Document Number:
XE-PBA1PM-R0A

PRESSURE GOVERNOR

with DISPLAY and MONITORING SYSTEM

MODEL: PBA100

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CONTENTS

Table of Contents

List of Tables

List of Figures

INTRODUCTION

Overview

The Fire Research pressure governor uses state-of-the-art-programmable microprocessor technology and operates in one of two modes, pressure or RPM. It maintains a steady pump discharge pressure within system capabilities by controlling the engine speed or holds a selected engine RPM.

In pressure mode the governor maintains a constant pump discharge pressure. The discharge pressure is monitored and compared to the selected pressure setting, the engine RPM is varied to keep the discharge pressure at the selected setting.

In RPM mode the governor maintains a constant engine RPM. The pump discharge pressure is monitored, it can vary but is limited to an increase of 30 PSI. If the discharge pressure increases 30 PSI, the pressure governor automatically lowers the engine RPM to reduce the discharge pressure.

All controls and indicators are located on the front of the control module.

Features

J1939 CAN Bus for Engine Information and Control

Power Up in Pressure Mode

Automatic Regulation of Pump Discharge Pressure

Manual Control of Pressure or Engine RPM Settings

Programmable Presets

Diagnostic Capabilities

No Pressure or RPM Variation When Changing Modes

Limits Increase of Pressure When in RPM Mode

Recognition of No Water Condition With Automatic Response

Interlock Signal Recognition with Throttle Ready LED

Return to Engine Idle With the Push of a Button

High Idle

Audible Alarm Buzzer (Optional)

Transmission Temperature Sensor (Optional)

KPa (Optional)

Specifications

The governor is available in various models. Each model is programmed to interface with specific engines. All models provide the same functions, controls, and digital readouts for the management of pump discharge pressure.

Display Module

Supply Power:	12/24 VDC
Supply Current:	0.5 Amps
Dimensions:	4 5/8” Wide by 6 3/4” High

LED Bar Graphs

Oil Pressure:	10 - 100 PSI (10 PSI Increments)
Temperature (Engine Coolant):	130 - 240 °F (10° Increments)
Battery Voltage:	11.5 - 16 Volts (0.5 Volt Increments)

Engine Sensors

Engine Oil Pressure:	0 - 100 PSI, 1/8” NPTF
Engine Coolant Temperature:	100 - 250 °F, 1/2” - 14 NPT
Transmission Temperature:	140 - 320 °F, 1/8” NPTF

Pressure Sensor

Model Number:	XE-PRO31PT2	XE-FP4000PT1
Pressure Range:	0 - 300 PSI	0 - 600 PSI
Proof Pressure:	800 PSI	1200 PSI
Excitation Voltage:	5 VDC	5 VDC
Output Voltage:	0.5 - 4.75 VDC (See Table 1)	

Table 1. Pressure Sensor Output Voltage

	0psi	100psi	150psi	200psi	250psi	300psi	600psi
XE-PRO31PT2	0.5vdc	1.917vdc	2.625vdc	3.33vdc	4.04vdc	4.75vdc	N/A
XE-FP4000PT1	0.5vdc	1.12vdc	1.56vdc	1.92vdc	2.27vdc	2.625vdc	4.75vdc

GENERAL DESCRIPTION

The **PumpBoss** pressure governors are compatible with the following engines:

PBA101	Cummins IS Series
PBA102	Detroit Diesel
PBA104	Navistar
PBA105	Caterpillar
PBA108	Scania
PBA109*	GMC
PBA110	Mercedes

*** Note:** An adapter and cable assembly replaces the basic 8-pin cable when connecting the PumpBoss to a GMAC engine.

Components

The information available on the J1939 databus varies depending on the particular engine type. Not all wires are used for all engines. Refer to the engine specific wiring diagram for interface connections. The sensors (if any) that need to be installed will also vary depending on the engine.

The **PumpBoss** consist of the following components:

Contol Module

Pressure Sensor

Engine Coolant Temperature Sensor (As Necessary)

Engine Oil Pressure Sensor (As Necessary)

Audible Alarm Buzzer (Optional)

Transmission Temperature Sensor (Optional)

Cables

Contol Module

The control module is waterproof and uses 4 5/8 by 6 3/4 inches of panel space. All controls and indicators are located on the front of the control panel. (Refer to Controls and Indicators.)

Pressure Sensor

The pressure sensor is mounted on the pump discharge manifold. It provides an input signal to the control module that is proportional to the discharge pressure.

Engine Coolant Temperature Sensor

The engine coolant temperature sensor is installed as necessary.

Engine Oil Pressure Sensor

The oil pressure sensor is installed as necessary.

Audible Alarm Buzzer (Optional)

The optional buzzer is installed as required. A ground is provided at the 12-pin connector pin 6 to activate the buzzer (max current: 300mA).

Transmission Temperature Sensor (Optional)

The optional transmission fluid temperature sensor is installed as required.

Cables

There are two cables that connect to the control module. The 8-pin connector is for the remote throttle interface, the 12-pin connector is for the monitoring and display interface.

Controls and Indicators

All controls and indicators are located on the front of the control module. (Refer to Figure 1.) See Operation and Programming Sections for more information.

OIL PRESSURE LED Display

Shows engine oil pressure. The LEDs are green when the pressure is within normal limits and red when it is not.

CHECK ENGINE LED

Repeats the check engine warning from the cab.

TEMPERATURE LED Display

Shows engine coolant temperature. The LEDs are green when the temperature is within normal limits and red when it is not.

RPM Display

Shows the current engine RPM in bright red digits. It also shows error codes, stored data, and program features.

STOP ENGINE LED

Repeats the stop engine warning from the cab.

BATTERY VOLTAGE LED Display

Shows battery voltage. The LEDs are green when the voltage is within normal limits and red when it is not.

SILENCE Button

Press to suppress audio alarms.

PRESET Button

Press to change/select a pre-programmed value for pressure or RPM setting.

THROTTLE READY LED

This LED will be on when the required interlock conditions are met to begin pump operations.

Message Display

The message display shows the pressure or RPM setting during normal operations and warning alarms as they occur. It shows the time and date when the throttle ready LED is off. It also shows stored data and program features.

IDLE Button

When pressed immediately sets the engine RPM to idle.

Control Knob

When rotated changes the pressure or RPM setting. The setting will increase or decrease proportionally to the speed and direction the control knob is rotated.

RPM LED

The LED is on to indicate operation in the RPM mode.

PSI LED

The LED is on to indicate operation in the PSI mode.

MODE Button

Press to change modes.

Day/Night Sensor

Adjusts the brightness of the LED displays for best day or night viewing.

MENU Button

Used to access stored data and program features.

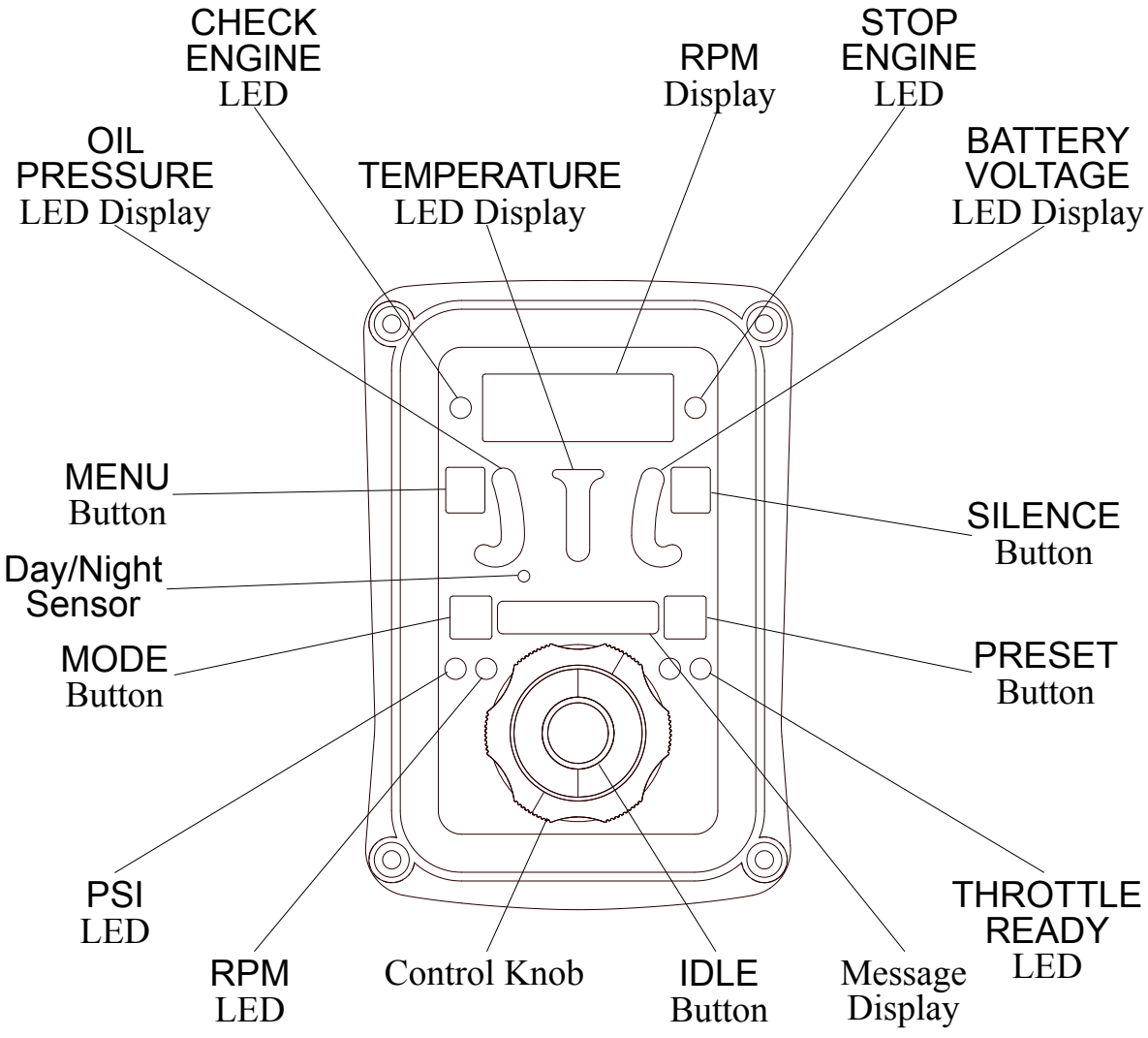


Figure 1. Controls and Indicators

INSTALLATION

Install Control Module

1. Measure and mark mounting location for control module panel cutout and mounting screw holes. Make sure there is clearance behind the panel for the module and cables before cutting holes. Refer to Figure 2 for layout and dimensions.
2. Cut out a 3 1/2 by 5 3/4 inch hole.
3. Drill four holes, clearance or tapped, for 10-32 mounting screws.
4. Place control module in position and secure with screws.
5. Connect cables at rear of the control module. (Refer to Wiring Section.)

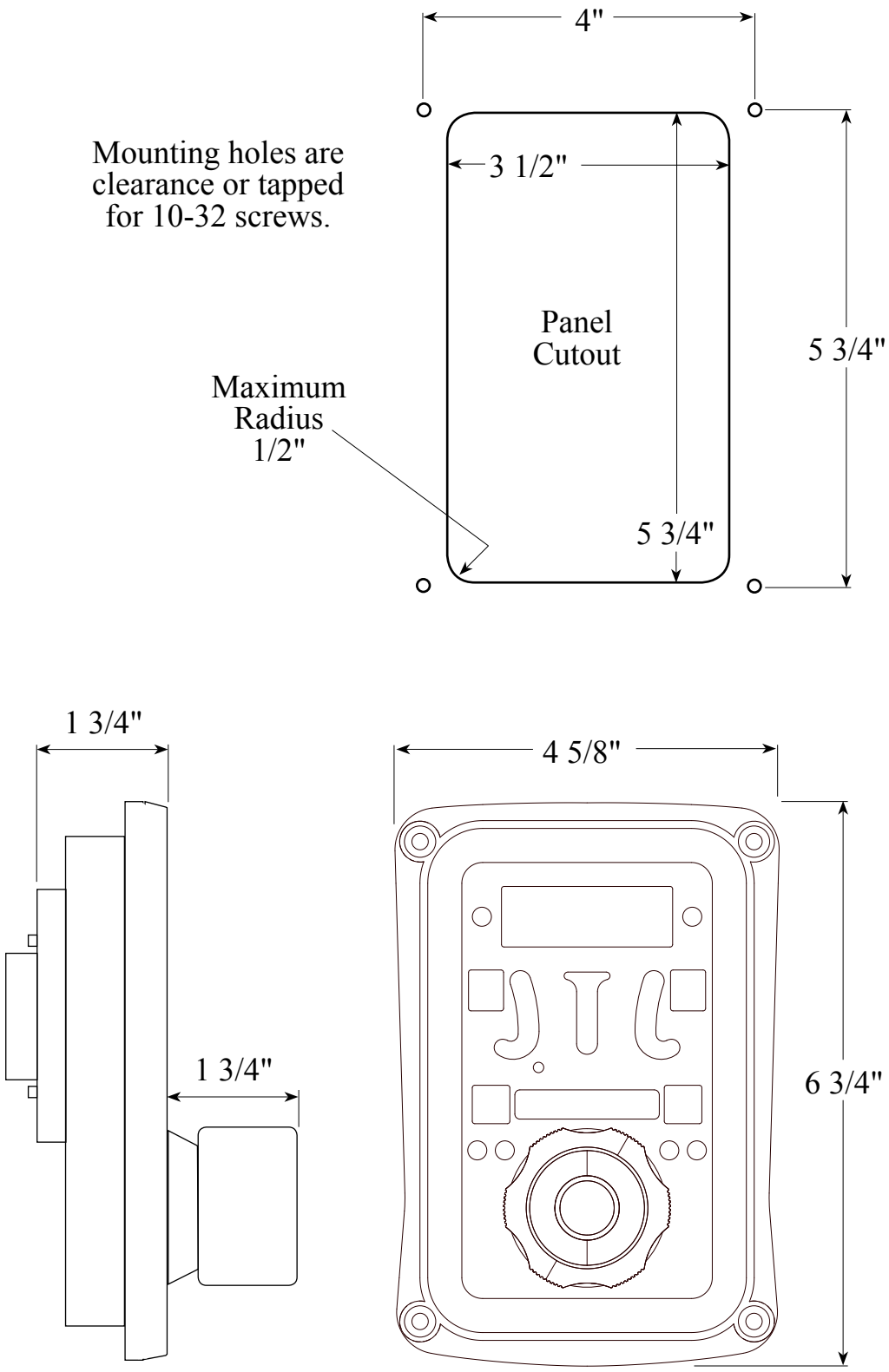


Figure 2. Control Module Mounting Dimensions

Install Pressure Sensor

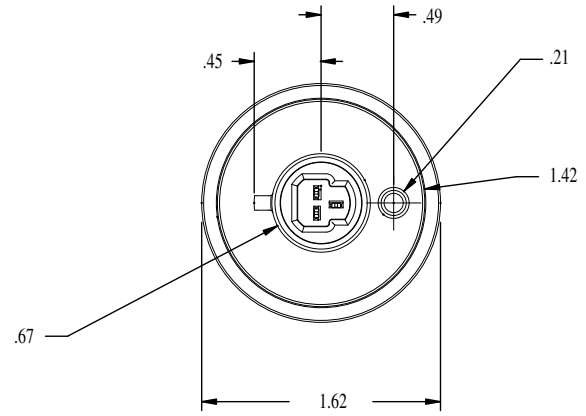
The discharge pressure sensor is mounted on the pump discharge manifold. If there is a check valve in the discharge side of the pump, mount the discharge sensor before the check valve. T-fittings can be used to mount the pressure sensors.

Note: Install the pressure sensor upright so that the water in the end of the sensor is able to drain back into the pipe.

1. Screw the sensor into a 1/4-18 NPT hole.

Caution: Do not use the main body that houses the electronics to tighten the pressure sensor. Damage to the sensor may occur.

2. Tighten the sensor with a 3/4-inch wrench on the lower hex fitting.
3. Connect the pressure sensor cable from the control module to the pressure sensor. (Refer to Wiring Section.)



Caution: Do not use the main body that houses the electronics to tighten the sensor. Damage to the sensor may occur.

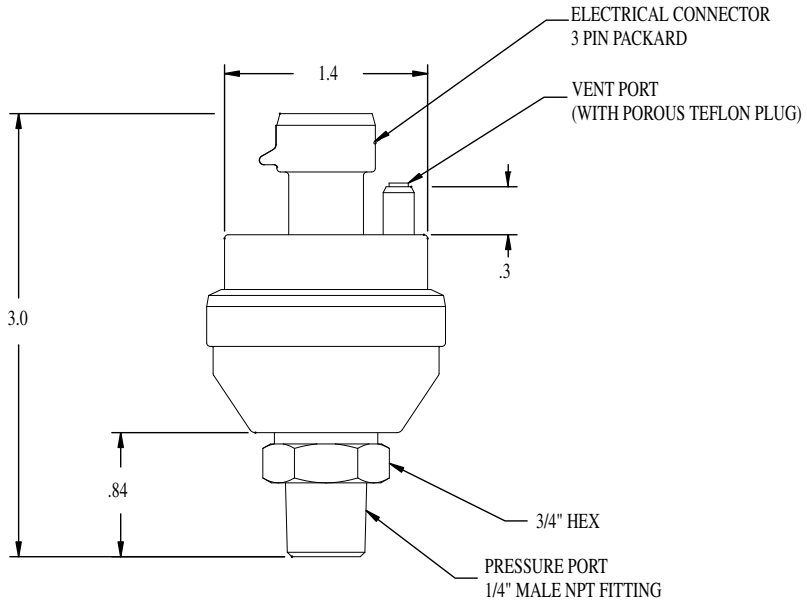


Figure 3. Pressure Sensor Dimensions

Install Engine Sensors

For most engines, the **PumpBoss** receives engine RPM, oil pressure, and coolant temperature data over the J1939 databus. Some engines do not broadcast this data over the databus and sensors may need to be installed.

Note: The PumpBoss may need a programming change for some sensor inputs to be recognized. If the sensor was not ordered as part of the PumpBoss kit you may need to contact FRC technical support for programming information.

The sensors are wired to the 12-pin connector at the rear of the control module. Refer to the Wiring section for pinout and wire color information.

An input is provided for an optional transmission temperature sensor.

Install Buzzer

Pin 6 on the 12-pin connector at the rear of the control module is provided to connect an optional buzzer. Connect the ground side of the buzzer to pin 6. Maximum current through pin 6 is 300 mA. The buzzer ordered from FRC requires a 1-1/8 inch diameter mounting hole. (Refer to the Wiring section.)

Install High Idle Kit

The high idle is activated when + VDC is provided to pin 7 (High Idle Active Input) of the 12-pin connector and pin 6 (Interlock Input) of the 8-pin connector. Refer to High Idle Wiring.

Note: It is important that the connection to the Interlock Input from the High Idle circuit be isolated from the apparatus interlock wiring with the two diodes. **The pump must NOT be engaged when using the high idle function and the THROTTLE READY LED will be off.**

OPERATION

On power-up the governor is in the pressure mode of operating. The RPM display shows engine RPM, the three LED bar graphs are green indicating readings within normal ranges, and the message display alternates between showing the date and time.

If a monitored function is not within normal parameters the display flashes, the RPM display shows an error or fault warning code and a description shows in the message display. (Refer to Table 2. Error Codes or Table 3. Fault Warning Codes.)

If one of the inputs displayed by the LED bar graphs is not within normal range the LEDs will be red.

When all necessary throttle enables are active and the interlock circuit is complete the THROTTLE READY LED lights and the remote throttle is controlling engine RPM. The engine RPM control signal is set at idle regardless of the control knob position.

Controls

Control Knob

The control knob is used to adjust PSI and RPM settings. The governor senses how fast and in what direction the control knob is rotated and sends a signal to the ECM to increase or decrease the engine RPM proportionally.

If the control knob is rotated quickly; the engine RPM changes quickly.

If the control knob is rotated slowly; the engine RPM changes slowly.

- Rotate the control knob clockwise to increase engine RPM.
- Rotate the control knob counterclockwise to decrease engine RPM.
- Press the red IDLE button to immediately return the engine to idle.

MODE Button

Switches between PSI and RPM modes.

MENU Button

Selectss the accumulated hours mode.

SILENCE Button

The silence button is used to suppress an optional audio alarm and exit the accumulated hours mode.

PRESET Button

Selects a pre-programmed value for pressure or RPM setting.

Table 2. Error Codes

RPM Display	Message Display	Probable Cause
E01	NO DATA	>Datalink cable not connected / connected to wrong port >Broken wire / bad connector contact on datalink cable
E02	NO RESP	>No responce to control signal
E03	NO RPM	>Datalink cable not connected / connected to wrong port >Engine not running / ignition key on >Broken wire / bad connector contact on alternator cable
E04	N/A	N/A
E05	NO PSR	Pressure sensor not detected
E06	N/A	N/A
E07	N/A	N/A
E08	Trans	>Sensor cable not connected >Broken wire / bad connector contact on sensor cable >Defective temperature sensor
E09	ENG OIL'	>Sensor cable not connected >Broken wire / bad connector contact on sensor cable >Defective pressure sensor
E10	ENG T'	>Sensor cable not connected >Broken wire / bad connector contact on sensor cable >Defective temperature sensor

Table 3. Fault Warning Codes

RPM Display	Message Display	Description
F01	-	N/A
F02	-	N/A
F03	HI RPM	High Engine RPM
F04	-	N/A
F05	PRES LOW	Pump Cavitation
F06	HI BATT	High Battery Voltage
F07	LOW BATT	Low Battery Voltage
F08	Trans 'T	High Transmission Temperature
F09	LOW OIL	Low Engine Oil Pressure
F10	ENG TEMP	High Engine Coolant Temperature

Pressure Mode Operation

In the pressure mode of operation the PSI LED is on. The governor maintains a constant discharge pressure within system capabilities. It adjusts the engine RPM automatically to compensate for variations in pressure.

Note: When changing from RPM mode to pressure mode the pressure setting is the pressure that the pump was operating at in RPM mode.

1. Press and hold MODE button for 3 seconds.

   Result: PSI LED goes on.

2. Press PRESET and/or rotate control knob to select pressure setting.

   Result: Message display shows PSI setting, engine RPM changes.

3. Press IDLE button after operations to set engine to idle RPM.

   Result: Message display shows date and time, engine at idle RPM.

Opening/Closing Discharge Valves

In pressure mode the governor maintains the pressure setting regardless of the number of discharge lines that are opened or closed providing there is sufficient water supplied. As lines are opened the discharge pressure starts to drop and the governor raises the engine RPM to maintain the required pressure. As lines are closed and the discharge pressure starts to rise, the governor lowers the engine RPM to maintain the required pressure.

Note: The following description is for software with a revision number prior to V1.42. Enter code 1130 to view the software revision number (refer to Programming section). See the description on the following page for software with a revision number V1.42 and newer.

Running Away From Water, No or Low Supply Water

There are situations during pump operations when there may be no or low supply water. This can be due to an empty water tank, a problem on the intake line, or when switching the water supply source.

The governor constantly monitors the discharge pressure and compares it to the engine RPM.

If discharge pressure drops very quickly (from air coming into the pump) the governor limits the RPM increase to +300 and does not allow the engine to exceed 1900 RPM. If the discharge pressure does not increase after 3 seconds the governor reduces the engine speed by 150 RPM and this RPM is held as long as the pressure stays above 45 PSI. (See below for pressure drop below 45 PSI.) The governor resumes normal operation when air stops coming into the pump.

If the discharge pressure starts dropping in pressure mode the governor increases the engine RPM and attempts to maintain the selected pressure setting. If an increase in RPM does not bring the pressure up, the governor recognizes this as a running away from water condition and holds the engine at a steady RPM. (The engine will not go to the maximum RPM, it holds at the RPM it recognized the running away from water condition.) When the running away from water condition stabilizes the operator may have to take action (using PRESET or control knob) to reset the pressure setting.

If the discharge pressure drops below 45 PSI but stays above 15 PSI the governor goes into a low water cycle. It sets the engine to 1100 RPM, if the pressure does not rise above 45 PSI in 7 seconds the governor sets the engine at idle RPM. The governor repeats the low water cycle as long as the discharge pressure is between 15 and 45 PSI. When the pressure rises above 45 PSI the governor resumes normal operation.

If the discharge pressure drops below 15 PSI the engine is set to idle RPM. When the discharge pressure rises above 15 PSI the governor resumes the low water cycle.

Note: The following description is for software with a revision number V1.42 and newer. Enter code 1130 to view the software revision number (refer to Programming section). See the description on the previous page for software with a revision number prior to V1.42

Running Away From Water, Low Water, or No Supply Water

There are situations during pump operations when there may be low or no supply water. This can be due to an empty water tank, a problem on the intake line, air in the pump, changing the water source, or an insufficient water supply.

The governor constantly monitors discharge pressure and compares it to engine RPM. It is programmed to limit RPM increases when conditions arise that fall outside normal operating parameters.

Running Away From Water: If the discharge pressure starts dropping while operating in pressure mode, the governor will increase the engine RPM and attempt to maintain the selected pressure setting. If pressure drops and an increase in RPM does not bring the pressure back up, the governor recognizes this as a running away from water condition. When this condition occurs the governor switchs to the RPM limit mode and controls the engine RPM accordingly.

RPM Limit Mode: When the RPM limit mode is in effect the PSI LED stays on. To alert the operator the RPM LED and the RPM display flash, and the message display flashes LO WATER. When the pressure comes back upto the selected pressure setting, the RPM limit mode is canceled and the governor switches to normal operation in pressure mode at the selected pressure setting.

In some cases the pressure may not come back up but remains at a level above 45 PSI. In the RPM limit mode, the governor behaves like a manual throttle and the operator can raise or lower the engine RPM by rotating the control knob. In this mode the pressure setting does not change and the PRESET button is disabled. If the engine is set to idle using the IDLE button, the governor comes out of RPM Limit Mode and cancel the pressure setting.

Low Water Cycle: If the discharge pressure is below 45 PSI, but stays above 15 PSI, the governor enters a low water cycle. It sets the engine at 1100 RPM. If the pressure does not rise above 45 PSI in 7 seconds the governor sets the engine RPM at idle. The governor repeats the low water cycle as long as the discharge pressure is between 15 and 45 PSI. When the pressure rises above 45 PSI the governor resumes normal operation. (The values for RPM and PSI in the low water cycle are programmable and may vary for some engine/pump combinations.)

No Supply Water: If the discharge pressure is below 15 PSI the engine RPM is set at idle. If, within 3 minutes, the discharge pressure rises above 15 PSI the governor enters the low water cycle. If the discharge pressure does not rise above 15 PSI within 3 minutes, the governor switches to idle mode and cancels the pressure setting. To restart pump operations, the operator must take action (press PRESET and/or rotate control knob to select pressure setting).

RPM Mode Operation

In the RPM mode of operation the RPM LED is on. The governor maintains a constant engine RPM.

The pump discharge pressure can vary but, as a safety feature, the governor limits the increase in pressure to 30 PSI over the last established PSI value. As the discharge pressure approaches this limit the governor automatically lowers the RPM to prevent a high pressure surge. The RPM LED blinks as the governor sets a lower RPM. This lower RPM will be the new operating RPM setting.

Note: When changing from pressure mode to RPM mode, the RPM setting is the RPM that the pump was operating at in pressure mode.

1. Press and hold MODE button for 3 seconds.

   Result: RPM LED goes on.

2. Press PRESETand/or rotate control knob to select RPM setting.

   Result: Message display shows RPM setting, engine RPM changes.

3. Press IDLE button after operations to set engine to idle RPM.

   Result: Message display shows date and time, engine at idle RPM.

Switching Between Operating Modes

- No variation in discharge pressure or RPM occurs when changing between pressure and RPM modes.
- When changing to RPM mode, the RPM setting isthe RPM that the pump was operating at in pressure mode.
- When changing to pressure mode the pressure setting is the pressure that the pump was operating at in RPM mode.

When the engine is at idle RPM:

Press the mode button and the governor changes modes immediately.

When the engine RPM is above idle:

Press and hold the mode button for 3 seconds and the governor changes modes. (This is to avoid an accidental change over if the buttons get bumped.)

Pump Discharge Pressure is High at Engine Idle

Once the governor has set the engine RPM at idle, it can do no more to reduce discharge pressures. To reduce discharge pressure the pump operator can gate incoming water, reduce pressure at the intake relief valve, gate discharges, or disable the pump.

Preset Settings (Pressure or RPM)

The preset button allows the operator to go to a pre-programmed pressure or RPM setting during operations. The preset value shows in the message display. This procedure is to change the pre-programmed setting.

Note: The engine must be running and the pump engaged interlock circuit must be closed (the THROTTLE READY LED **must be on**).

1. Press IDLE button.

   Result: Engine goes to idle RPM

2. Press PSI or RPM mode button to select the setting to be changed.

   Result: LED indicator goes on for mode selected.

Note: The RPM display must show IdLE before changing the preset.

3. Press and hold PRESET button. (Continue to hold through step 4.)

   Result: Message display flashes then shows PSEt.

4. Rotate control knob to change preset setting.

5. Release PRESET button.

   Result: The new preset is programmed. RPM display shows IdLE.

High-Idle

The governor programming includes a high-idle function. To activate the high-idle set interlocks as called for by SOP (normally this would include the transmission in neutral and the parking brake on). Set the High-Idle switch to ON.

Note: The pump must NOT be engaged when using the high-idle function and the THROTTLE READY LED will be off.

Change High-Idle Setting

Note: The high-idle is set at about 1000 RPM at the factory. (This value varies depending on the specific engine.)

1. With the engine running, set the high-idle switch to ON.
2. Press and hold PRESET button for 3 seconds.

   Result: RPM display flashes and shows the high-idle setting.

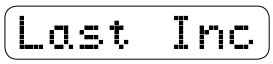
3. Keep pressing the PRESET button and rotate control knob to desired RPM.
4. Release PRESET button to store the new high idle setting.

Display Stored Data

Both the RPM and the message displays are used to show stored data.

Accumulated Hours and Transmission Temperature

Accumulated hours are stored in memory for engine operation, pump operation, last incident, and current incident. The menu button allows the operator to gain access to this stored data. When in the accumulated hours mode the RPM display shows the hours. The message display shows the following:

Pump Operating Hours	
Engine Operating Hours	
Last Incident Hours	
Current Incident Hours	
Transmission Temperature	

The accumulated hours mode is a display only mode and no changes can be made to the data.

Press the MENU button to enter the accumulated hours mode.

Stored accumulated hours are displayed.

The RPM display shows the number of hours.

The message display shows what the hours are for.

Press the MENU button to show the next stored hours.

Each time the MENU button is pressed the displays change to show the next block of stored accumulated hours.

Press and hold the MENU button for 5 seconds.

The displays continuously cycle to show all of the stored accumulated hours. If the engine is above idle RPM, the displays revert to normal operation after 20 seconds.

Press the SILENCE button to exit the accumulated hours mode.

Fault Warnings

Each time a fault occurs, the type of fault, date, and time are stored in memory. The memory holds the last ten (10) fault occurrences to be displayed at a later time. Refer to Programming Section for details on retrieving fault warnings.

Maximum Engine RPM

The maximum RPM that the engine reaches is stored in the memory to be displayed at a later time. Refer to the Programming Section for details on retrieving the maximum engine RPM.

PROGRAMMING

To gain access to the program features a four digit program code must be entered. Review the Program Code Descriptions for the proper four digit code.

Both the MENU and SILENCE buttons are used to enter a program code. The RPM display shows the codes.

Enter Program Code

Note: There is a time out feature that returns the program to normal operation in three seconds if input is not detected at the buttons.

1. Press the SILENCE button and hold it for 3 seconds until the RPM display shows four dashes. The program is ready for a four digit program code to be input.
2. Press the MENU button. The RPM display shows the number 1000. Each time the MENU button is pressed the first digit increments by 1. Set the first digit to the desired number.
3. Press the SILENCE button. Each time the SILENCE button is pressed the second digit incrermments by 1. Set the second digit to the desired number.
4. Press the MENU button. Each time the MENU button is pressed the third digit increments by 1. Set the third digit to the desired number.
5. Press the SILENCE button. Each time the SILENCE button is pressed the fourth digit increments by 1. Set the fourth digit to the desired number.
6. Wait a few seconds:

   If a valid four digit program code is entered the display changes to show a program value or an option.

   If an invalid code is entered the display shows WRONG CODE.

Program Code Descriptions

When a valid four digit program code has been entered, stored data or program options show in the displays.

The MENU and SILENCE buttons are used to change the data. The SILENCE button selects the digit that is to be changed. The MENU button changes the digit or the option choice.

Data Display Codes 1000

Press the SILENCE button to exit the data display mode.

1110 - Fault Warnings

This code will show the last ten (10) fault warnings that have occurred. The RPM display will show a fault code and the message display will alternate between showing the date and time that the fault occurred. Press the MENU button to scroll. Refer to Table 3. Fault Warning Codes

1120 - Maximum Engine RPM

This code displays the maximum RPM that the engine has attained.

1130 - Software Revision Number

This code displays the software version that is loaded in the governor.

Parameter Settings Codes 2000

Press the SILENCE button first then the MENU button and hold them both for 3 seconds to accept changes and exit the parameter settings mode.

2110 - Clock

This code allows the clock display to be changed.

2120 - Date

This code allows the date display to be changed.

2130 - Clear Fault Warnings

This code clears the history of all ten (10) fault warnings. Select YES or no.

2140 - RPM Calibration

This code allows the digits in the RPM display to be adjusted to match a tachometer. This is for engines that do not receive RPM data over the datalink and have RPM signal wire (pin 12 on the 12-pin connector) connected to an RPM source.

2150 - Perform System Check

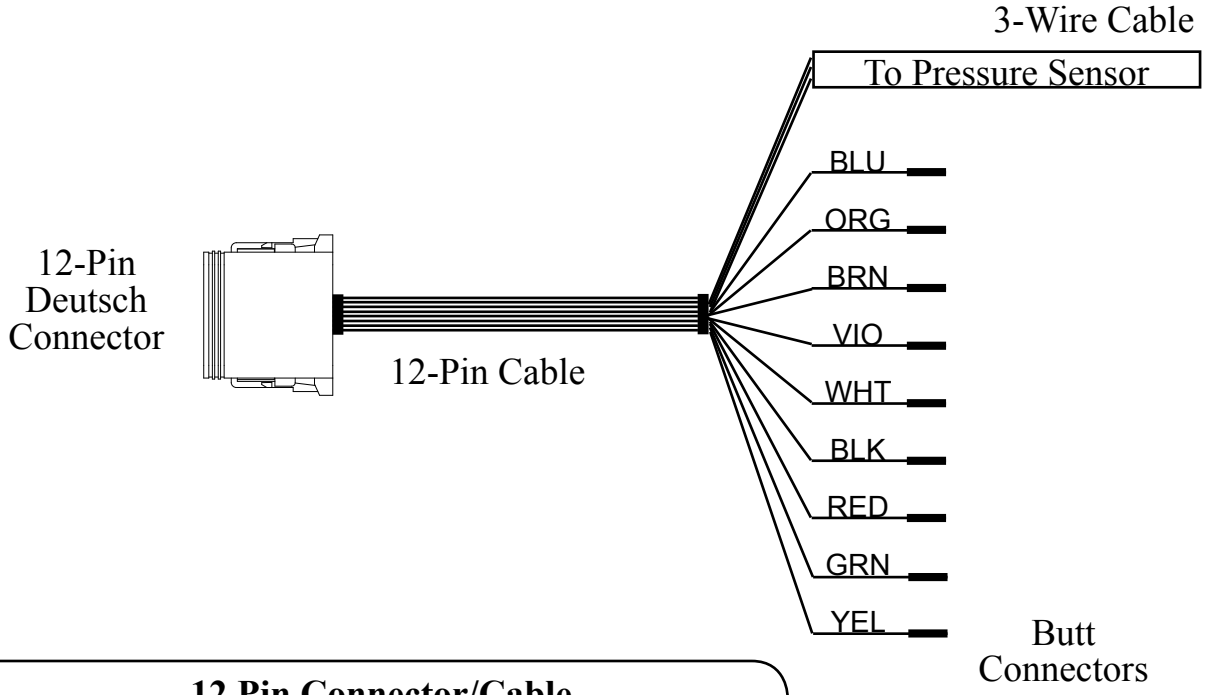
This code allows scrolling through system status information.

WIRING

The following figures include the schematics, wiring diagrams, block diagrams, and cables for the governor.

Connectors and Cables

For most engines the governor receives engine RPM, oil pressure, and coolant temperature data over the J1939 data link from the ECM. Some engines do not broadcast this data over the data link and sensors may need to be installed.

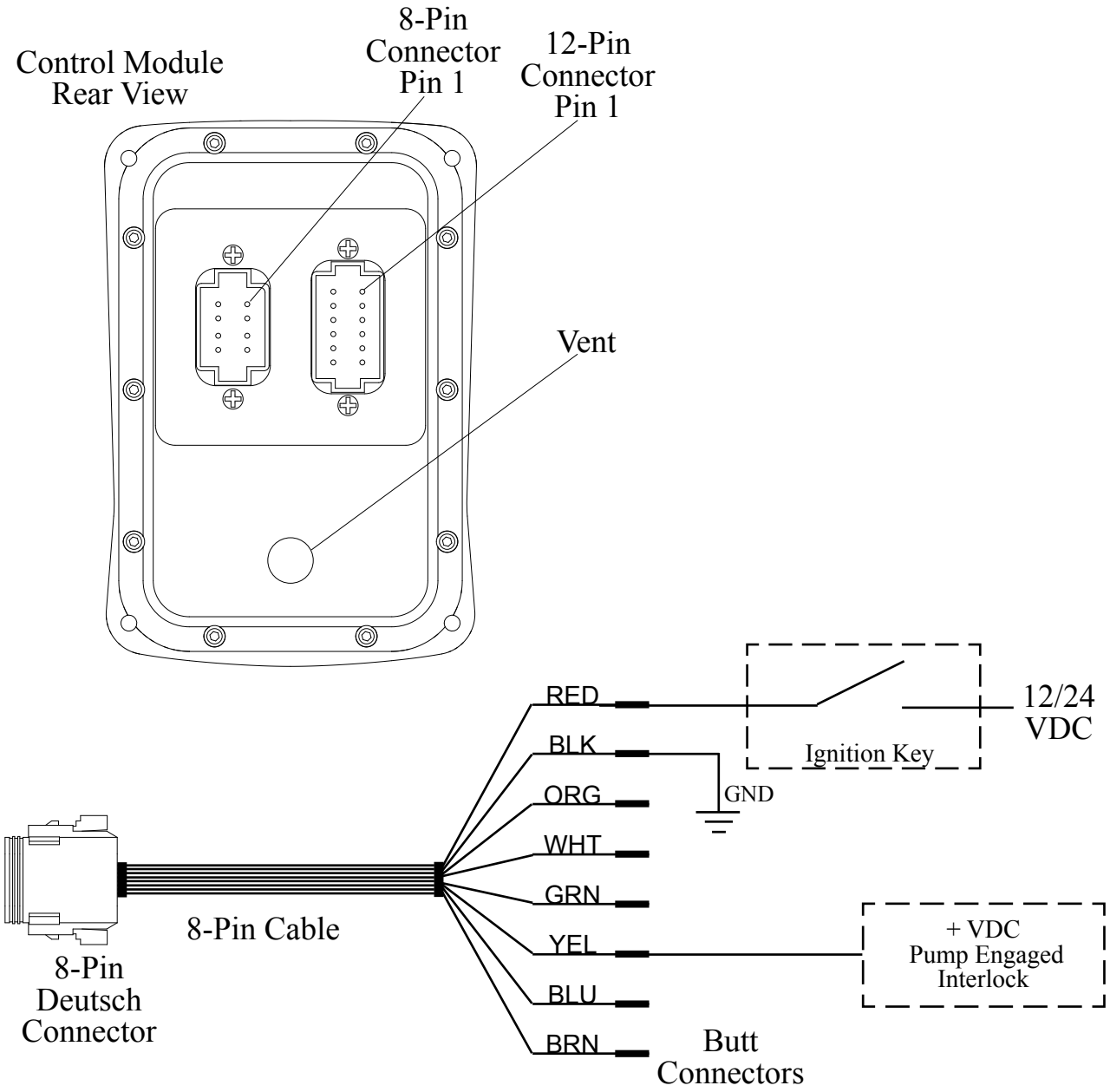


12 Pin Connector/Cable

Pin	Wire Color	Description
1	Red	+ 5 VDC Pressure Sensor
2	Black	Ground Pressure Sensor
3	White	Signal Pressure Sensor
4	Blue	Engine Oil Press. Sensor Signal
5	Orange	Engine Temp. Sensor Signal
6	Brown	Buzzer Ground (300mA)
7	Violet	High Idle Active Input (+ VDC)
8	White	Check Engine LED Input (+ VDC)
9	Black	CAN J1939 (–)
10	Red	CAN J1939 (+)
11	Green	Transmission Temp. Sensor Signal
12	Yellow	RPM Signal

Notes:
- Not all wires are used for all engines.
- High idle not available for GMC.
- The J1939 CAN bus is terminated with a 120 ohm resistor.
- When using an FRC provided sensor cable, the red wire is sensor signal and the black wire connects to a ground.

Figure 4. PBA 12-Pin Connector Wiring



8 Pin Connector/Cable

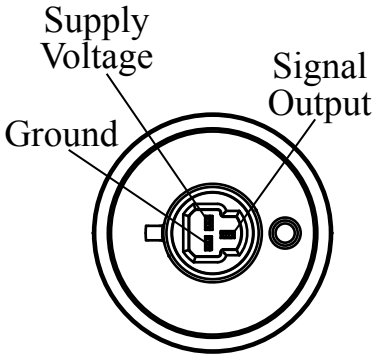
Pin	Wire Color	Description
1	Red	Supply Voltage (12/24 VDC)
2	Black	Ground
3	Orange	+5 VDC Reference From ECM
4	White	Throttle Signal To ECM
5	Green	Signal Return From ECM
6	Yellow	Interlock Input (+ VDC)
7	Blue	Throttle Enable Signal Output
8	Brown	Foot Pedal Signal Input

Notes:
- Not all wires are used for all engines. Refer to the engine specific wiring diagram for interface connections.
- An adapter and cable assembly replaces the basic 8-pin cable when connecting the governor to a GMC engine. Refer to the engine specific wiring diagram.

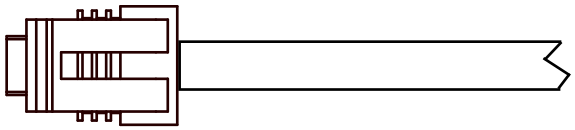
Figure 5. PBA 8-Pin Connector Wiring

Pressure Sensor

Pressure Sensor
(Top View)



Pressure SensorCable
from 12-Pin Connector



Pressure Sensor Cable
3-Pin Connector

Pin/Wire	Description
A/Black	Ground
B/Red	Supply Voltage
C/White	Signal

Pressure Sensor
Side View

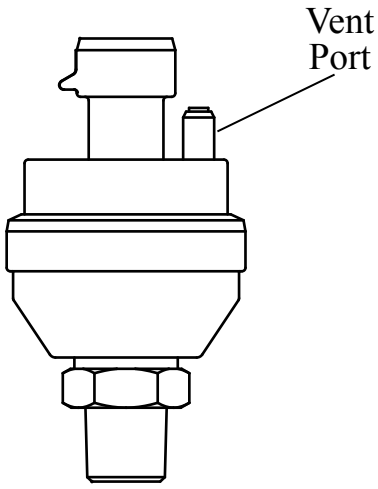
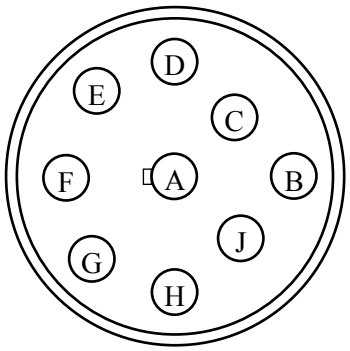


Figure 6. Pressure Sensor Wiring

Common OEM Diagnostic Connector

Typical 9-pin Deutsch Diagnostic Connector.
Commonly found under the driver side dashboard.



FRONT
VIEW

9-Pin Connector

Pin	Description
A	BATTERY GROUND
B	+12 VDC
C	J1939 DATA LINK (+)
D	J1939 DATA LINK (–)
E	J1939 SHIELD
F	J1587 DATA LINK (+)
G	J1587 DATA LINK (–)
H	PLUG
J	PLUG

Figure 7. Common OEM 9-Pin Diagnostic Connector

Cummins Harness Connections

Interface Information

For use on 2004 or newer engines.

The governor is designed to control engine throttle directly over the SAE J1939 databus.

If the PUMPBOSS is being used on a COMMERCIAL CHASSIS with a Cummins Engine, ENSURE that the Cummins Engine EMERGENCY VEHICLE CALIBRATION is programmed in the engine ECM for the PUMP BOSS to work.

ISB, ISC, ISL, and ISM Engine Interface

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock wire connections.

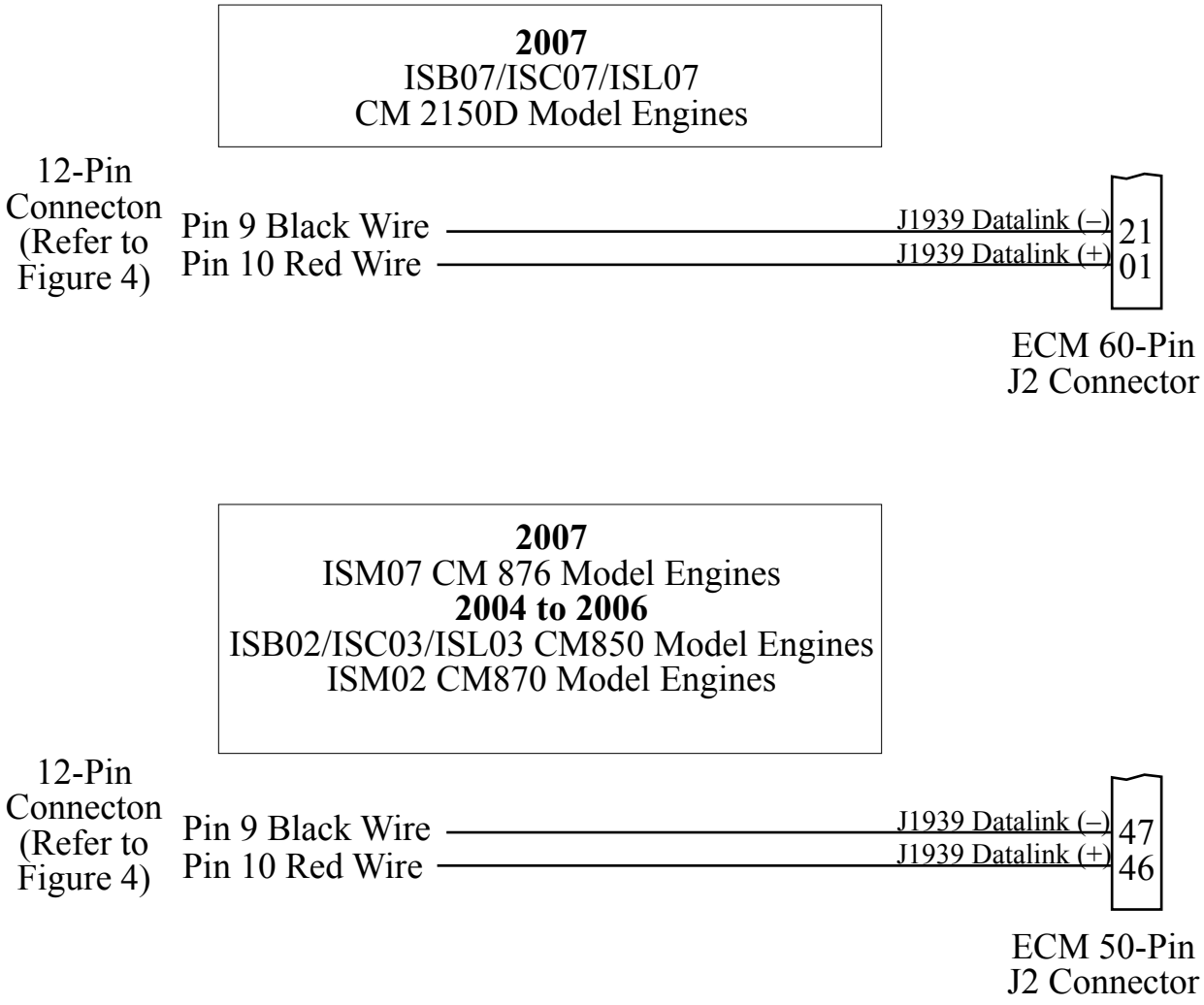


Figure 8. Cummins PBA101 Wiring

Detroit Diesel Harness Connections

Interface Information.

The governor is designed to control engine throttle directly over the SAE J1939 databus. Remote throttle does not need to be enabled in the ECM.

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock connections.

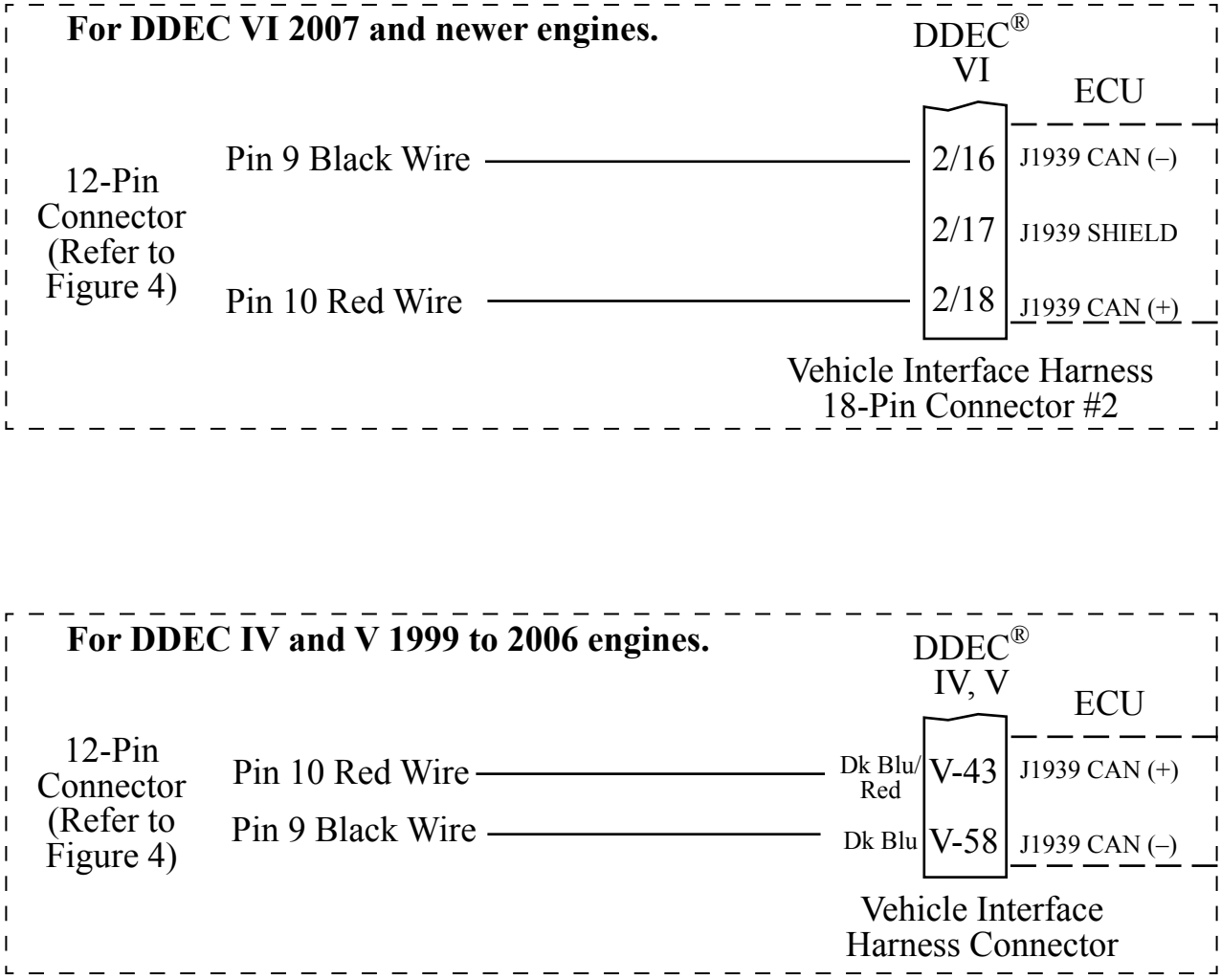


Figure 9. Detroit Diesel PBA102 Wiring

Navistar Harness Connections

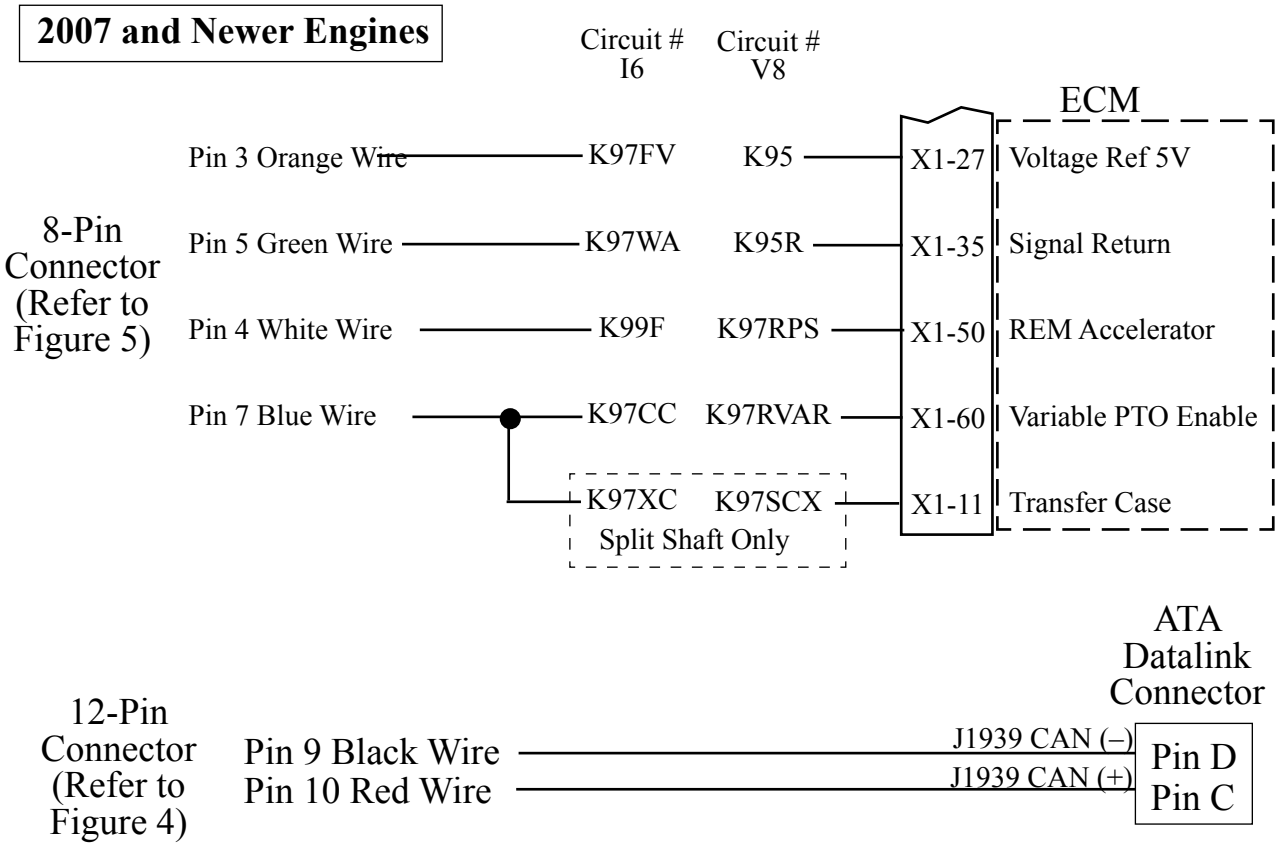
Interface Information

The ECM must be programmed for a remote throttle input. When using code 12VZA or 12VXY, the following parameters need to be set:

PTO-REMOTE-PEDAL to 1-Yes; PTO-REM-PEDAL-RTZ to 1-RTZ-not;

PTO-DISABLE-CAB-INTERFACE to 1-Yes; DRIVELINE-MODE to 1

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock wire connections.



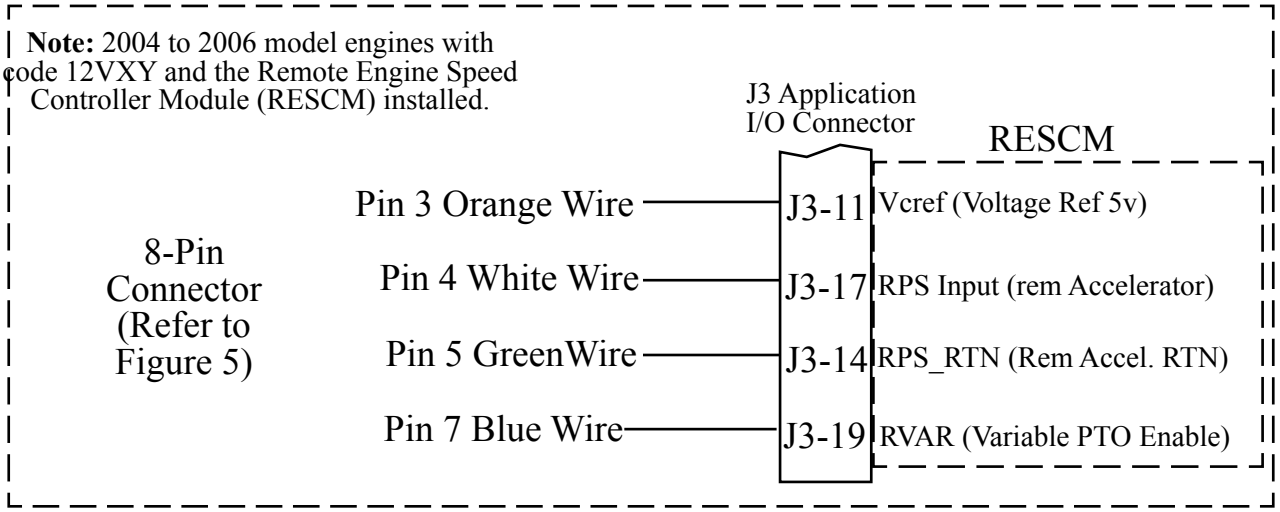


Figure 10. Navistar PBA104 Wiring

Caterpillar Harness Connections

Interface Information

The parameter settings for PTO Cofiguration is programmed to Remote Throttle or Remote Throttle with J1939 Speed Command.

ECM software with a Personality Module release date of May08 for C7, C9, C13, C15 engines, will have the Remote Throttle with J1939 Speed Command setting available. This setting alows the engine speed to be controlled during PTO operations by a J1939 compliant device.

Refer to an authorized dealer to program one of these options.

C7, C9, C10, C11, C12, C13, C15 Engine Interface

Engines with 70-pin OEM connector.

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock wire connections.

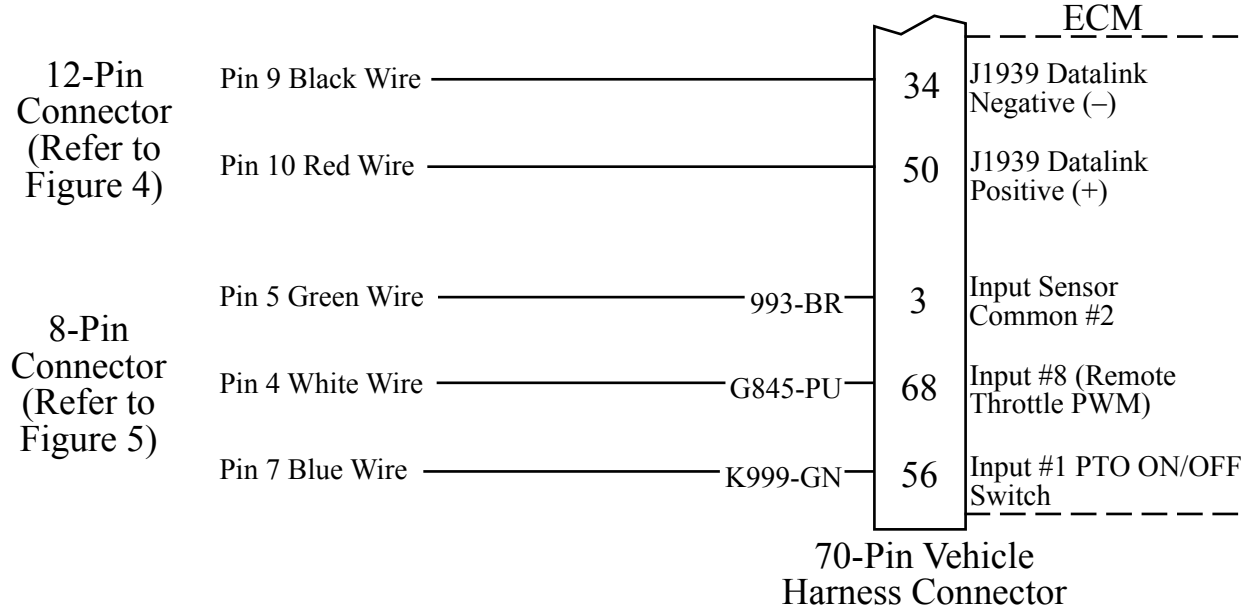
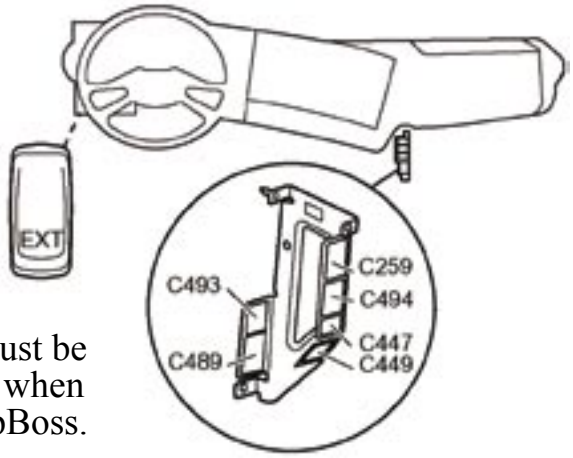


Figure 11. Caterpillar PBA105 Wiring

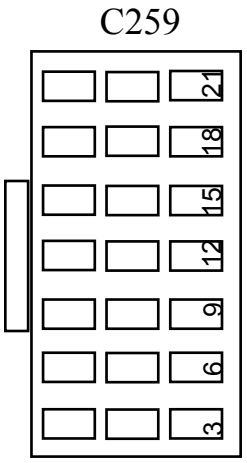
Scania Harness Connections

Interface Information

For use on P, R, and T-series trucks equipped with a bodywork control unit (BWS). Connector C259 is available on all vehicles ordered with any of the bodywork options. It is located on the plate for the electrical bodywork interface for body builders. Connector C259 is white and has 21 pins. (February 2005 and newer.)

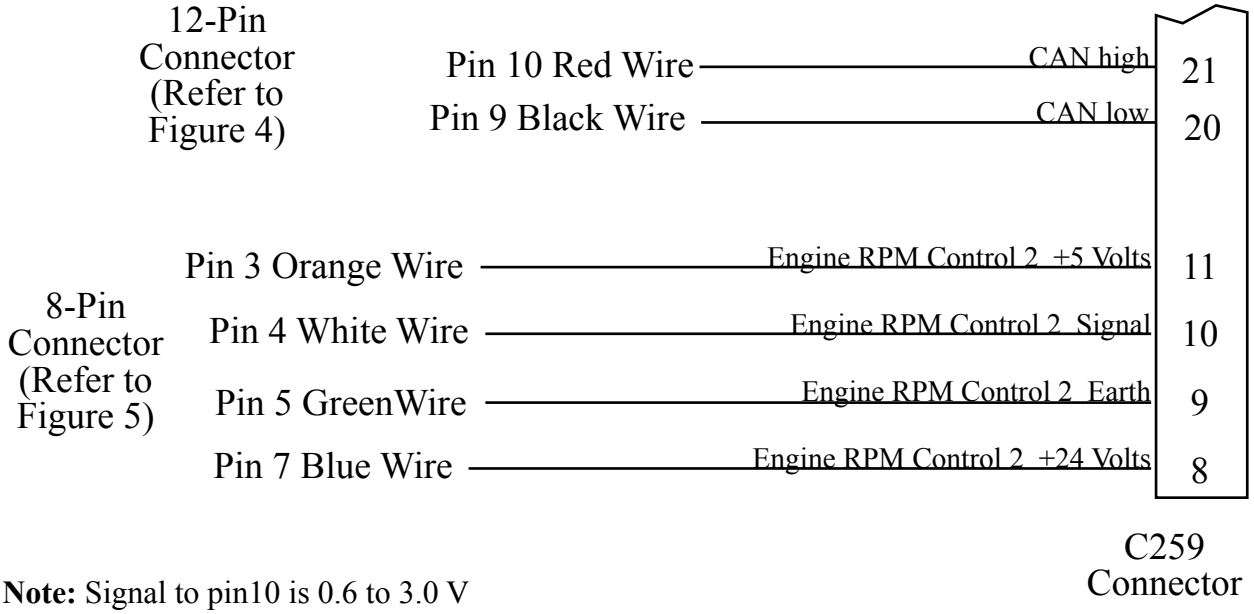


The EXT switch must be in the ON position when operating the PumpBoss.



Contact Housing (MCP)

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock wire connections.



Note: Signal to pin10 is 0.6 to 3.0 V

Figure 12. Scania PBA108-B Wiring

GMC Harness Connections

Interface Information

An adapter and cable assembly is needed to interface the with GMC engines.

Note: Sensors need to be installed. Refer to Figure 4. PBA 12-Pin Connector Wiring for seperate sensor and RPM connections. When using an FRC provided sensor cable, the red wire is sensor signal and the black wire connects to a ground.

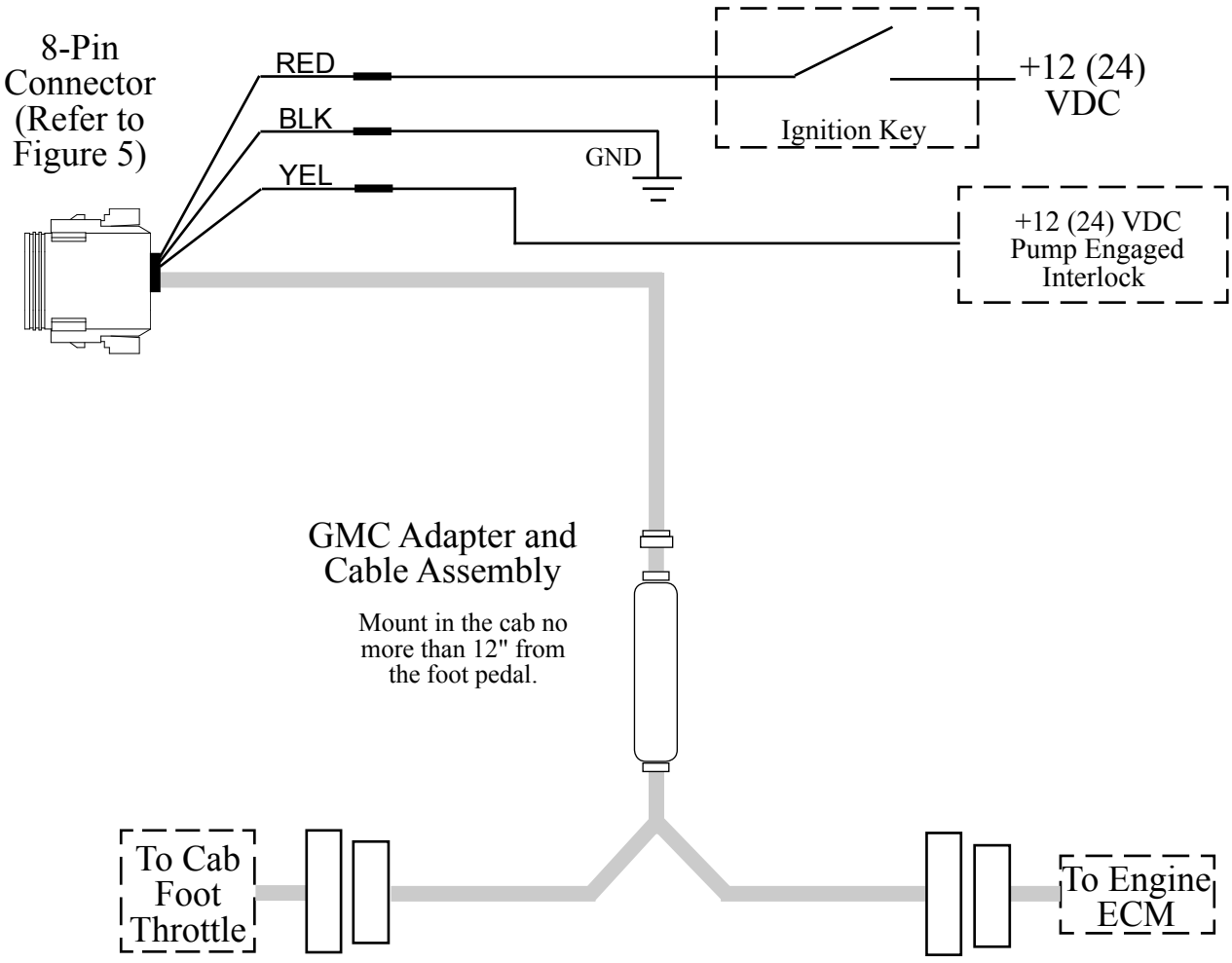


Figure 13. GMC PBA109 Wiring

Mercedes Harness Connections

Interface Information.

For 2007 and newer engines, the governor is designed to control engine throttle directly over the SAE J1939 databus. Remote throttle does not need to be enabled in the ECM.

Note: Refer to Figure 5. PBA 8-Pin Connector Wiring for power and interlock wire connections.

For 2007 engines.

For 2006 and older engines.

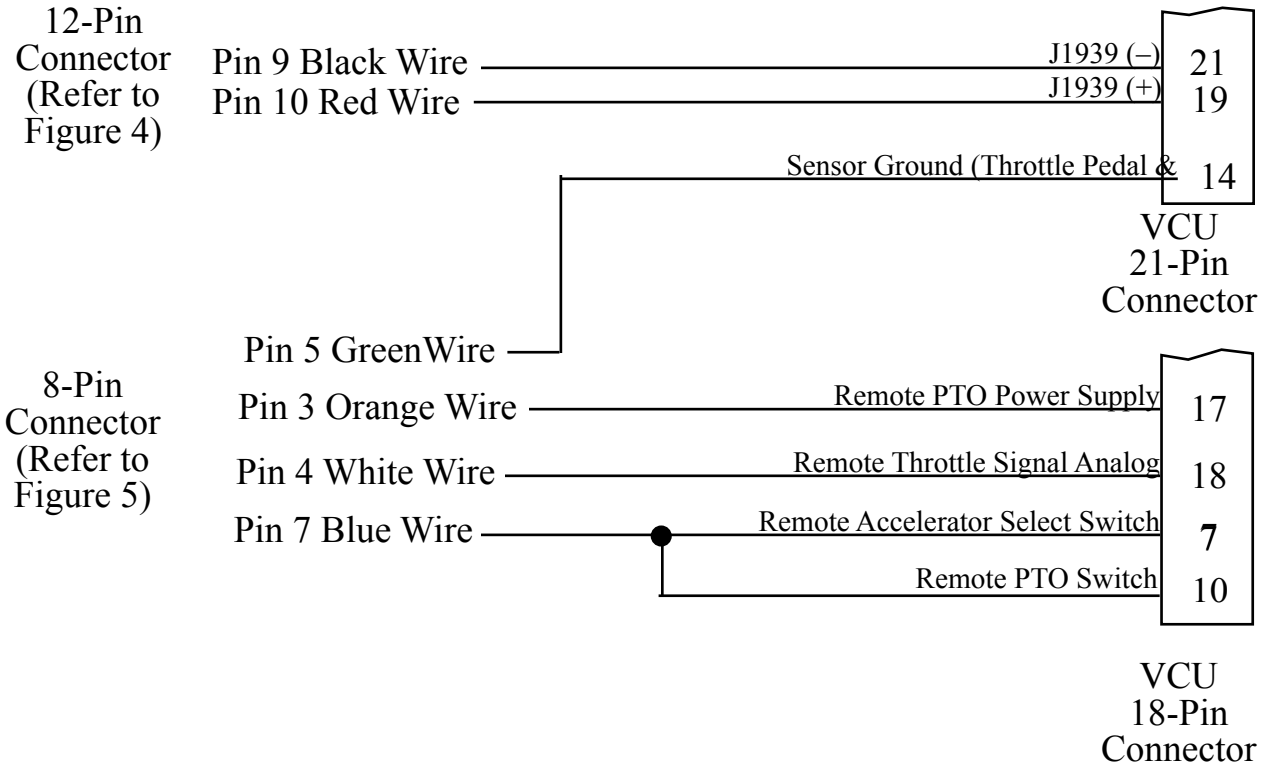


Figure 14. Mercedes PBA110 Wiring
Sheet 1 of 2

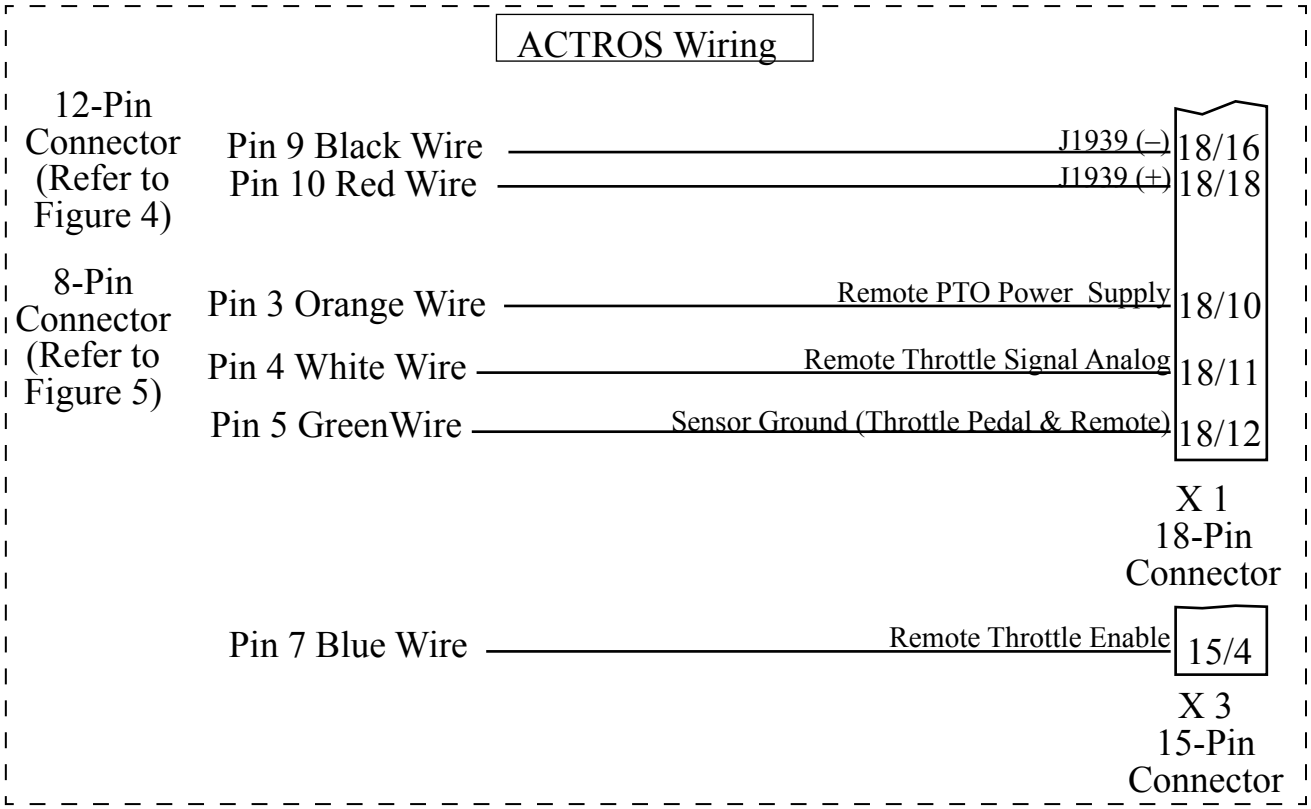


Figure 14. Mercedes PBA110 Wiring
Sheet 2 of 2

High-Idle Wiring

The governor programming includes a high-idle function. To activate the high-idle provide + VDC to pin 7 (High-Idle Active Input) of the 12-pin connector and pin 6 (Interlock Input) of the 8-pin connector. The high-idle connection to pin 6 must be isolated form the interlock circuit using two diodes (see schematic).

Note: It is important that the connection to the Interlock Input from the High-Idle circuit be isolated from the apparatus interlock wiring with the two diodes. Refer to the wiring diagram. **The pump must NOT be engaged when using the high idle function.**

The high-idle is set at about 1000 RPM at the factory. (This value will vary depending on the specific engine.) To adjust this setting refer to High-Idle in the Operation Section.

High-Idle Kit is not available for GMC.

A High-Idle Kit is available from FRC.
P/N XE-TG38HK
Includes:
ON/OFF Switch
Indicator Light
Two Diodes

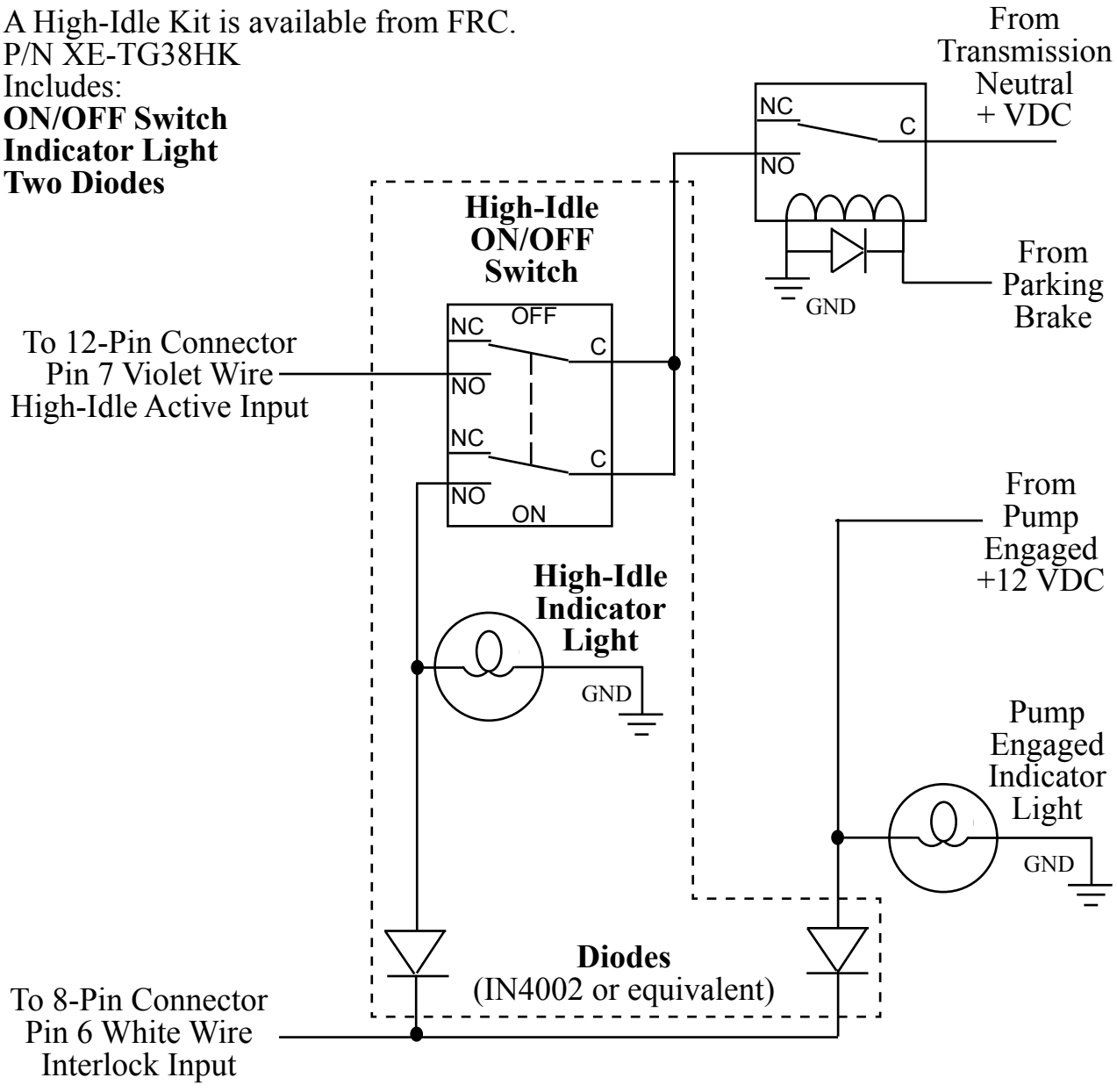


Figure 15. High-Idle Wiring

FLYBACK DIODE INFORMATION

It is good engineering pratice to include a flyback diode when switching an inductive load (soleniod coil, relay coil, electric motor winding, etc.). It is recommended that a flyback diode be installed on inductive devices that share a common power source/ ground with a FRC governor.

Typical circuit showing a flyback diode installed across an inductive load.

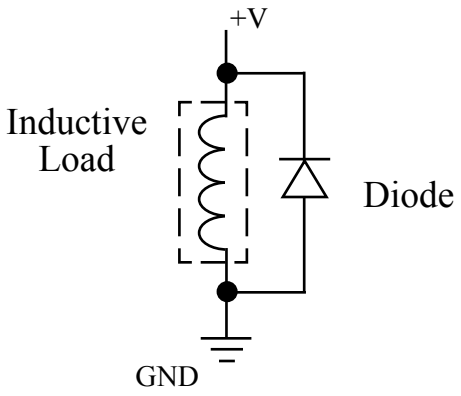


Diagram showing a flyback diode connected on a typical pump primer motor solenoid.

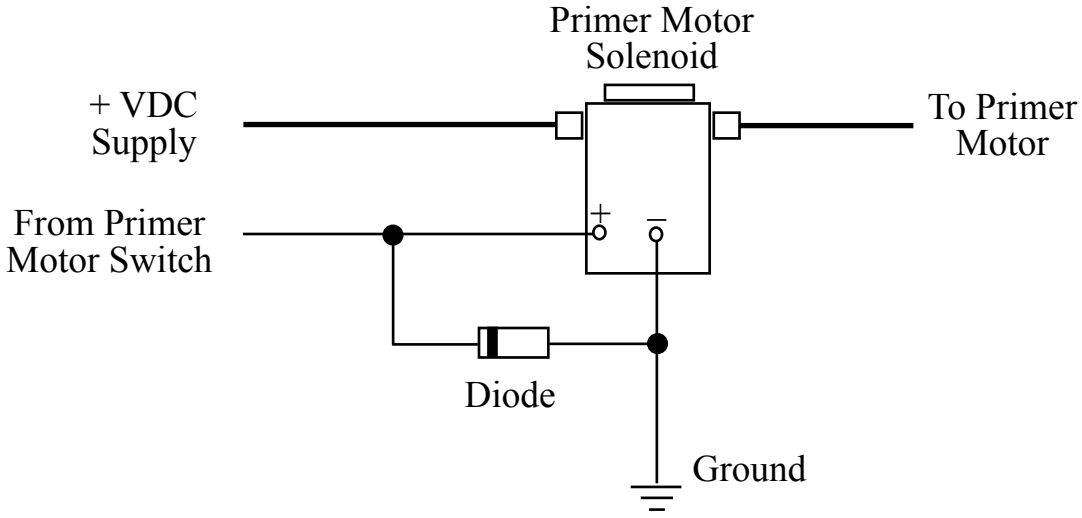


Figure 16. Flyback Diode