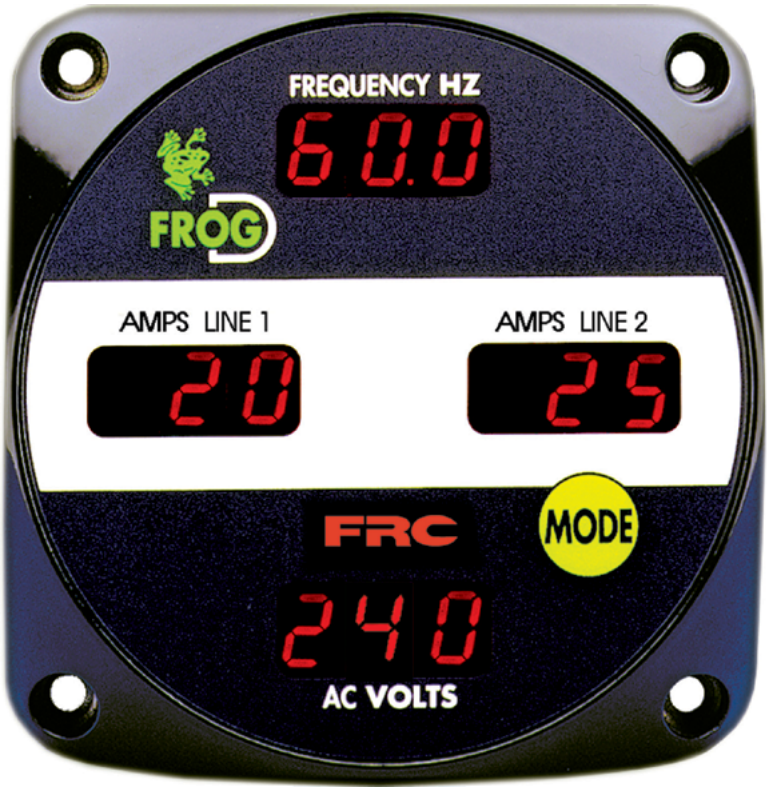
Document Number:
XE-FRA1PM-R0A

A Safe Fleet Brand

FROG

FREQUENCY REGULATION OF GENERATOR

GENERATOR GOVERNOR



FRA102

FIRE RESEARCH CORPORATION
www.fireresearch.com
26 Southern Blvd., Nesconset, NY 11767
TEL (631) 724-8888 FAX (631) 360-9727 ***TOLL FREE 1-800-645-0074***

CONTENTS

Table of Contents

List of Figures

Overview

The FROG is a generator governor and generator output display in one unit. This governor regulates engine RPM to help maintain steady generator frequency regardless of the engine or generator load.

The ultra-brite LED displays on the FROG constantly show generator frequency, current on two lines, and AC voltage. When the generator is off line the display shows total accumulated generator hours.

Built in safety features include a safety interlock and overspeed protection. When the PTO is disengaged, breaking the interlock, the governor returns the engine to idle. The overspeed protection function helps prevent engine run-away. It holds the engine speed below a preprogrammed maximum RPM.

Features

Automatic Regulation of Generator Frequency

Interlock Signal Recognition

Controlled Ramp-Up to Operating Frequency

Overspeed Protection

Generator Hourmeter

Audible Alarm Buzzer (Optional)

Hydraulic Oil Temperature Sensor (Optional)

Specifications

The FROG is programmed to interface with specific engines.

Display Module

Supply Power:	12 VDC
Supply Current:	1.25 Amps
Dimensions:	4.25” Wide by 4.25" High

LED Displays

Frequency:	0 - 99.9 Hz
Current:	0 - 200 Amps Each Line
Voltage:	0 - 400 AC Volts
Hourmeter:	0 - 99999.9 (0.1 Hour Increments)
Hydraulic Oil Temperature:	0 - 230 °F

GENERAL DESCRIPTION

The **FROG** FRA102 generator governors are compatible with the following engines:

Cummins, Detroit Diesel, Navistar

Components

The **FROG** generator governors consist of the following components:

Control Module

Current Sensors

AC Transformer

Audible Alarm Buzzer (Optional)

Hydraulic Oil Temperature Sensor (Optional)

Cables

Control Module

The control module is waterproof and takes up 4 1/4 by 4 1/4 inches of panel space. All indicators are located on the front of the module. There are no controls for the FROG governor, operation is automatic. There is a hidden menu button and a mode button. (Refer to Controls and Indicators.)

Current Sensor

Two current sensors are supplied. Both current sensors are identical and they can be used either to measure line 1 or line 2 current. Run the wires from the generator through the current sensors; one wire through the center of each current sensor.

AC Transformer

The voltage transformer supplied will work for 120 or 240 volt AC systems. The transformer should be securely mounted inside the electrical box.

Audible Alarm Buzzer (Optional)

The optional buzzer is installed as required.

Hydraulic Oil Temperature Sensor (Optional)

The optional hydraulic oil temperature sensor has a 1/8 NPT male threads and is installed as required.

Cables

The interconnecting cables to connect the control module to power, engine control, and the sensors are provided. Refer to the Wiring Section.

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.

FREQUENCY LED Display

Shows generator frequency in hertz.

AMPS LINE 1 and LINE 2 LED Displays

Shows current flow in ampers on the lines through the current sensors.

MODE Button

Press to show total generator hours and hydraulic oil temperature.

AC VOLTS Display

Shows the generator output voltage in volts.

Menu Button

Used to program the rated capacity of the generator in kW. This is only used at installation if needed.

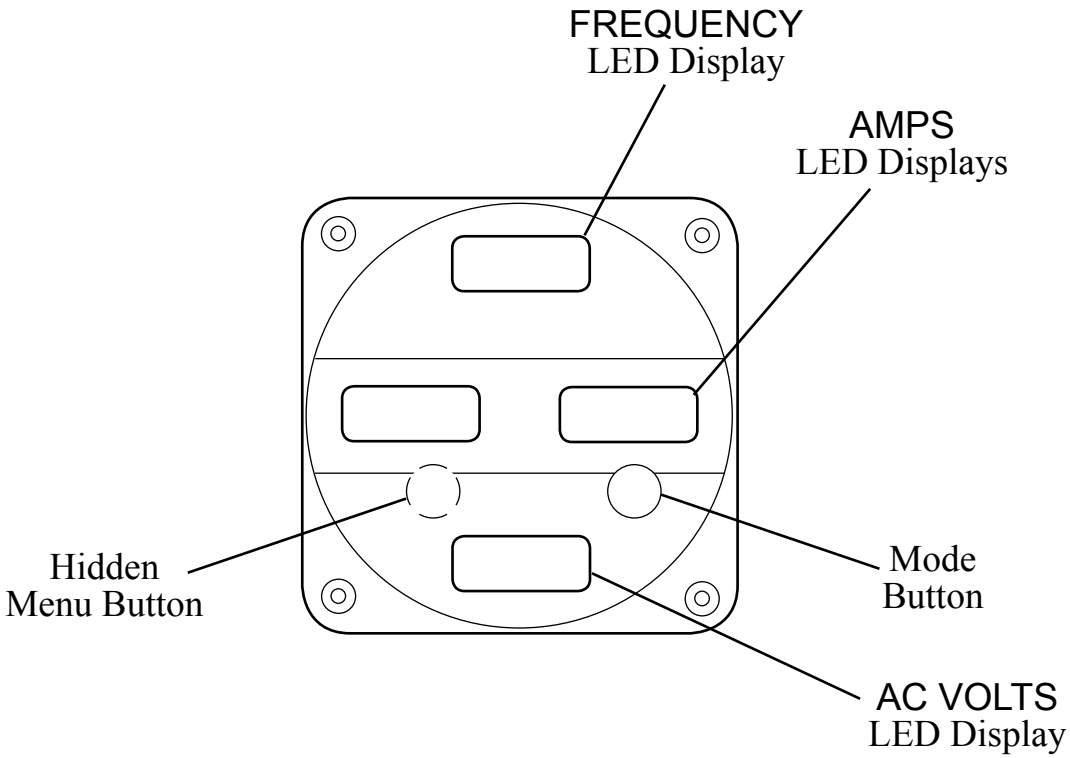


Figure 1. Controls and Indicators

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 mounting hole in panel.
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.)

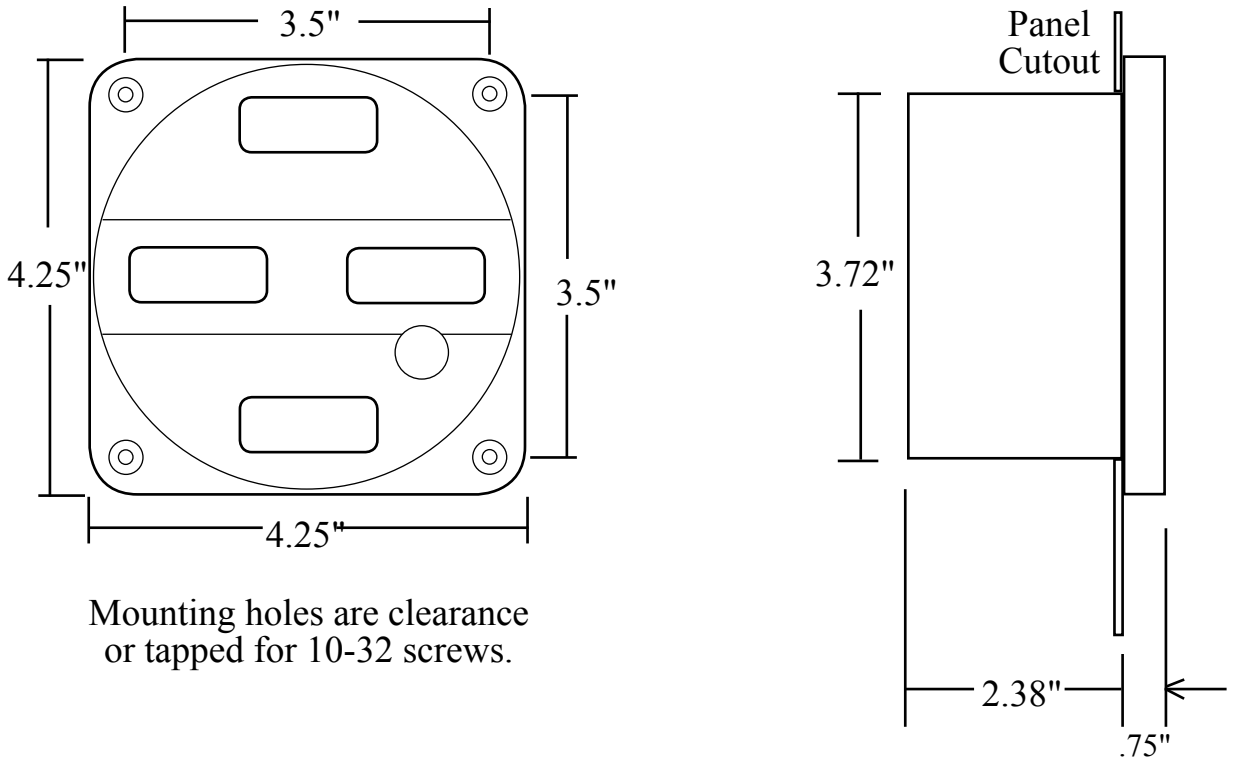
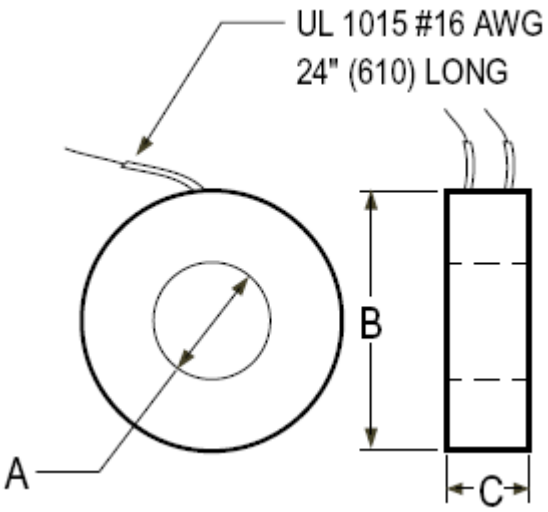


Figure 2. Control Module Mounting Dimensions

Install Current Sensor

Two current sensors are supplied. It is best to mount the sensors in the circuit breaker box. For each line that is to be monitored, run the wire from the generator through the current sensor to the input side of the circuit breaker. (Refer to Wiring section.)



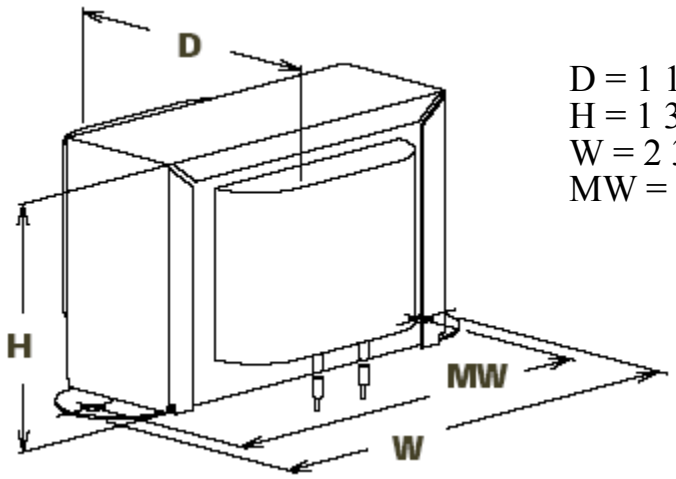
Current Sensor Ratio:
150 : 5

A = 1.13"
B = 2.46"
C = 1.05"

Figure 3. Current Sensors

Install AC Voltage Transformer

The voltage transformer supplied will work for 120 or 240 volt AC systems. The transformer should be securely mounted inside the electrical box. (Refer to Wiring section.)



D = 1 1/2"
H = 1 3/8"
W = 2 3/8"
MW = 2"

AC Voltage Transformer
Input: 120/240 VAC
Output: 12/24 VAC @ 0.2A

Figure 4. AC Transformer

Install Optional Hydraulic Oil Temperature Sensor

The hydraulic oil temperature sensor (FRC part number XE-FDT2) has 1/8-27 NPT male threads. (Refer to Wiring section.)

Install Optional Buzzer

Install the buzzer close to the control module so the audible warning is easily associated with the visual warning on the display. The optional buzzer provided by FRC requires a cutout hole of 1-1/8" (1.125"). (Refer to Wiring section.)

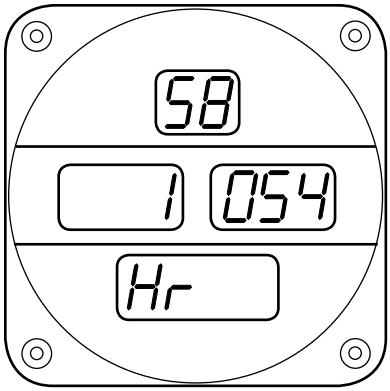
OPERATION

On power-up the FROG displays the total generator operating hours.

Minutes Display

Hours Display

Hours are displayed when the PTO is off.



Right side hour display is used when 999 hours are exceeded.

FROG display shows:
1054 hours and 58 minutes.

When the PTO is engaged and the interlock circuit is closed, the FROG changes to show frequency, current, and voltage. There is a three second delay before the governor starts to raise the engine RPM. This ensures that the PTO is fully engaged.

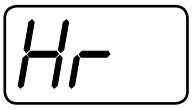
MODE Button

During normal operations the mode button is used to display the accumulated hours and hydraulic oil temperature if this option is installed.

MODE

Operations with the Mode Button

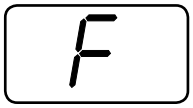
The mode switch allows the user to read the operational hours on the generator and the current hydraulic oil temperature. The first time the **MODE** button is pressed, the governor displays the generator hours as follows:



Generator Operating Time is:
50 hours and 36 minutes

Pressing the **MODE** button again switches the display to show the engine oil temperature:

Hydraulic Oil Temperature is:
150 degrees F



Pressing the **MODE** button again returns the display to the normal mode.

Over Current Warning

When the generator is operating outside the range of its rated capacity, the AMPS LINE 1 or AMPS LINE 2 display flashes. An optional audible buzzer can be connected for audible warning.

Voltage Out-Of-Range Warning

If the output voltage is below 200 VAC or above 270 VAC, the AC VOLTS readout flashes. This gives the operator an indication that the generator output falls outside the safe operating level. There is no audible alarm for the voltage out of range warning.

Optional Hydraulic Oil Temperature Warning

This warning is activated if the oil temperature rises above 180° F. The frequency readout flashes OIL to warn the operator and the optional audio alarm is activated.

CALIBRATION

Generator Rated Capacity Setting (FRA102 Only)

Each governor is set to operate at a customer specified generator rating. The over current warning will not work properly if this is not set correctly. Check the label on the rear of the control module to ensure that it is set at the correct kilowatt rating for the generator.

If the kilowatt rating for the governor is not correct it needs to be changed.

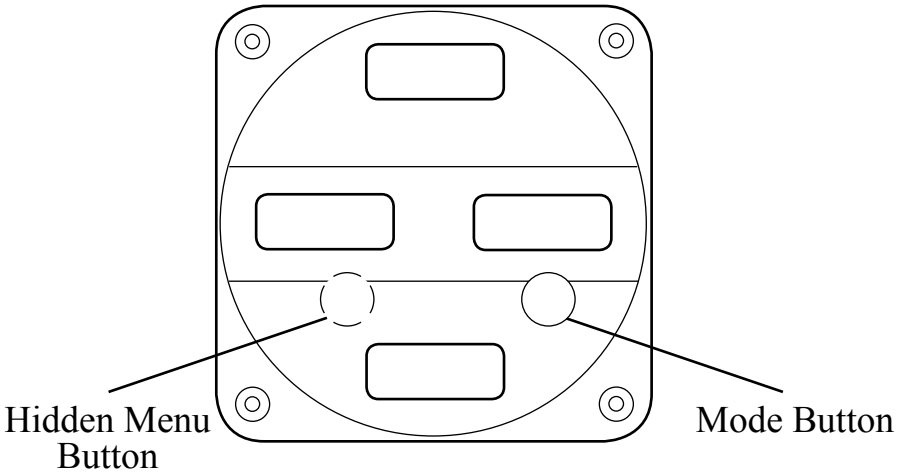
Adjust Kilowatt Rating

There is a MODE button on the right hand side of the control module. There is also a hidden MENU button on the left hand side as shown. To change the kilowatt rating, follow the procedures below:

1. Press the MENU button twice follow by the MODE button twice.

   Result: The display shows the existing kilowatt setting.

2. Press the MENU button to step through the kilowatt ratings available. (Refer to the table)
3. Press and hold the MODE and then the MENU button to accept the selection.
4. Release both buttons once the governor returns to normal display.



Generator Rating (KW)
6
7
8
9
10
12
15
20
25
30
35
40
45

This page intentionally left blank.

WIRING

The following figures include the schematics, wiring diagrams, block diagrams, and cables for the FROG series generator governors.

Note: Refer to Engine Harness Connections for information on engine control wiring.

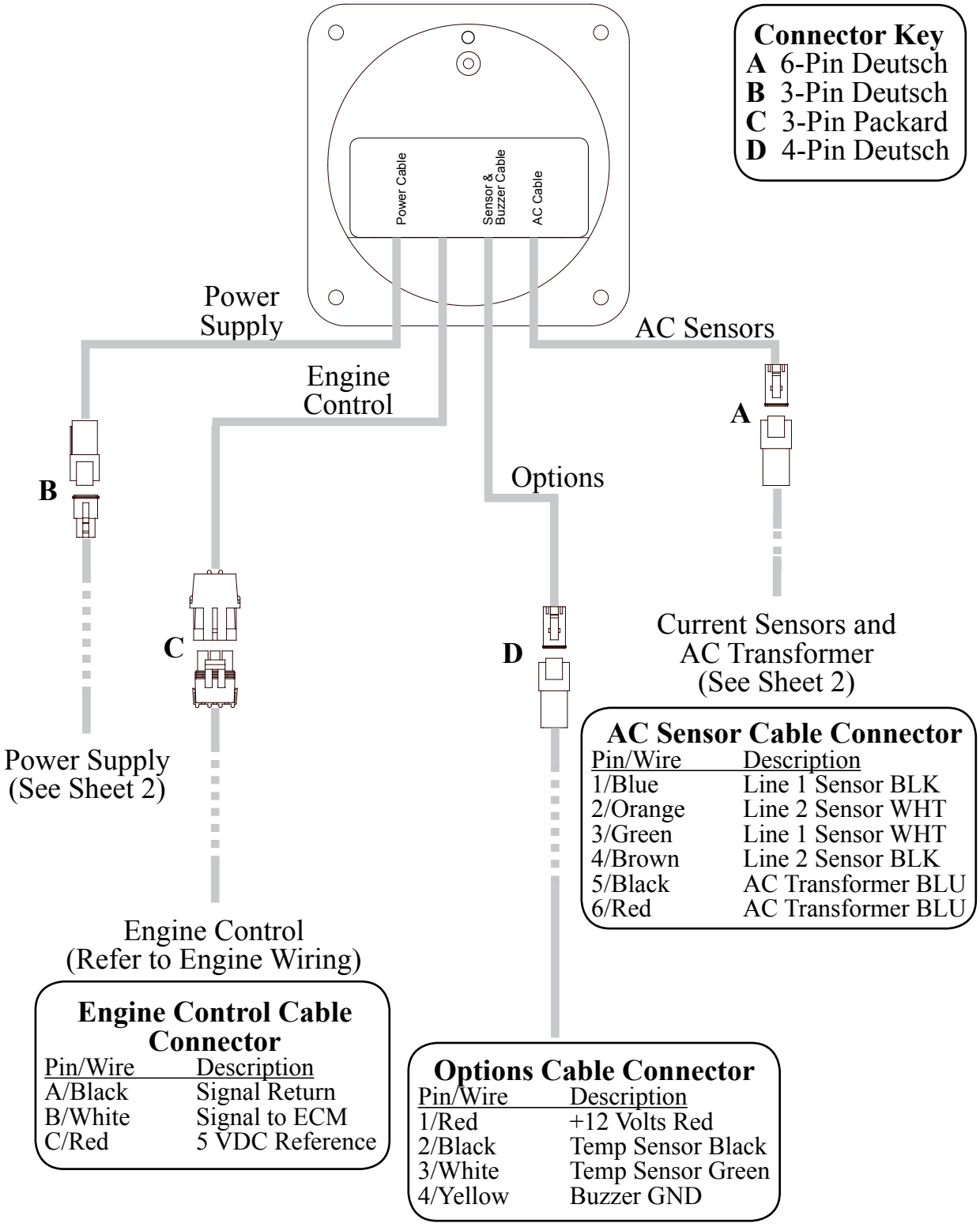
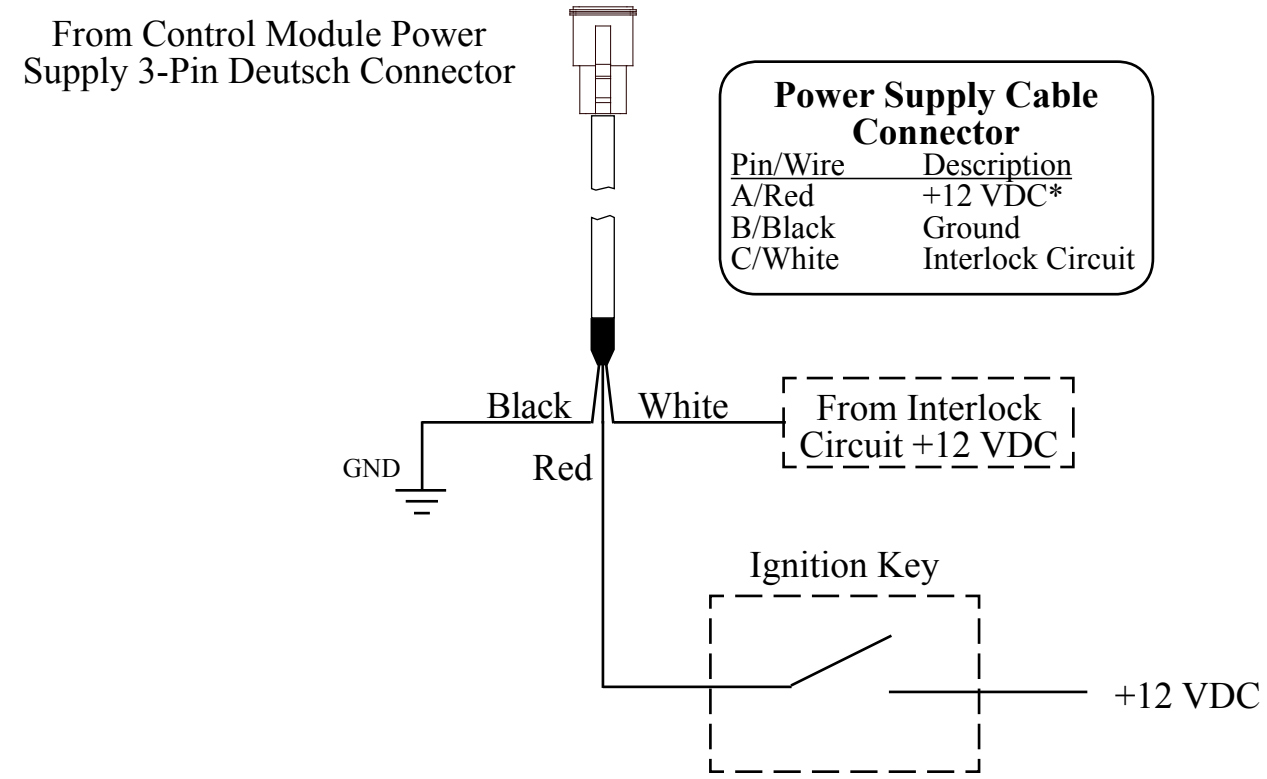
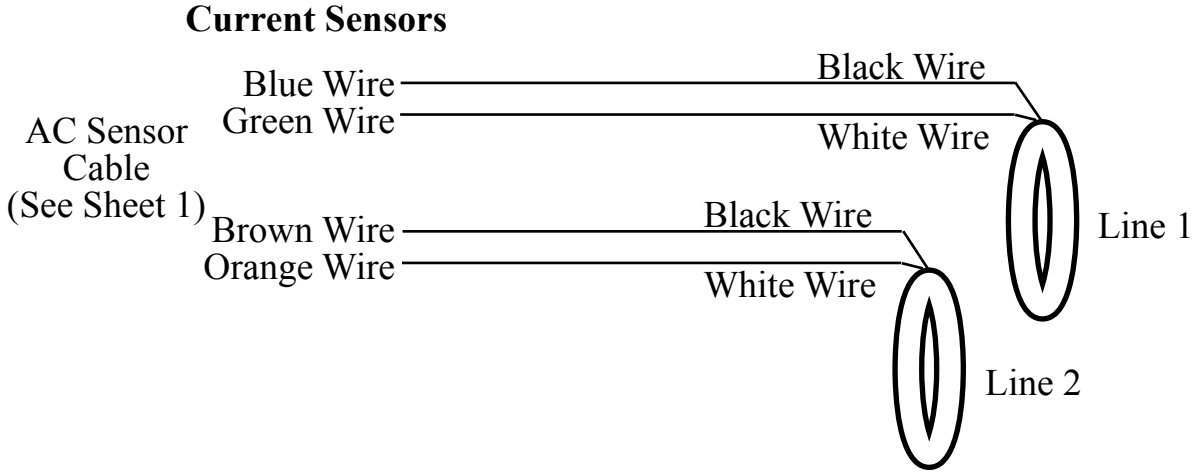


Figure 5. Wiring (Sheet 1 of 2)





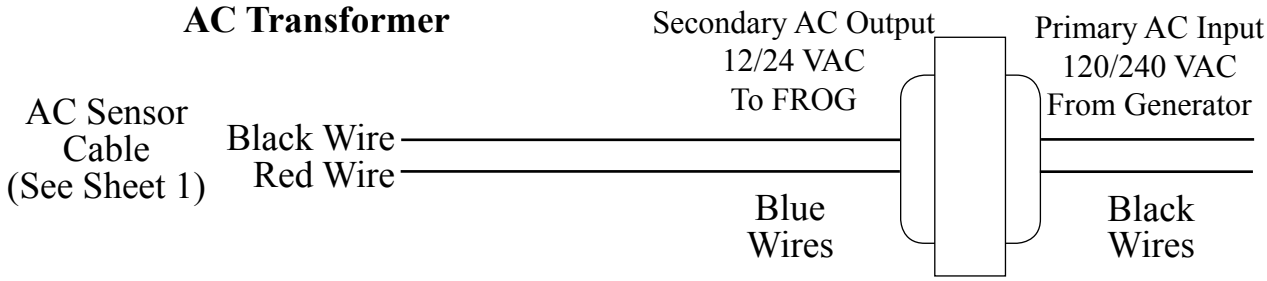


Figure 5. Wiring (Sheet 2 of 2)

Cummins Engine Connections

Interface Information

The ECM Remote Accelerator (Throttle) Option has to be set to ON. The diagnostic tool cannot be used to do this, an Insight service tool must be used. Refer to an authorized dealer to program this option.

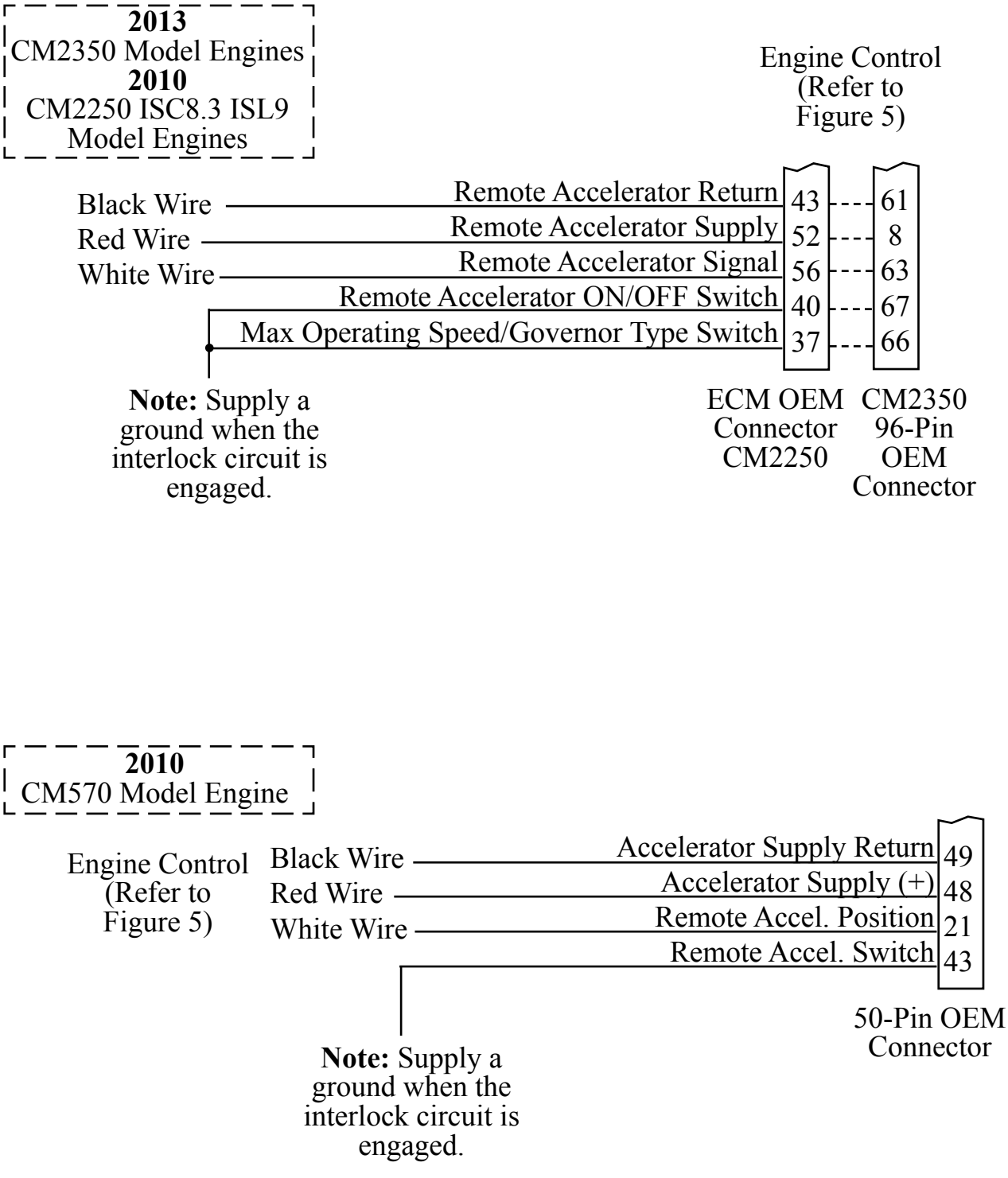
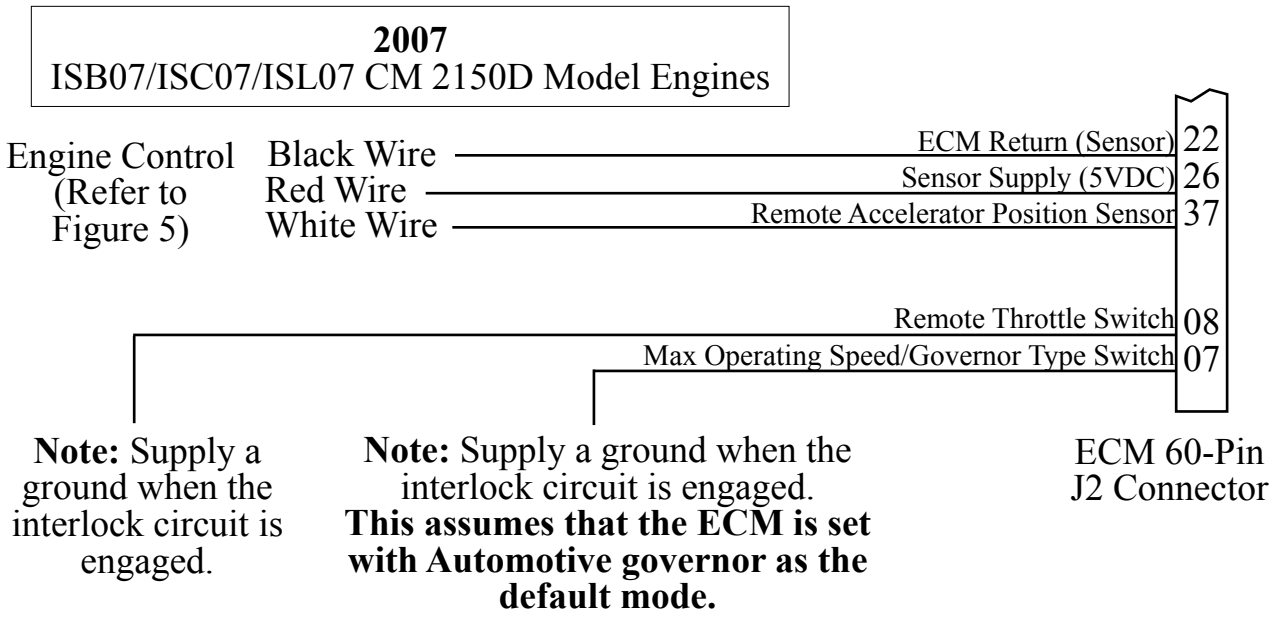


Figure 6. Cummins Wiring (Sheet 1 of 2)



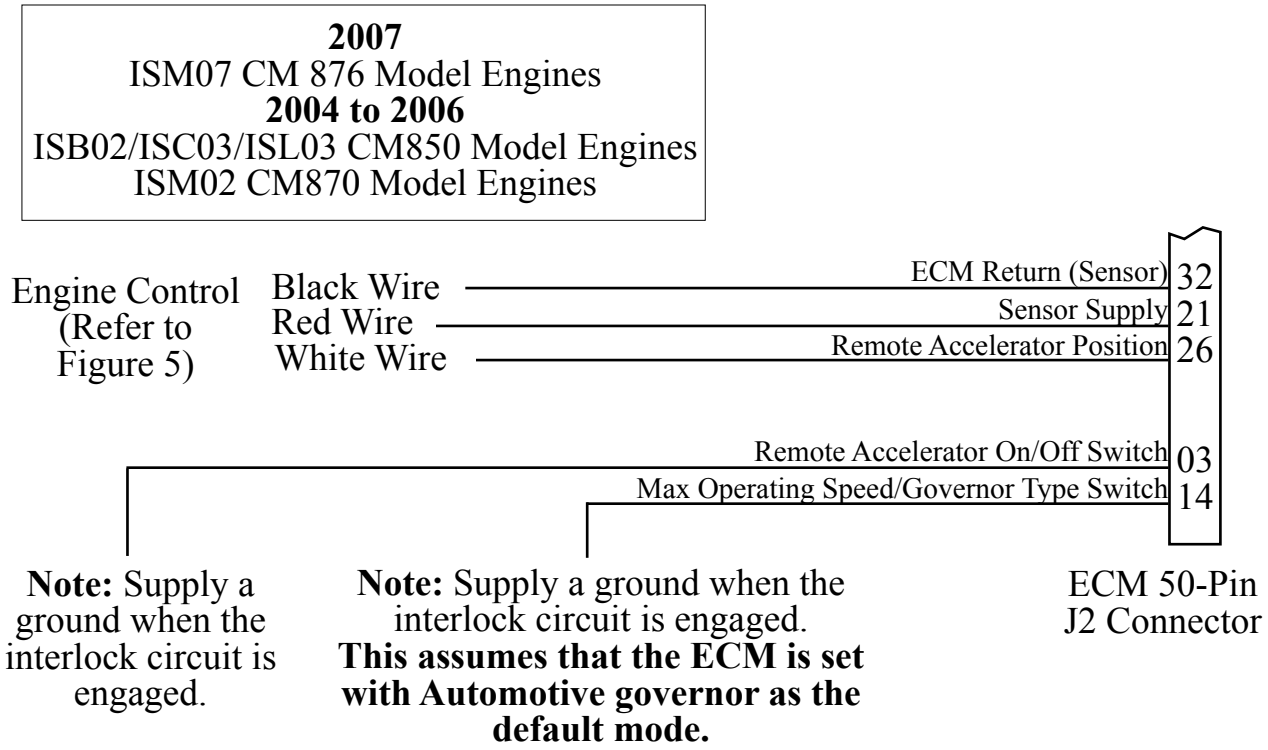


Figure 6. Cummins Wiring (Sheet 1 of 2)

Detroit Diesel Engine Connections

Interface Information

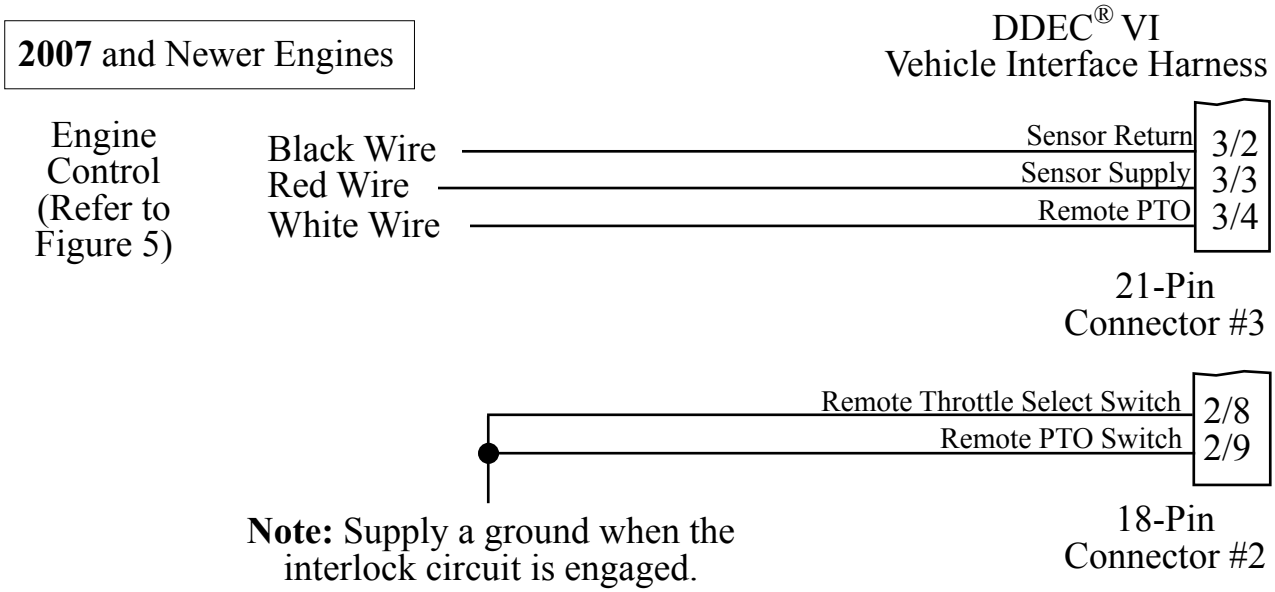


Figure 7. Detroit Diesel Wiring

Navistar Engine 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

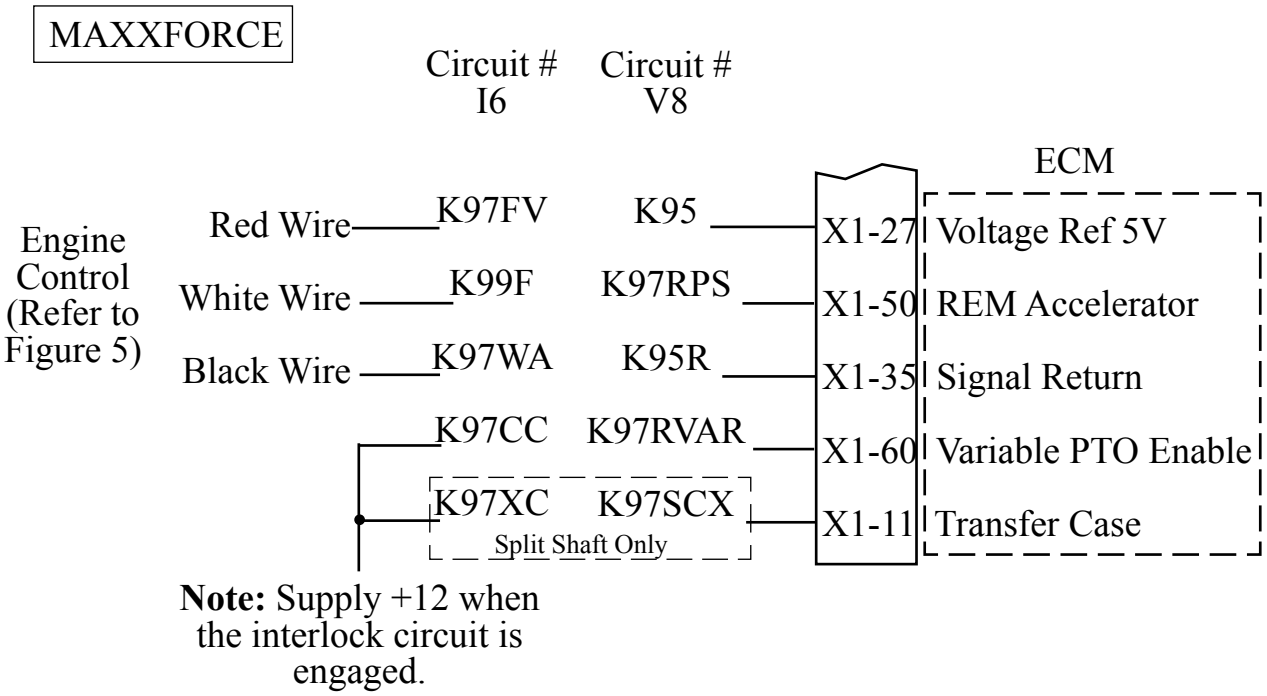
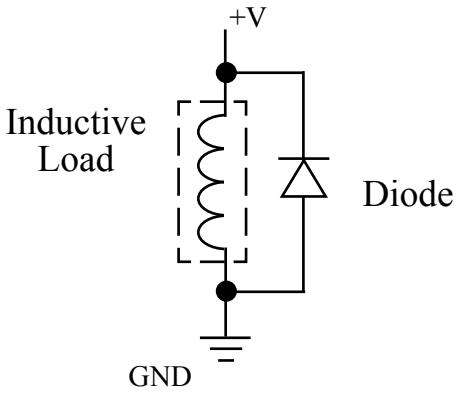


Figure 8. Navistar Wiring

FLYBACK DIODE INFORMATION

It is good engineering practice to include a flyback diode when switching an inductive load (solenoid 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.

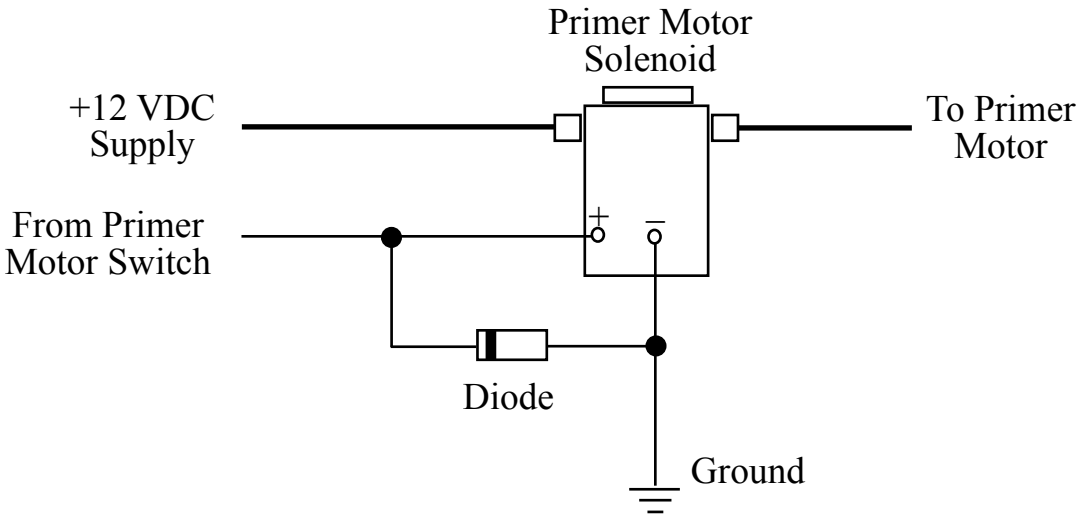


Figure 9. Flyback Diode

NOTES

NOTES

NOTES

DANGER

PERSONAL RESPONSIBILITY CODE

The member companies of FEMSA that provide emergency response equipment and services want responders to know and understand the following:

1. Firefighting and Emergency Response are inherently dangerous activities requiring proper training in their hazards and the use of extreme caution at all times.
2. It is your responsibility to read and understand any user's instructions, including purpose and limitations, provided with any piece of equipment you may be called upon to use.
3. It is your responsibility to know that you have been properly trained in Firefighting and/or Emergency Response and in the use, precautions, and care of any equipment you may be called upon to use.
4. It is your responsibility to be in proper physical condition and to maintain the personal skill level required to operate any equipment you may be called upon to use.
5. It is your responsibility to know that your equipment is in operable condition and has been maintained in accordance with the manufacturer's instructions.
6. Failure to follow these guidelines may result in death, burns or other severe injury.

FEMSA

Fire and Emergency Manufacturers and Services Association, Inc.
P.O. Box 147, Lynnfield , MA 01940 www.FEMSA.org