

# **PAINLESS**<sup>®</sup>

## **PERFORMANCE PRODUCTS**

### Installation Instructions

Manual #90579

For Installing:

Part #60650- Painless Gauge Controller



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If you have any questions concerning the installation of this harness, feel free to call Painless Performance Products' Tech Line at 1-800-423-9696. The Tech Line can be reached from 8 A.M. to 5 P.M. central time, Monday through Thursday, and 8 A.M. to 4:30 P.M. on Fridays.

We have attempted to provide you with as accurate of instructions as possible and are always concerned about corrections or improvements that can be made. If you have found any issues or omissions, or simply have comments or suggestions concerning these instructions, please write us at the above address, send us a fax at (817) 244-4024, or email us at [painless@painlessperformance.com](mailto:painless@painlessperformance.com). We sincerely appreciate your business.

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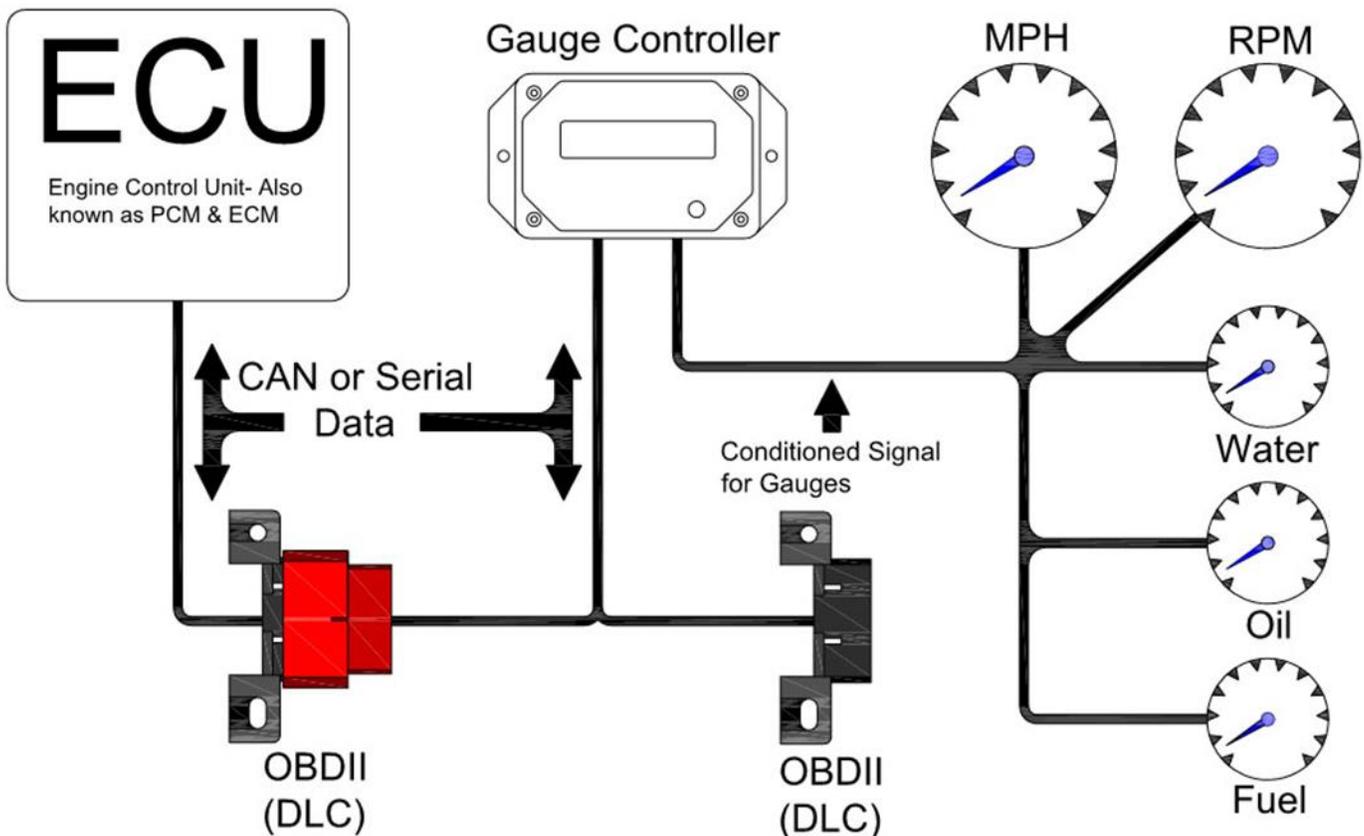
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# Introduction

The PERFECT Gauge Controller is designed to use information from the OBDII port/ Data Link Connector (DLC) and convert it into a usable signal for your aftermarket gauges. The OBDII, or On Board Diagnostic II, system is designed to give you access to emissions related data streams. These data streams are provided by your ECU, or Engine Control Unit, and will vary from vehicle-to-vehicle. All powertrains from OBDII compatible vehicles will include a data stream for vehicle speed, engine RPM, and coolant temperature, because these are emissions related data streams. Some powertrains will also give you access to additional data streams for oil pressure and fuel level, eliminating the need to install redundant oil pressure and coolant temperature sensors.

The available data the Gauge Controller uses will vary from vehicle to vehicle, we cannot guarantee that the gauge controller will be able to receive data for fuel level or oil pressure. We have been able to verify that all 5 gauges will function properly when using either an E38 or E67 ECU. We have also been able to verify that if you are using a "0411" or similar ECU, the oil pressure and fuel level gauges **WILL NOT** function using our Gauge Controller. Also, you must have the necessary sensors and sending units correctly connected to your ECU for the Gauge Controller to be able to collect data from the OBDII system. For instance, if you do not have the correct fuel level sending unit connected to the ECU, the gauge controller will not receive a signal for the fuel level.

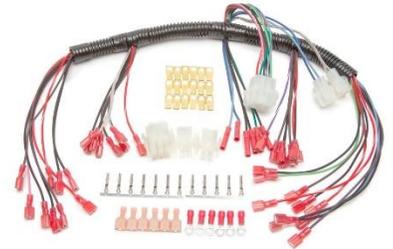


There are several different protocols, or languages, used in OBDII systems. The PERFECT Gauge Controller supports only two of these protocols, which are J1850 VPW and ISO 15765-4. Typically J1850 VPW will be found in GM vehicles produced between 1997 and 2007, while ISO 15765-4 can be found in most new GM and Mopar vehicles. Starting in the year 2008, all new Mopar and GM vehicles utilize ISO 15765-4, however manufactures were allowed to begin using ISO 15765-4 as early as 2003. This overlap means some GM vehicles manufactured between 2003 and 2007 might use either the J1850 protocol or the ISO 15765-4 protocol. Any Mopar vehicles that don't use the ISO 15765-4 protocol WILL NOT be compatible with our gauge controller at this time. If

you are unsure what protocol your powertrain uses please refer to the Pre-Programming section of this instruction manual.

This instruction manual is intended to be a guide to help with the installation and programming of the gauge controller, however, it might not cover all scenarios that may arise when installing the gauge controller. This is due to that fact that everyone's individual installation will differ slightly because of the gauges chosen for the controller to run, and the custom nature of vehicles that have had an engine swap. If you are having trouble with your installation don't hesitate to call our tech line at 1-800-423-9696.

**Before installing the gauge controller it is important to fully read this instruction manual and any instruction manuals that came with your gauges.** This instruction manual will only cover how to hook up the sending unit or sensor wires to your gauges. You will need to properly connect all other necessary wires to your gauges such as power, ground, illumination and illumination ground in order for your gauges to work properly. If you don't already have a gauge harness you may want to purchase the Painless gauge harness, part number 30302, seen in the picture to the right.



This installation manual consist of the following sections:

- **Introduction** – Provides information on how the Gauge Controller is designed to work.
- **Contents of Painless Kit** - List of all parts included with the Gauge Controller.
- **Tools Needed** – List of all tools required to properly install the Gauge Controller.
- **Pre-Installation Guidelines** – Contains precautions to take before installing the gauge controller.
- **Installation** – Contains step by step instructions on how to install the Gauge Controller in your vehicle. These instructions must be followed step by step in order to properly install the Gauge Controller.
- **Special Instructions for Fuel Gauge**- Gives special instructions if you are using the Gauge Controller to run your fuel level gauge. This section consist of specific instructions for both the E38 and E67 ECU's, and how to identify which is which.
- **Special Instructions when using Painless P/N 30302**- This section will give specific instructions for integrating the Gauge Controller harness with a Painless Gauge Wiring harness.
- **Gauge Controller Basics**- Provides a brief introduction to the Gauge Controller and discusses the various screens that will be displayed when you first turn the Gauge Controller on.
- **Pre-Programming** –This section will discuss information needed to properly program the Gauge Controller.
- **Programming** – This sections gives step by step instructions on how to program the Gauge Controller for your specific gauges.

# CONTENTS OF THE PAINLESS KIT

Refer to the **Contents Figure** (below) to take inventory. Verify that you have everything you are intended to have in this kit. If you find that anything is missing or damaged, please contact the dealer where you obtained the kit or Painless Performance at (800) 423-9696.

## The Perfect Gauge Controller Kit contains the following:

- (1) Gauge Controller module
- (1) Gauge Controller harness
- (1) 20ft purple fuel level sender wire
- (1) 20ft tan fuel level sender wire
- (4) 3/4" self-tapping screws
- (4) #10-32 3/4" pan head screws
- (4) #10-32 nylon insert locking nuts
- (6) #10 flat washers
- (30) 4" zip ties
- (2) 7" zip ties
- (1) 4" strip of Velcro
- (1) Blade style fuse tap
- (1) Mini blade style fuse tap
- (1) Glass style fuse tap
- (1) Posi-tap
- (5) Red butt connectors
- (10) Red female spade terminals
- (1) Instruction manual

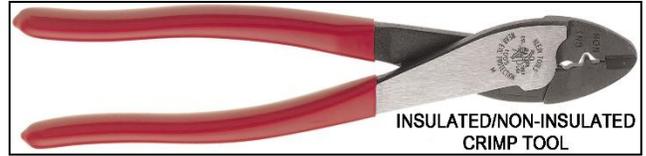


## TOOLS NEEDED

In addition to your regular hand tools, you will need, at least, the following tools:

● **Wire Crimping and Stripping Tools:**

This style of hand crimper can be purchased from just about any local auto parts store, home improvement store or can also be purchased online. You will need this style of crimper to crimp terminals included in the parts kit.



A good set of wire strippers are required. This style of wire stripper is ideal for this Gauge Controller install because of its ability to properly strip wire gauges 10 to 20. These are available from just about any local auto part store, electrical supply shop, home improvement store or can be purchased online.



● **Volt/Ohm Meter:**

A Volt/Ohm meter is always a good tool to have on hand when installing any type of electrical components into any vehicle. The volt/ohm meter will be used to determine how to set the controller up for you specific gauges. A standard inexpensive volt/ohm meter will work fine for this application. They can be purchased from any home improvement store, local hardware store, electrical supply shop or online.



● **Electric Drill & Drill Bits:**

A drill and Drill bits may be needed in order to use the screws provided with the kit to mount the Gauge Controller module and Data Link Connector (DLC).

## **Pre-Installation Guidelines**

Before starting the installation of the Gauge Controller it is important to find an appropriate mounting location for the Gauge Controller module. There are several factors that must be taken into consideration when deciding on an appropriate mounting location.

The first thing that must be taken into consideration is the current mounting location of your Data Link Connector, or DLC. The harness for the Gauge Controller must be plugged into the pre-existing DLC, so the module mounting location will need to be close to the DLC. The Gauge Controller is supplied with a 24" long harness between the DLC and the module.

The next thing that must be taken into consideration is the accessibility of the module for programming. While the module will most likely not be permanently mounted in a position accessible from the driver's seat, it is important the module be mounted in a location where it can temporarily be removed and accessed for programming.

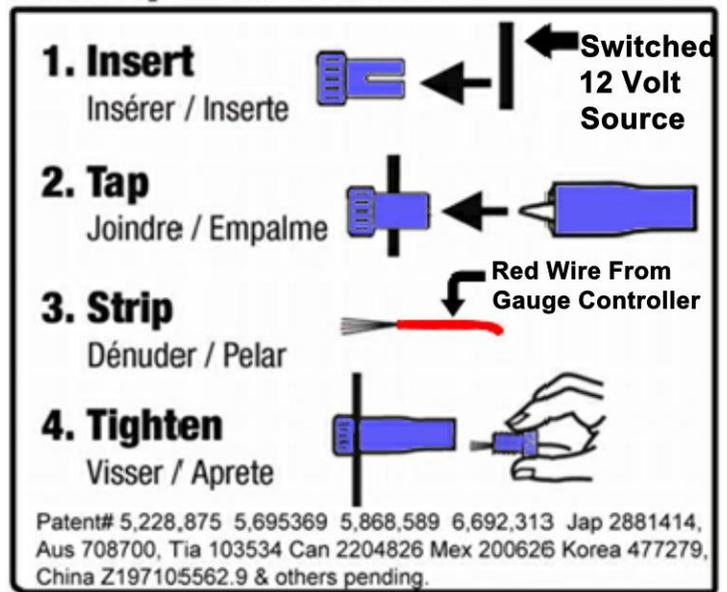
The final factor to be taken into consideration is the mounting location of ALL the gauges in the vehicle to be ran by the Gauge Controller. We have supplied 72" of length between the DLC and the vehicles gauges. While most applications have all the gauges located in the same general area, some applications will have gauges mounted in a pillar pods or in the center stack of the dash. Keep in mind that the module will need to be temporarily accessible for programming.

## Installation

1. Disconnect the battery from the vehicle.
2. Mount the Gauge Controller module in a suitable mounting location as described in the **Pre-Installation Guidelines** using the supplied Velcro, self-tapping screws or #10-32 screws and nylon insert nuts. If you are using the #10-32 screws you will need to drill two holes for the screws in the mounting location using a 3/16" drill bit.
3. Plug the 24 pin connector from the supplied harness into the 24 pin connector on the Gauge Controller module.
4. Find a suitable 12 volt switched source to power the module. A switched 12 volt source will only see 12 volts when the ignition is in either the accessory, run and start positions. A good place to start searching for a switched 12 volt source would be at your interior fuse panel. Use a test light or Volt/Ohm meter to determine which circuits **DO NOT** have 12 volts with the ignition turned off. Then turn the ignition switch to the run position and see if any of the same circuits now have 12 volts. If you find a fuse that meets these criteria then it will be suitable 12 volt switched power source to power the Gauge Controller module. If you reconnected the battery during this step to find an appropriate 12 volt switched source make sure you **DISCONNECT THE BATTERY BEFORE PROCEEDING.**

- Now that you have located a suitable 12 volt switched power source you can connect the red 20ga wire from the harness to the fused side of the switched 12 volt circuit by doing one of the following: cut the wire to length, strip  $\frac{1}{4}$ " of insulation, crimp on a .250 spade terminal and use one of the supplied fuse taps. The second option is to connect to the fused side of the circuit using one of the supplied Posi-Taps. If you use the Posi-Taps make sure you read the supplied Posi-Tap instructions in this manual. Also, be sure when routing this wire, as with all under dash wires, that it does not interfere with function of the gas pedal, brake pedal, clutch pedal or steering column.

## Posi-Tap™ Instructions



- Next locate the Data Link Connector, or DLC. This connector is sometimes referred to as the OBDII connector. It will typically be located somewhere within reach of the driver's seat, however this may differ slightly from one application to another due to the custom nature of a vehicle that has an engine swap. You will remove this connector from its current location. It will usually be attached with either two bolts or two screws. Make sure to keep any hardware that was used to mount the DLC, as it may need to be re-used later depending on your particular install.
- Now route the section of harness containing the new DLCs from the module's location to the location of the pre-existing DLC that was removed in the previous step. Connect the red male DLC from the supplied harness to the existing DLC.
- Now mount the new black female DLC supplied in the harness in the same location as the pre-existing DLC that was removed in step 6. The black female DLC that is supplied in the kit should be similar to most GM DLCs, however in some applications this may not be true. If the new DLC is the same as the old DLC you can mount it in the same location as the old DLC either using the supplied #10/32  $\frac{3}{4}$ " pan head screws and nuts, self-taping screws or you can reuse the original mounting hardware that was set aside in step 6. If the new black female DLC differs from the pre-existing one it may be necessary to make a custom mounting bracket to mount the new DLC in the same location as the pre-existing DLC. If the new and old DLCs differ slightly it is also possible to find a new suitable location to mount the new DLC using the supplied hardware mentioned above.

9. You can now route the sender or signal wires from the controller to the gauges. This section of the harness includes 5 wires of various colors that will be connected to their respective gauges. The colors for the five wires are:
  - Purple for the Speedometer
  - Purple/White for Tachometer
  - Light Green for Coolant Temperature
  - Pink for Fuel Level
  - Light Blue/Black for Oil Pressure
10. Once you have routed the 5 signal wires to the area the gauges will be installed you can cut the wires to length and terminate them by stripping  $\frac{1}{4}$ " of insulation and terminating them using either the .250" spade terminals or the butt connectors supplied in the kit. You should crimp the terminals using a crimp tool similar to the one seen in the "Tools" section of this instruction manual. If any of the wires are not used at this point it is a good idea to wind them up and secure them with a zip tie in case you would like to add additional gauges in the future.
11. You can now connect the appropriate signal wires to their respective gauges. Most gauges will have a terminal or wire marked "S" for signal, which should now be connected to the correct signal wire coming from the Gauge Controller. If you are using an oil pressure or coolant temp gauge that has a 2 or 3 wire sender please refer to the "Pre-Programming" section of this instruction manual to determine which terminal the signal wire should be connected to.
12. Now connect all other necessary wires to the gauges such as power, ground, back light power and back light ground. This step will differ slightly depending on the gauges used in a particular application.
13. At this point you can reconnect the battery to the vehicle and verify that the gauges are getting power.

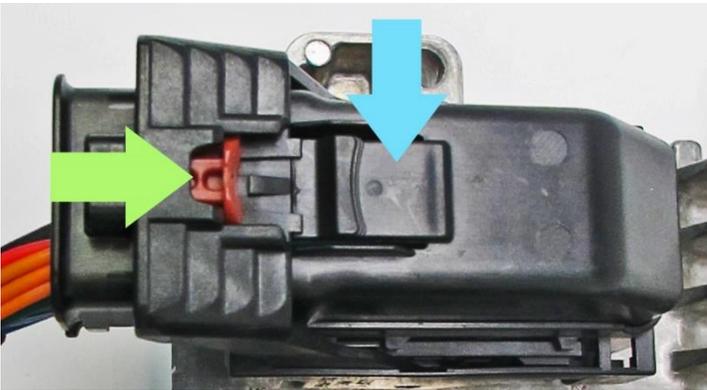
## **Special Installation Instructions for Fuel Gauge**

If you are planning on using the Gauge Controller to send the fuel level signal to your fuel level gauge there are a few considerations that must be taken. The only GM ECU's that will support the fuel level gauge are the E38 and E67, which can be found in vehicles that utilize the ISO 15765-4 CAN protocol. If you are going to run the fuel level gauge with the gauge controller you must have the correct fuel level sending unit connected to the correct pins on the ECU's connectors. This will not be a problem if you are simply fitting aftermarket gauges to a late model vehicle, that came factory equipped with one of the compatible ECU's, as long as the factory fuel level sending unit is still being used. If you are using the Gauge Controller in a vehicle that has had an engine installed that uses one of the two compatible ECU's, and plan on running your fuel level gauge with the gauge controller, you will more than likely need to add two additional wires (supplied with in this kit) to your engine wiring harness. You will also need to purchase and install a specific aftermarket fuel level sending unit, VDO P/N 226-169. **Remember you do not have to use the Gauge Controller to run the fuel level gauge, you simply purchase a matching fuel level gauge and fuel level sender, then wire them together in a standard one wire configuration.** On the following page you will find specific instructions for each ECU and pictures to help identify what ECU you have.

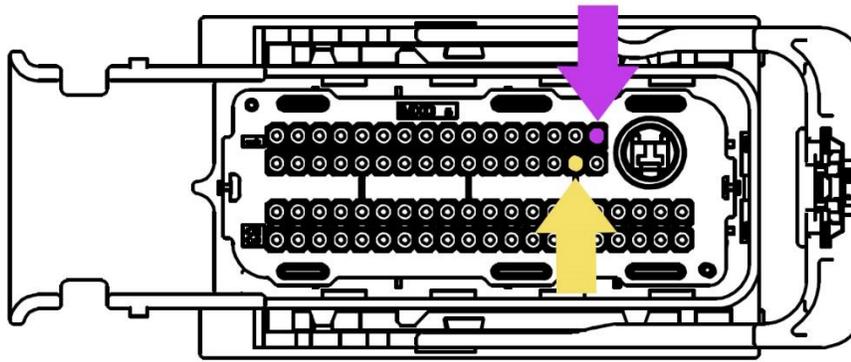
## E38 Instructions



1. Start by disconnecting the negative cable to your battery.

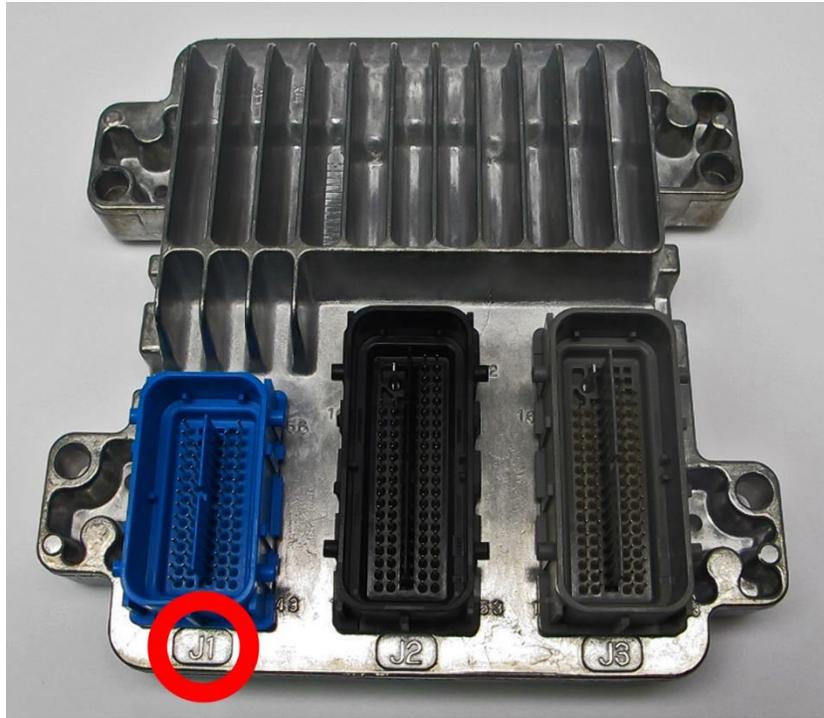


2. Locate your ECU and remove the connector attached to the black connector on the ECU, labeled J1. To remove the connector you will slide the red lock (green arrow) forward, then press the tab down (light blue arrow). You can now lift up on the lever as indicated by the purple arrow.
3. Now remove the cover by using a small flathead screwdriver to release the tabs, one on each side, indicated by the orange arrow. Be careful not to damage the cover or connector body.
4. At this point there might be a zip tie that is holding the wires down, if so remove it.

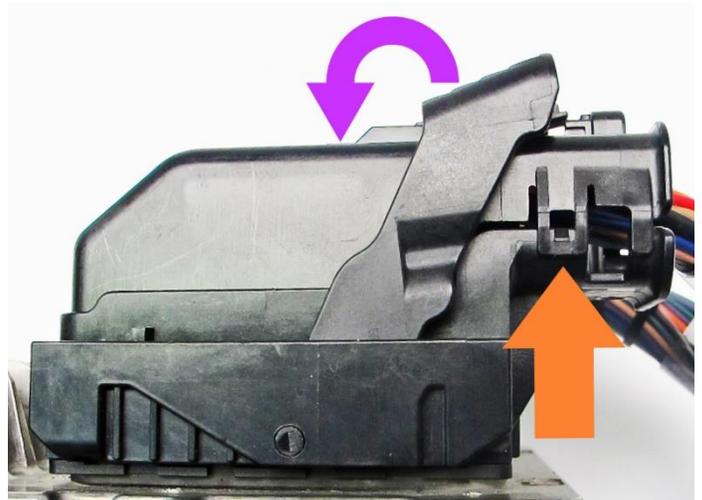


5. You should now have access to the wire side of the connector. You will now insert the terminated end of the single purple wire into position # 16, as seen in the graphic above. At the same time you can insert the terminated end of the single tan wire into position # 31, also seen above. **Be very careful that you are inserting the terminal into the correct position. Once the terminals are seated there is no way to remove them, so make sure that the terminal is in the correct position before seating it.**
6. Replace the zip tie removed in step 4 with one of the supplied 7" zip ties, then snap the cover, which was removed in step 3, back on the connector.
7. You can now re-attach the connector to the ECU. Make sure that the connector is properly seated and the red lock is in its locked position.
8. You can now route the two fuel sender wires from the ECU to the fuel tank, and secure them using the supplied 4" zip ties. Remember, when routing wires, to keep them away from excessive heat and moving parts and to always use a grommet if the wires must pass through a hole.
9. Install VDO P/N 226-169 using the instructions that come with the fuel level sending unit. You must use this exact fuel sender for two reasons. The first reason is this particular fuel level sending unit works within the resistance range the ECU is designed to read. The second reason for using this exact fuel level sending unit is it has a separate terminal for the signal ground, unlike most fuel level sending units that simply ground through the body of the fuel level sending unit.
10. Cut the two wires to length, then strip approximately ¼" of insulation from the ends. Now terminate the wires using the supplied female spade terminals.
11. Now connect the purple wire to the terminal on the fuel level sending unit marked "S" and connect the tan wire to the terminal labeled "-".
12. You can now re-connect the battery.

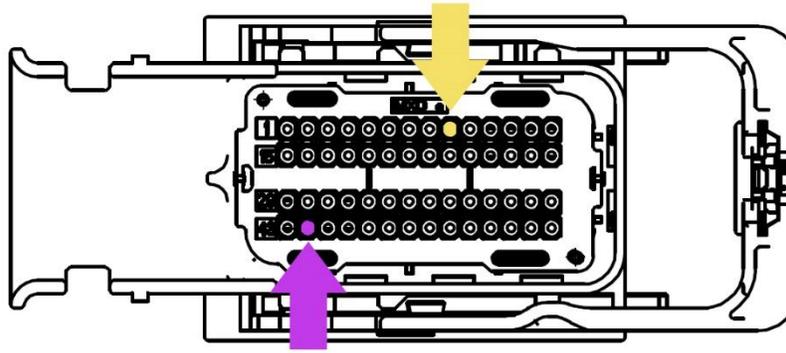
## E67 Instructions



1. Start by disconnecting the negative cable to your battery.



2. Locate your ECU and remove the smaller connector attached to the blue connector on the ECU, labeled J1. To remove the connector you will slide the red lock (green arrow) forward, then press the tab down (light blue arrow). You can now lift up on the lever as indicated by the purple arrow.
3. Now remove the cover by using a small flathead screwdriver to release the tabs, one on each side, indicated by the orange arrow. Be careful not to damage the cover or connector body.
4. At this point there might be a zip tie that is holding the wires down, if so remove it.



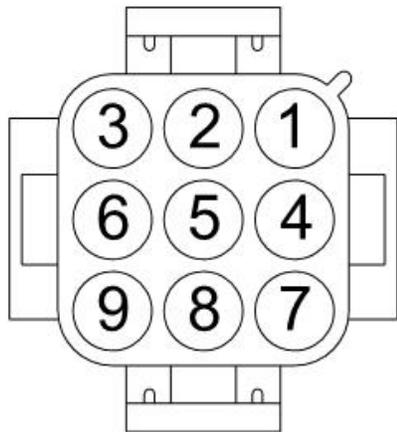
5. You should now have access to the wire side of the connector. You will now insert the terminated end of the single purple wire into position # 44, as seen in the graphic above. At the same time you can insert the terminated end of the single tan wire into position # 9, also seen above. **Be very careful that you are inserting the terminal into the correct position. Once the terminals are seated there is no way to remove them, so make sure that the terminal is in the correct position before seating it.**
6. Replace the zip tie removed in step 4 with one of the supplied 7" zip ties, then snap the cover, which was removed in step 3, back on the connector.
7. You can now re-attach the connector to the ECU. Make sure that the connector is properly seated and the red lock is in its locked position.
8. You can now route the two fuel sender wires from the ECU to the fuel tank, and secure them using the supplied 4" zip ties. Remember when routing wires to keep them away from excessive heat and moving parts and to always use a grommet if the wires must pass through a hole.
9. Install VDO P/N 226-169 using the instructions that come with the fuel level sending unit. You must use this exact fuel sender for two reasons. The first reason is this particular fuel level sending unit works within the resistance range the ECU is designed to read. The second reason for using this exact fuel level sending unit is it has a separate terminal for the signal ground, unlike most fuel level sending units that simply ground through the body of the fuel level sending unit.
10. Cut the two wires to length, then strip approximately  $\frac{1}{4}$ " of insulation from the ends. Now terminate the wires using the supplied female spade terminals.
11. Now connect the purple wire to the terminal on the fuel level sending unit marked "S" and connect the tan wire to the terminal labeled "-".
12. You can now re-connect the battery.

## Special Installation Instructions for Painless Part Number 30302

If you will be using the Gauge Controller in conjunction with a Painless Gauge Harness (30302) there, are a few things that will make installation easier.

First off, the color coding of the Gauge Controller harness will match the color coding of the Gauge Harness with the exception of one wire. So when you pin out the 9 pin connector for the Gauge Harness you can simply make sure that the signal wires in the Gauge Controller harness match the color of the wires already terminated in the other side of the 9 pin connector on the Gauge Harness. The 4 signal wires will be purple/white for the tachometer, light green for coolant temperature, light blue/black for oil pressure and pink for fuel. The final wire that doesn't match the color code of the Gauge Harness will be the purple speedometer wire. The Gauge Harness supplies you with a bonded pair of wires to connect to speedometer, however these wires will go un-used if you are installing the Gauge Harness along with the Gauge Controller. We recommend that you simply connect the purple wire to the signal wire or terminal on the speedometer by cutting it to length, stripping  $\frac{1}{4}$ " of insulation off and terminating it with either a supplied .250" female spade terminal or butt splice. All other connections on the Gauge Harness will be the same as in the instruction manual for the Gauge Harness. Below is the pin out for the loose connector supplied with Painless P/N 30302.

Wire Side View of  
Connector



- 1: **Light Green from Gauge Controller**
- 2: **Light Blue/Black from Gauge Controller**
- 3: High Beam Indicator B+
- 4: **Purple/White from Gauge Controller**
- 5: Dash Light Power
- 6: Battery + for Voltmeter
- 7: Chassis Ground
- 8: **Pink from Gauge Controller**

# Gauge Controller Basics

Before you begin programming the Gauge controller, it is a good idea to make yourself familiar with the various menus and screens of the gauge controller and how they will be utilized. The first aspect of the Gauge Controller you should familiarize yourself with is the control knob. This knob is located in the bottom right-hand corner of the Gauge Controller. It can be turned both clockwise and counter clockwise to scroll through the various menus of the Gauge Controller. You will also use this same knob to select the option that is displayed on the screen, by pressing down on the knob until you feel it click. The next aspect of the Gauge controller you should familiarize yourself with is the various screens that you will see displayed while you are programming the Gauge Controller. Below you will find several pictures displaying the main menus of the Gauge Controller. These pictures will be accompanied by brief descriptions and organized by what screens you will see first when scrolling through the screens from beginning to end.



**Start Up Screens-**The two screens above are the first two screens you will see when you first press the knob down to enter configuration mode. These screens will flash briefly, then continue to the next screen without any user intervention.



**Gauge Illumination-**Once you have seen the two start up screens, you will be taken to the first of the "Menu Option" screens, which is displayed above. At this point you can either turn the knob to scroll through the main "Menu Options" screens or press the knob down to select the option that is displayed. The first option to be displayed will be "GAUGE ILLUMINATION". This function is currently not utilized by the Gauge Controller and should be skipped over, however future versions of the Gauge Controller may use this function.



**Gauge Calibration-** If you turn the knob one click clockwise from the previously shown screen (Illumination), you will be taken to the Gauge Calibration screen. If you select this screen, by pressing the knob down while it is displayed, you will be taken to another menu that allows you to select what gauges you are going to be using. It then allows you to calibrate the gauge controller to run your selected aftermarket gauges.



**OBD2 Protocol-** The next screen you will see, while scrolling through the “Menu Option” screens, will be the OBD2 Protocol screen. If you select this screen, by pressing the knob down while this screen is displayed, you will be taken to a menu that allows you to select which OBD2 protocol the controller will be configured to communicate with. While there will be three protocol options displayed, when you go to select a protocol, only two of them will be utilized by the Gauge Controller at this time. The two protocols that are currently supported are **ISO 15765-4** and **J1850 VPW**. If you have further questions regarding what protocol you need to use please refer to the Pre-Programming section of this manual, page 20.



**Power Up Needle Swing-** This function is not utilized by the Gauge Controller in its current configuration.



**Firmware Upgrade and Test Mode-** These next two screens found under “Menu Options” will be the Firmware Upgrade and Test Mode screens. Firmware Upgrade allows Painless Performance to upgrade the software on the controller if any revisions are made to the software. Test Mode is used for testing the controller during manufacturing. These two screen are for internal use at Painless performance and will not be used by you, the consumer.



**Exit User Menu-** This is the final screen you will see under “Menu Options”. This screen will only be used when you have completed programing the Gauge Controller. Once you have completed

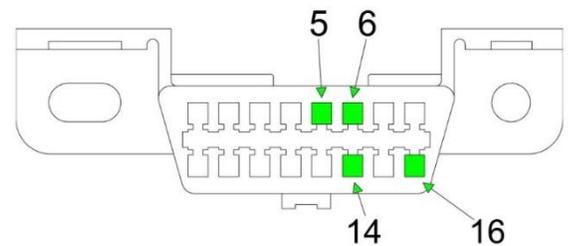
programming the Gauge Controller you will press the knob down, while the screen displays “EXIT USER MENU”. Once you have pressed the knob down the screen will display “Resetting System” then turn off. The gauges should then display the information coming from your ECU.

## Pre-Programming

Before beginning the programming of the Gauge Controller there are a few things which need to be determined. First which OBDII protocol does your powertrain utilize? The easiest way to determine which protocol your powertrain uses is to check the pin out of the OBDII port from the vehicle that the powertrain originally came from. Below you will find two pictures that show what pins should be populated for **ISO 15765-4** and **J1850 VPW**. It is important to note that some vehicles may have other pins populated for vehicle specific functions that are not utilized by our Gauge Controller.

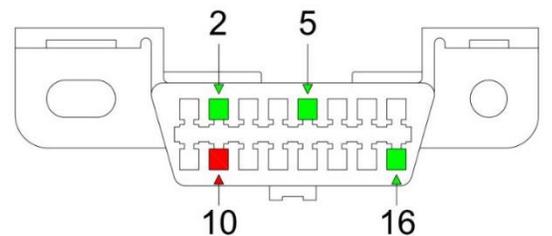
### ● ISO 15765-4 Pin Out:

To the right you will see a front view of the OBDII connector from a vehicle that uses the ISO 15765-4 protocol. If your donor vehicle uses the ISO 15765-4 protocol the OBDII connector should have pins 5, 6, 14 and 16 populated. As stated above it is possible you will have other pins populated, but the two pins that supply ISO 15765-4 data to the gauge controller are pins 6 and 14.



### ● J-1850 VPW Pin Out:

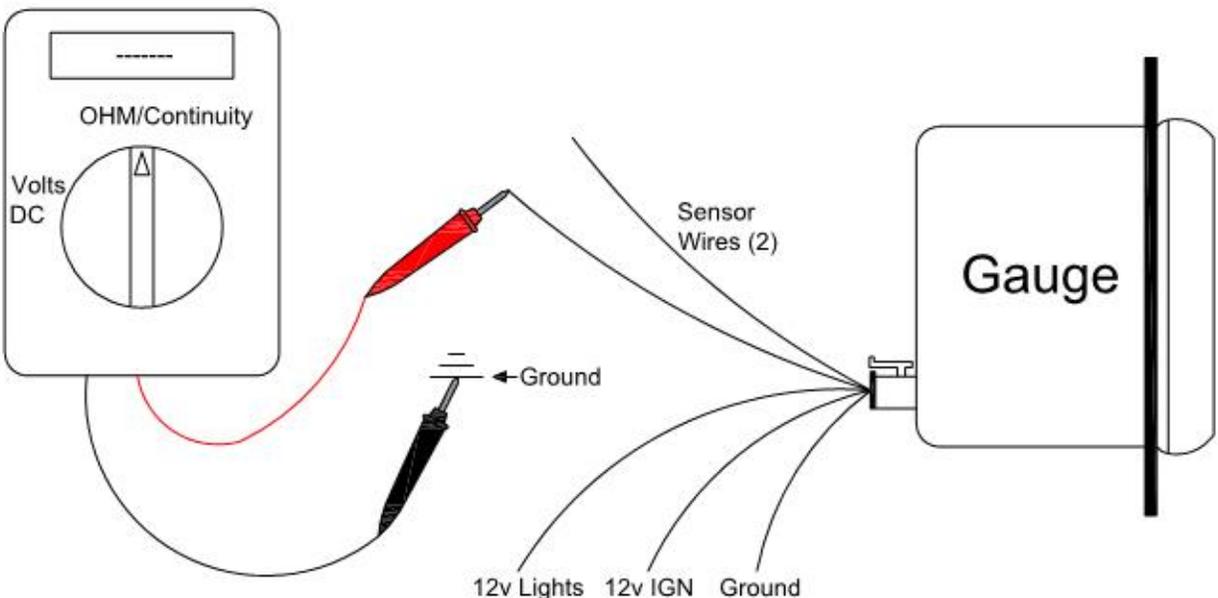
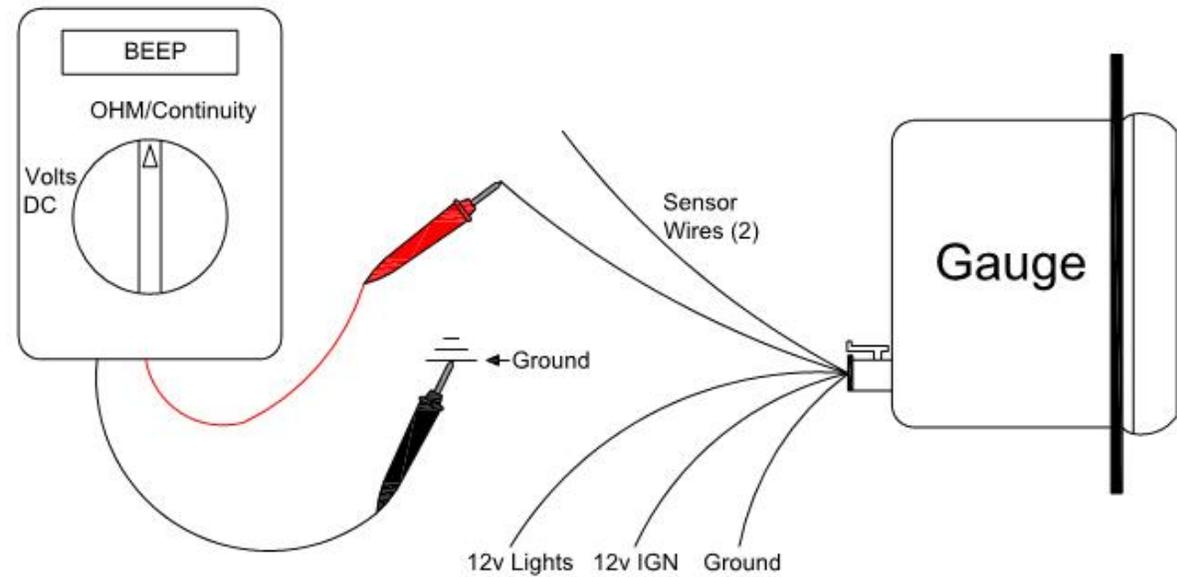
To the right you will see a front view of the OBDII connector from a vehicle that utilizes the J-1850 VPW protocol. If your donor vehicle uses the J-1850 VPW protocol the OBDII connector should have pins 2, 5, and 16 populated, **BUT NOT PIN 10**. As stated above it is possible that other pins are populated that won't be utilized, **however if pin 10 is populated, your donor vehicle does not utilize J-1850 VPW and is not compatible with our Gauge Controller at this time.**



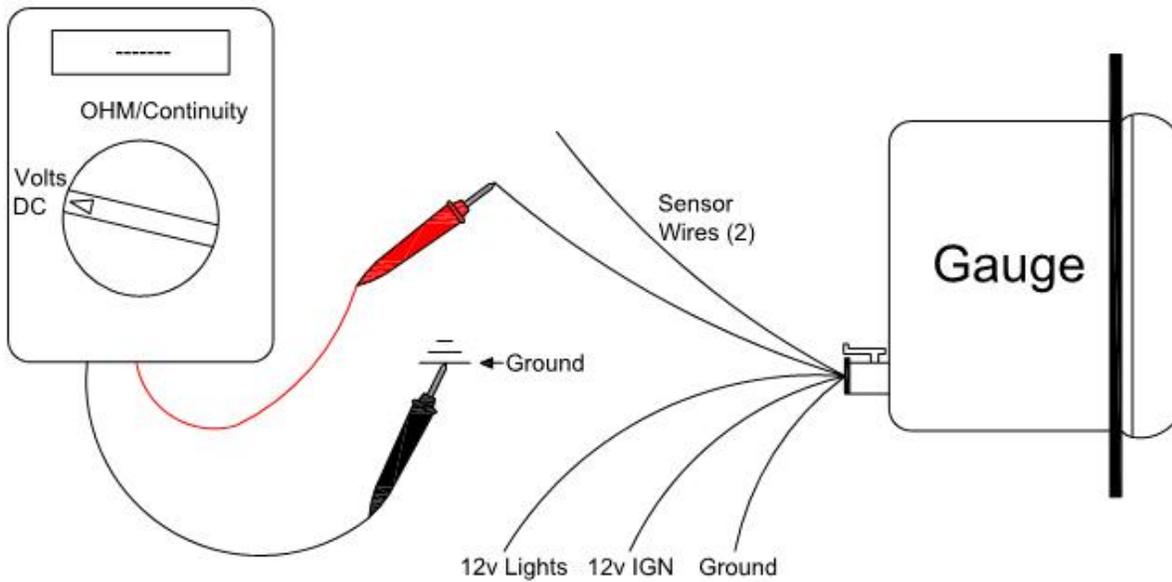
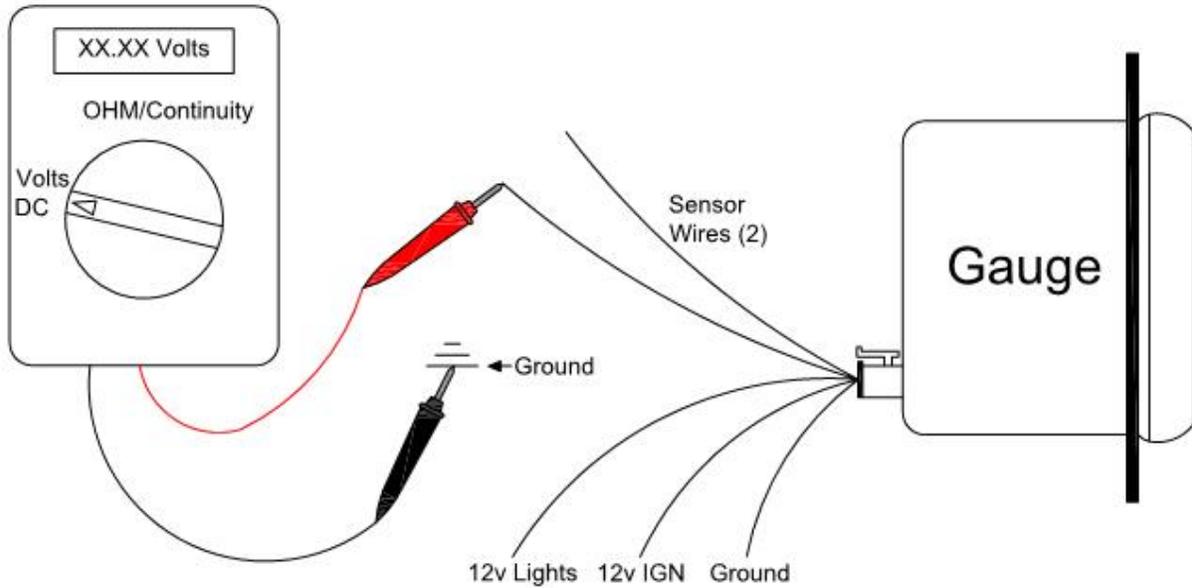
The next thing you will need to determine before you start programming the controller is what type of senders are your oil pressure and coolant temperature gauges designed to work with? The three types of senders/sensors that are commonly used are 1 wire, 2 wire and 3 wire sensors. If your gauge is designed for a **one wire sensor you will use “Sender Option: A”** when programming that gauge. If your gauge is designed for a **three wire sender you will use “Sender Option: B”** when programming that gauge, and connect the signal wire from the Gauge Controller to the voltage input terminal on the gauge. **Two wire senders can be configured as either “Sender Option: A” or “Sender Option: B” depending on the internal circuitry of the gauge.** The best way to determine which sender option should be used with a 2 wire sensor is to use a volt/ohm meter with the gauge powered up. With the gauge powered up, use the volt/ohm meter to determine if the sender terminals or leads on the gauge have either “supply voltage”, “ground” or “nothing”. If the two sender terminals

are “ground “ and “nothing”, the Gauge Controller will need to be set on “Sender Option: B”, with the signal wire from the Gauge Controller connected to the wire that reads “nothing”. If the two sender terminals are “supply voltage” and “ground”, the Gauge Controller will need to be set on “Sender Option: A” with the signal wire from the Gauge Controller connected to the wire that reads “supply voltage”

Below is two examples of how to test the sender/sensor wires for continuity to ground. The top example shows a sender/sensor wire that **does** have continuity to ground, while the lower picture shows a sender/sensor wire that **does not** have continuity to ground. Perform this test on both sender/sensor wires with the gauge powered up and make a notation of if the wires have continuity to ground or not.



Below is two examples of how to test the sender/sensor wires for supply voltage. The top example shows a sender/sensor wire that **does** have supply voltage present, while the lower picture shows a sender/sensor wire that **does not** have supply voltage present. Perform this test on both sender/sensor wires with the gauge powered up and make a notation of if the wires have supply voltage present or not.



You should now be able to determine if the two wires have either "supply voltage", "ground" or "nothing". If a wire reads does not have "ground" or "supply voltage" in either test then it has "nothing".

## Programing

1. Start by temporarily removing the Gauge Controller from its mounting position. It may be necessary to temporarily re-route the harness to the Gauge Controller to allow more slack for programing. Be sure that you can see the gauges head on while programing the Gauge Controller.
2. Next turn the ignition key to the “on” or “run” position. You will need to keep the key in this position for the entire time you are programing the Gauge Controller.



3. Press the knob on the Gauge Controller down. The Gauge Controller should now turn on and display the startup screen, then read “Menu Options GAUGE ILLUMINATION”. The Gauge Illumination feature is currently not supported, but will be in future versions.



4. Turn the knob clockwise until the screen reads “Menu Options OBD2 PROTOCOL” then press the knob down.



5. The screen should now display "Protocol Options 15765 CAN". Turn the knob clockwise until the correct protocol (as described in the Pre-Programming section on page 20) is shown on the screen. Now press the knob down to select the correct protocol.



6. The screen will now read "Save Calibration –YES-". If the correct protocol was selected, press the knob down again. If you accidentally selected the wrong protocol you can turn the knob clockwise one click and the screen will display "Save Calibration –NO-". You can then press the Knob down and the Controller will go back to the "Protocol Options" menu and you can start back at step number 5.



7. Once you press the knob at the end of step 6 the controller should display a screen that says "Saving" and take you back to the "Protocol Option" menu. Once you are back to the "Protocol Option" menu you can turn the knob clockwise until the screen reads "Protocol Options EXIT PROTOCOL". Now press the knob down and you will be taken back to the "Menu Options" screen. The OBDII protocol is now set in the Gauge Controller.



8. You can now begin the process of calibrating the gauges. From the "Menu Options" screen, turn the knob counter clockwise until "Menu Options GAUGE CALIBRATION" is displayed, then press the knob down.



9. The screen should now display "Calibration Options TACHOMETER". If a tachometer is being used you can press the knob down to begin calibrating the tachometer. If you are not using a tachometer you can proceed to step # 16 on page 26.



10. The screen should now display "Tach Cal 500 RPM". You should now turn the knob clockwise until the tachometer reads 500 rpm. If you go past 500 rpm you can turn the knob counter clockwise until you get back to 500 rpm.



11. Once the tachometer reads 500 rpm you can press the knob down. At this point the screen will still display "Tach Cal 500 RPM", however when you turn the knob clockwise the screen should scroll through 1000-10,000 rpm in 500 rpm increments. Turn the knob clockwise until "Tach Cal 1000 RPM" is displayed then press the knob down. You can now repeat step 10, but you will turn the knob clockwise until the tachometer displays 1000 rpm.
12. Once the tachometer reads 1000 rpm you can press the knob down. You can now repeat steps 9-11, increasing the rpm in increments of 500 rpm until you have reached the maximum RPM value the gauge displays. Make sure that when you perform step 10 again the tachometer displays the same RPM value shown on the screen of the Gauge Controller before pressing the knob down. **It is important to note that some tachometers will not be marked every 500 rpm. If this is the case you can set the gauge in whatever increments that are clearly displayed on the tachometer until the maximum RPM value is reached.**



13. Once you have completed step 12, you can turn the knob clockwise until "Tach Cal EXIT CALIBRATION" is displayed, then press the knob down.



14. The screen should now read "Save Calibration –YES-". If you have completed steps 9-12 correctly you can push down on the knob and continue to the next step. If you accidentally saved an incorrect data point while calibrating the tachometer you can now turn the knob one click, until the screen reads "Save Calibration –NO-", then press the knob down and repeat steps 9-12 correctly.



15. The module will now display a "saving" screen. Once the saving process is 100% complete you will be taken back to a screen that reads "Calibration Options TACHOMETER"



16. You can now begin calibrating your speedometer. Turn the knob clock wise until the screen displays "Calibration Options SPEEDOMETER", then press the knob down.



17. At this point the screen should display “Speedometer Cal 10 MPH”. You will now turn the knob clockwise until the speedometer reads 10mph. If you accidentally go past 10mph on your speedometer you can always turn the knob counter clockwise to go back to 10mph. Once the speedometer displays 10mph you will press the knob down.



18. The screen should still be displaying “Speedometer Cal 10 MPH” at this point, but when you turn the knob the screen should scroll between 20mph and 200mph in 10mph increments. Once the screen displays “Speedometer Cal 20 MPH” you will press the knob down. You can then repeat step 17, but making sure the speedometer displays 20mph before you press the knob down.

19. At this point you will repeat steps 17-18 in 10mph increments until you have reached the maximum value displayed on the gauge. Remember to always verify the gauge is displaying the same speed that the Gauge Controller is showing before you press the knob down and proceed to the next 10mph increment.



20. Once you have pressed to knob down, to set the maximum speed your speedometer can display, you will turn the knob clockwise until the screen reads “Speedometer Cal EXIT CALIBRATION”. You can then press the knob down and the screen will display “Save Calibration –YES-“. If you have set all the calibration points correctly you can now press the knob down and the screen should display a “Saving” screen, then take you back to a screen that reads “Calibration Options SPEEDOMETER”. If you accidentally set a calibration point wrong you can turn the knob one click clockwise while the screen still displays “Save Calibration –YES-“. The screen will then show “Save Calibration –NO-“ and you will press the knob down, then start back at step 16.



21. After the “Saving” screen is displayed you can begin calibrating your coolant temperature gauge. The screen, at this point, should still display “Calibration Options SPEEDOMETER”. Turn the knob one click clockwise and the screen should then display “Calibration Options COOLANT TEMP”. Once this is displayed on the screen you will press the knob down and begin calibrating the coolant temperature gauge. If you are not using a coolant temperature gauge you can proceed to step # 29.



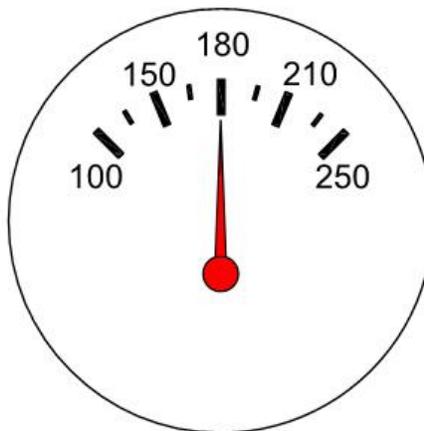
22. The screen will now display “Sender Option → A”, and if you turn the knob one click clockwise the screen will display “Sender Option → B”. Use the guide lines describe in the Pre-Programming section of this manual, on page 20, to determine which sender option is correct for the gauge you are about to program. Once the correct sender option is displayed you can press the knob down and proceed to the next step.

**WARNING: If you choose the incorrect sender type you will permanently damage your gauge.**

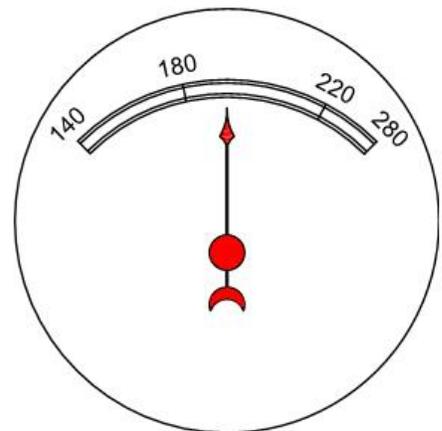
23. At this point it is a good idea to determine what temperatures you can accurately set on your gauge. Bellow you will see several examples of temperature gauges and a list of recommended set points for these particular gauges. These are generic examples that are intended to give you an idea of what temperature points you should use for your particular gauge.



Set Points for Calibration:  
100, 120, 140, 160, 180,  
200, 220, 240, 260



Set Points for Calibration:  
100, 150, 180, 210, 250



Set Points for Calibration:  
140, 180, 220, 280



24. The display on the Gauge Controller should now read “Coolant Temp 0 Deg F”. Turn the knob clockwise until the display shows the first temperature you would like to set. If you look at the example shown on the previous, the first set points, from left to right, would be 100, 100 and 140 degrees respectively. Once the correct temperature is displayed on the Gauge Controller screen you will push the knob down.
25. You can now turn the knob clockwise until the indicator on the coolant temperature gauge points to the first temperature set point. If you accidentally go past the first set point you can always turn the knob counter clockwise until the correct temperature is displayed. Once the correct temperature is displayed on the temperature gauge you will press the knob down to save that calibration point.
26. Now turn the knob clockwise until the next temperature set point is displayed on the Gauge Controller, then press the knob down. You can now turn the knob clockwise until the gauge reads the corresponding temperature, then press the knob down once again.



27. Repeat step 26 until you have reached the maximum value displayed on your temperature gauge. Now turn the knob clockwise until the Gauge Controller reads “Coolant Temp EXIT CALIBRATION”, then press the knob down.



28. The screen will now read “Save Calibration –YES–”. If you have completed steps 24-27 correctly, you can press the knob down and continue to the next step after the “Saving” screen is displayed. If you accidentally set a calibration point wrong you can turn the knob one click clockwise while the screen still displays “Save Calibration –YES–”. The screen will then display “Save Calibration –NO–”. Press the knob down, then start back at step 21.



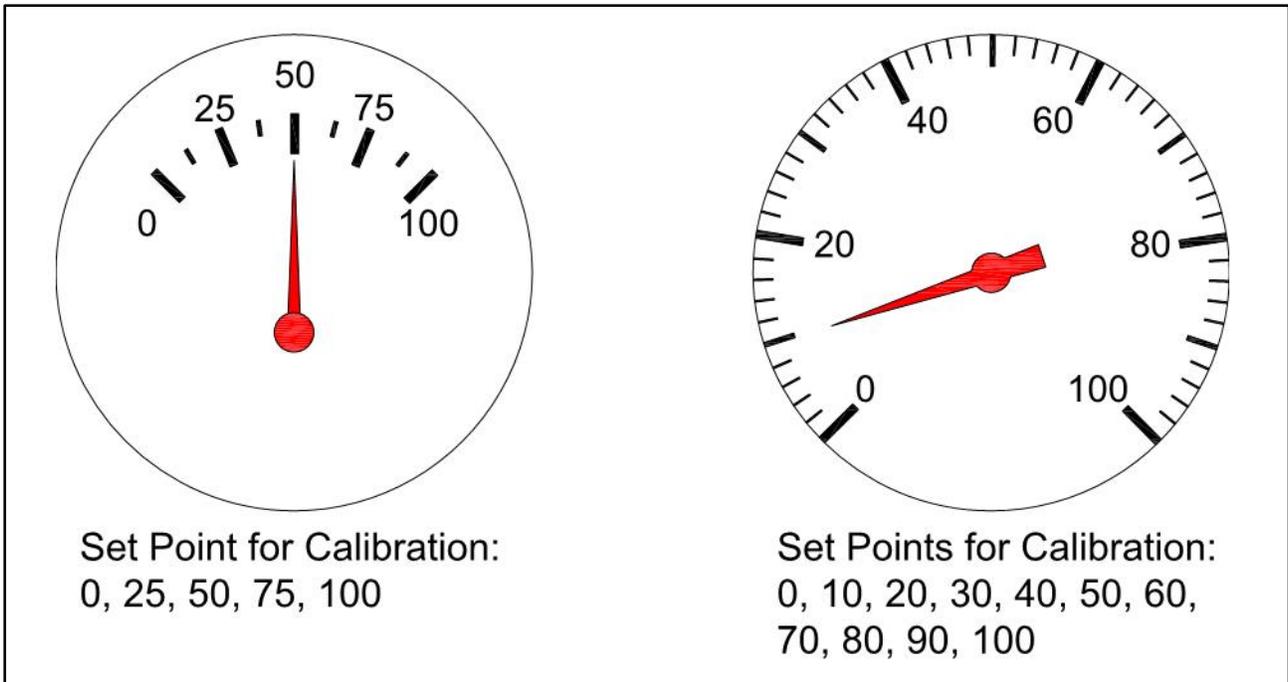
29. The screen will now display “Calibrations Options COOLANT TEMP”. Turn the knob one click clockwise and the display should now read “Calibration Options OIL PRESSURE”. You can now press the knob down and begin calibrating the oil pressure gauge. **Before calibrating the oil pressure gauge it is important to remember that some ECU's will not supply the gauge controller with a signal for the oil pressure gauge. This is discussed further in the Introduction section of this manual on page 5, if you have any questions regarding oil pressure compatibility.** If you are not using an oil pressure gauge you can proceed to step 37.



30. The screen will now display “Sender Option → A”, and if you turn the knob one click clockwise the screen will display “Sender Option → B”. Use the guide lines describe in the Pre-Programing section of this manual, page 20, to determine which sender option is correct for the gauge you are about to program. Once the correct sender option is displayed you can press the knob down and proceed to the next step.

**WARNING: If you choose the incorrect sender type you will permanently damage your gauge.**

31. At this point it is a good idea to determine what pressure readings you can accurately set on your gauge. Bellow you will see several examples of oil pressure gauges and a list of recommended set points for these particular gauges. These are generic examples that are intended to give you an idea of what pressure readings you should use for your particular gauge.





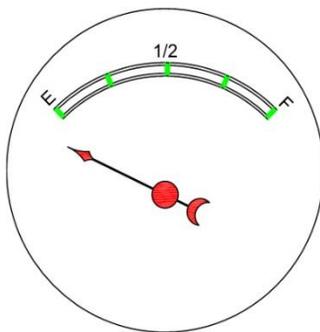
32. The display on the Gauge Controller should now read “Oil Pressure 0 PSI”. If your Gauge displays 0 psi you will press the knob down now. If your gauge does not start at 0 psi you will turn the knob clock wise until the gauge controller shows the first increment displayed on the oil pressure gauge, then press the knob down.
33. You can now turn the knob clockwise until the indicator on the gauge points to the first pressure set point. If you accidentally go past the first set point you can always turn the knob counter clockwise until the correct pressure is displayed. Once the correct pressure is displayed on the oil pressure gauge you will press the knob down to save that calibration point.
34. Now turn the knob clock wise until the next pressure set point is displayed on the Gauge Controller, then press the knob down. You can now turn the knob clockwise until the gauge reads the corresponding pressure, then press the knob down once again.



35. Repeat step 34 until you have reached the maximum value displayed on your oil pressure gauge. Now turn the knob clockwise until the Gauge Controller reads “Oil Pressure EXIT CALIBRATION”, then press the knob down.



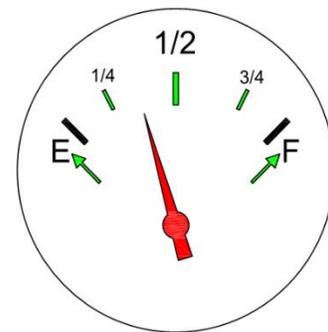
36. The screen will now read “Save Calibration –YES-“. If you have completed steps 32-35 correctly, you can press the knob down and continue to the next step after the “Saving” screen is displayed. If you accidentally set a calibration point wrong you can turn the knob one click clockwise while the screen still displays “Save Calibration –YES-“. The screen will then display “Save Calibration –NO-“. Press the knob down, then start back at step 29.



Set Points are marked in Green



Set Points are marked in Green



Set Points are marked in Green

37. At this point the display on the Gauge Controller should read “Calibration Options OIL PRESSURE”. You can now turn the knob one click clockwise, and the screen will display “Calibration Options FUEL LEVEL”, then press down on the knob if you are using the Gauge Controller to run your fuel level gauge. **If you will be using the Gauge Controller to run your fuel level gauge it is important that you read the “Introduction” (page 5) and “Special Instructions for Fuel Gauge” (page 11) sections of this installation manual before proceeding.** If you are not going to use the Gauge Controller to run your fuel level gauge you can proceed to step 42 on page 37.



38. The Gauge Controller will now display “Fuel Tank Level EMPTY”. Press down on the knob to begin setting the empty level on your fuel gauge by turning the knob clockwise until the needle on the gauge reaches the empty level, then press the knob down. On the previous page you will find a picture that shows three generic fuel gauges and what set points should be used for each gauge. If you notice the gauge on the right shows the set points being slightly lower than the actual line near the empty and full marks. This is because this particular example is not broken into exact  $\frac{1}{4}$  increments. If you compare the distance between the  $\frac{1}{4}$  and  $\frac{1}{2}$  tank marks and the distance between the empty and  $\frac{1}{4}$  tank marks you will notice the distance between the  $\frac{1}{4}$  and  $\frac{1}{2}$  tank marks is larger. It is ideal to have the distance between the set points as consistent as possible.



39. You can now turn the knob one click clockwise and the Gauge Controller will display “Fuel Tank Level  $\frac{1}{4}$ ”. Press the knob down, then turn it clockwise until the fuel level gauge reads  $\frac{1}{4}$  tank. Remember if you go past the  $\frac{1}{4}$  tank mark you can always turn the knob counter clockwise to go back to the mark. Once the fuel level gauge reads  $\frac{1}{4}$  tank you can press to knob down.
40. Repeat step 39 for  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and Full tank. Once you have set the Full tank point you can turn the knob one click clockwise and the screen should read “Fuel Tank Level EXIT CALIBRATION”, then press the knob down.



41. The screen will now read “Save Calibration –YES–”. If you have completed steps 38-40 correctly, you can press the knob down and continue to the next step after the “Saving” screen is displayed. If you accidentally set a calibration point wrong you can turn the knob one click clockwise while the screen still displays “Save Calibration –YES–”. The screen will then display “Save Calibration –NO–”. Press the knob down, then start back at step 37.



42. You can now turn the knob two clicks clockwise and the screen should read “Calibration Options EXIT CALIBRATION” (skipping over the screen that reads “Calibration Options ENGINE OIL TEMP” because this function is currently not supported). Once this is displayed on the screen you press the knob down, and you will be taken back to the screen that says “Menu Options GAUGE CALIBRATION”



43. From here you will turn the knob clockwise until the screen reads “Menu Options EXIT USER MENU”, then press the knob down. A screen that reads “Resetting System” will be displayed briefly, then the screen will go blank.

At this point the Gauge Controller has been programmed for you gauges. You can now start the vehicle and check that the gauges are functioning correctly. Once you have verified the gauges are reading correctly you can re-install the Gauge Controller module in its permanent mounting location you removed it from in step 1.

## **Painless Performance Products, LLC** **Limited Warranty and Return Policy**

Chassis harnesses, fuel injection harnesses, and Trail Rocker units are covered under a lifetime warranty.

All other products manufactured and/or sold by Painless Performance are warranted to the original purchaser to be free from defects in material and workmanship under normal use. Painless Performance will repair or replace defective products without charge during the first 12 months from the purchase date. No products will be considered for warranty without a copy of the purchase receipt showing the sellers name, address, and date of purchase. You must return the product to the dealer you purchased it from to initiate warranty procedures

