stops cranking. | Controller is not receiving AC output to measure speed.<br>1. Confirm that AVR circuit breakers are ON<br>2. Field may need to be flashed. |

## 3.2 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. |

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