



**HPD L15A7**  
**ELECTRICAL SYSTEMS MANUAL**



**Table of Contents**

1. Safety Considerations and Warnings ..... Page 2  
2. Overview ..... Page 3  
3. HPD Formula F ECU Engine Harness Schematic ..... Page 4  
4. HPD Formula F Dash Panel Interface ..... Page 5  
5. System Monitoring Information ..... Page 7  
6. LED Fault Code Table ..... Page 9

## **Safety Precautions**

The HPD E1 ECU was developed for use strictly in officially sanctioned motorsports activities. The correct and appropriate use of the hardware is the sole responsibility of the user. As with any electrical / electronic component, great care and judgment should be exercised when installing and handling the systems described in this manual.

The risk of electrical shock is always present and can result in personal injury/death as well as permanent damage to the components of this system and other components within the vehicle. You should not attempt to service any of the parts described in this manual, as they have been designed to be serviced solely by HPD qualified personnel.

The user accepts all liability if this policy is not adhered to. If you do not feel confident handling automotive electrical systems on your vehicle, please consult HPD personnel for assistance with the proper handling of your HPD electrical components.

The use of this product with any 3<sup>rd</sup> party components that have not been specifically certified by HPD to be compatible with this system is strictly prohibited. HPD cannot predict or ensure the expected behavior of the system when used in a manner not consistent with the one described in this manual.

Please follow all guidelines described in this manual carefully. If you have any questions or concerns about the correct handling or operation of this electrical system, please contact HPD personnel for assistance.

## **WARNING**

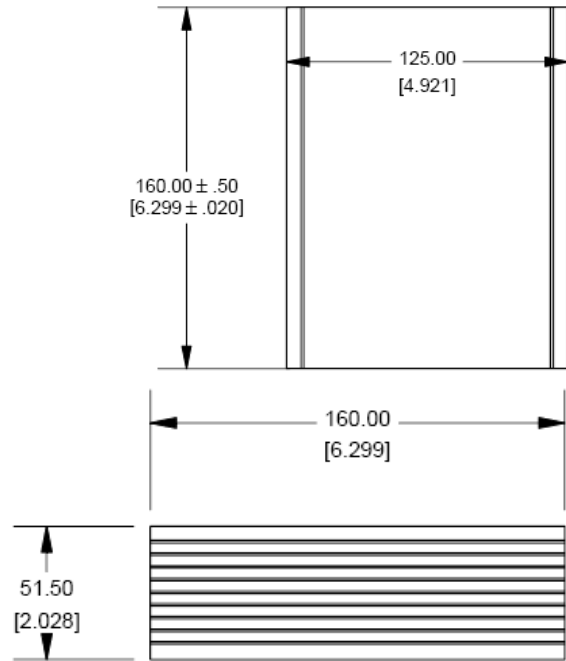
Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.  
Follow the procedures and precautions in this manual and other service materials carefully.

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.  
Follow the procedures and precautions in this manual carefully.

**Overview**

The HPD Formula F engine package includes a proprietary ECU (Engine Control Unit) to perform all engine control functions. The ECU has been specifically designed and setup for the Formula F engine and requires no user configuration in order to operate the engine.

**Figure 1 - HPD Formula F ECU**



**ENGINE / CHASSIS WIRING**

The HPD Formula F engine package also includes an ECU – Engine Harness that interfaces the Engine Control Unit to the relevant sensors and actuators required for the system to operate the engine.

**Figure 2 - HPD Formula F ECU Engine Harness**

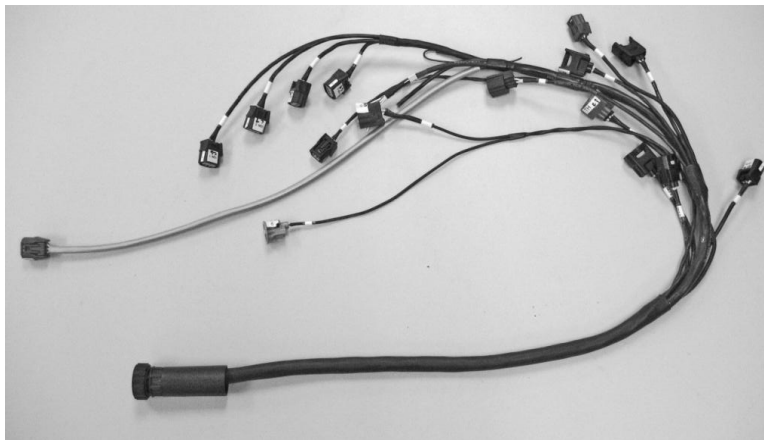
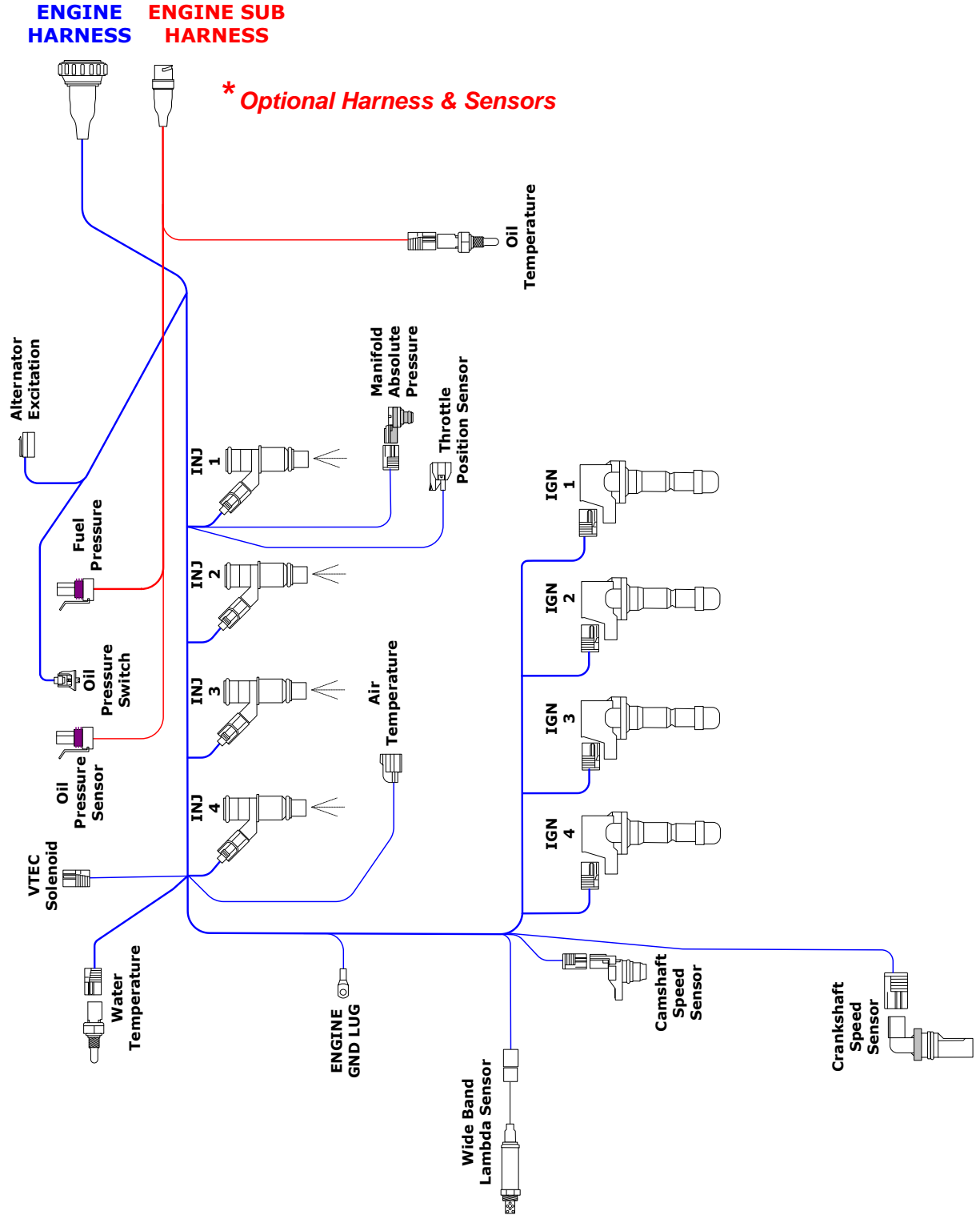


Figure 3 - HPD Formula F ECU Engine Harness Schematic



The Formula F chassis harness has provisions to interface with the essential switch panel controls and system monitoring/diagnostics.

**Figure 4 - HPD Formula F Dash Panel Interface**

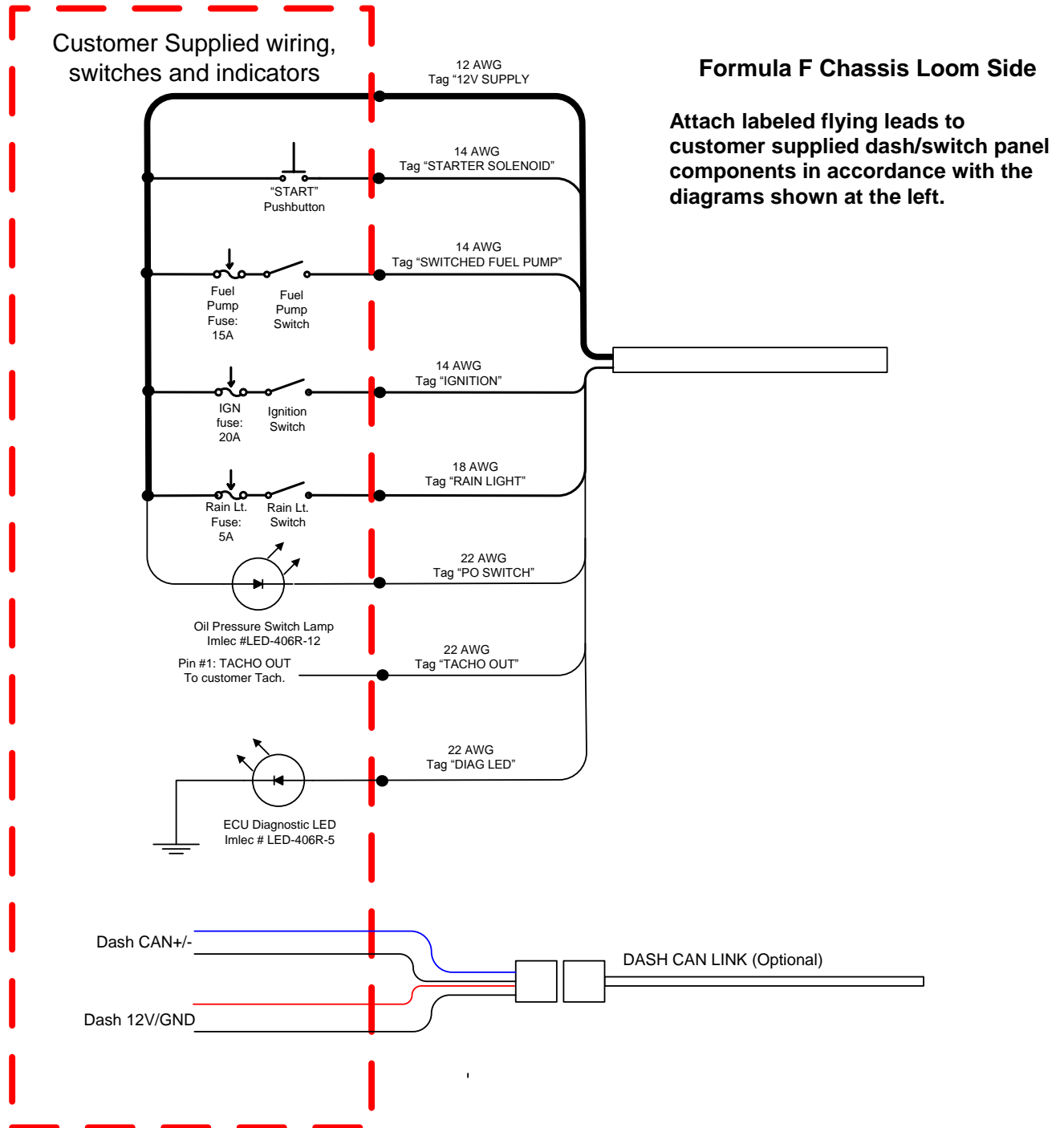
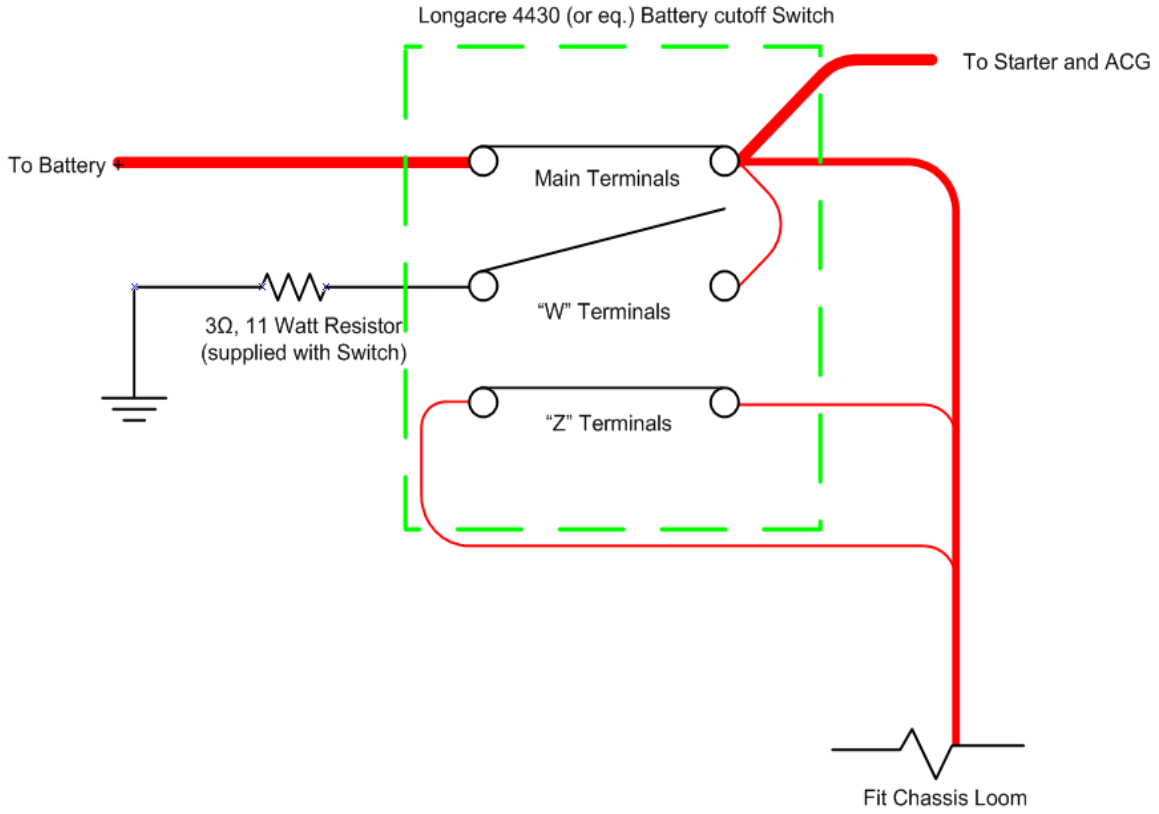


Figure 4 - HPD Formula F Dash Panel Interface cont'd



## SYSTEM MONITORING INFORMATION

The HPD Formula F package includes 3 basic methods of providing the user/driver with information regarding the operating conditions of the engine/system and overall integrity of the package.

**CAN Communications:** The HPD Formula F ECU adheres to the Bosch MS 4.3 Grand-Am CAN Spec. This link can be utilized with any compatible dash/steering wheel display. The following parameters are available:

- **Engine speed**
- **Throttle position**
- **Coolant temperature**
- **Oil temperature (if optional sensor equipped)**
- **Intake air temperature**
- **Intake manifold air pressure after throttle plate**
- **Battery voltage**
- **Fuel pressure (if optional sensor equipped)**
- **Oil pressure (if optional sensor equipped)**

**Tachometer Output:** The HPD Formula F ECU provides a +12V square wave analog tachometer output at 2 pulses per engine revolution.

**System Diagnostic LED:** A diagnostic LED output is provided to assist in the troubleshooting of potential issues with engine/system operation. This output behavior is characterized by the following guidelines:

- Fail codes are displayed via a flashing LED.
- Multiple fail codes will be displayed in succession starting with the first diagnosed fail. The cycle of fail codes is repeated forever until fails are cleared by an ECU boot up.

***Example:** Air Temp sensor fails then Water Temp sensor fails. The DIAG\_LED will first flash the Air Temp fail code then the Water Temp fail code and it will repeat this cycle until fails are cleared.*



- Each fail code displays the results of more than one failure detection for a given component. If multiple fails are diagnosed for a given component then the fail code will be repeated.

***Example:** Air Temp sensor fails shorted high then Air Temp sensor fails shorted low then Water Temp sensor fails shorted high. The DIAG\_LED will flash the Air Temp sensor fail code then it will flash the Air Temp sensor fail code again then it will flash the Water Temp sensor fail code and it will repeat this cycle until fails are cleared.*

*The following table summarizes the LED fault codes, their meaning and the potential avenues for troubleshooting and resolving the issue.*

LED Flashes	Fail	Description	Troubleshooting	Fail Checking
1	Manifold Air Pressure Sensor Fail	Sensor disconnected, shorted high, or low	Sensor could be disconnected or failed. Wiring could be shorted high or low.	Always when ignition switch is on
2	Air Temperature Sensor Fail	Sensor disconnected, shorted high, or low	Sensor could be disconnected or failed. Wiring could be shorted high or low.	Always when ignition switch is on
3	Water Temperature Sensor Fail	Sensor disconnected, shorted high, or low	Sensor could be disconnected or failed. Wiring could be shorted high or low.	Always when ignition switch is on
4	Throttle Sensor Fail	Sensor disconnected, shorted high, or low	Sensor could be disconnected or failed. Wiring could be shorted high or low.	Always when ignition switch is on
5	Battery Voltage Fail	Battery voltage is too high or too low	Battery or alternator could be failed. Wiring could be disconnected.	Always when ignition switch is on
6	Fuel System Fail	Lambda sensor feedback fuel correction has gone past the allowed limits.	Problem could be anything that causes incorrect combustion. Check for low or high fuel pressure, failed or disconnected injector, failed or disconnected ignition coil, failed or disconnected sensor.	Always when engine is running and driver is on throttle
7	Lambda Sensor Fail	Lambda sensor failure	Sensor could be disconnected or failed. Wiring could be shorted high or low.	When engine is started
8	Crankshaft Sensor Fail	Signal from the sensor is not proper.	Problem could be a failed sensor, trigger wheel, or wiring.	Always when ignition switch is on and engine is spinning
9	Camshaft Sensor Fail	Signal from the sensor is not proper.	Problem could be a failed sensor, trigger wheel, or wiring.	Always when ignition switch is on and engine is spinning
10	Sensor Power Supply Fail	5V power supply from ECU to pressure & throttle sensors is reading low	Sensor could be failed. Wiring could be shorted high or low.	Always when ignition switch is on

The following considerations should be taken into account when troubleshooting overall system fail codes:

- All fails are reset on ECU boot up so it is recommended that the user take note of any codes prior to shutting off master power.
- The only way to clear out a fail code is to cycle master power. Fail codes are not cleared by a fail fixing itself while running. Cycling ignition power also does not clear fails.

**Example:** *A sensor fails while driving around on track. The DIAG\_LED will start flashing to indicate the failure. Once the driver pulls back into the pits, they turn off the ignition switch to shut off the engine. The master power switch is still on so the DIAG\_LED is still flashing. The driver should write down the fail code. The driver now can cycle master power to clear the code; when the ECU boots back up the fail is cleared and the DIAG\_LED no longer is flashing. Fail checking will begin again so if the fail is still present it will be diagnosed again and the DIAG\_LED will once again flash the code.*