

3-3/8" PROGRAMMABLE SPEEDO/TACH INSTALLATION INSTRUCTIONS



GENERAL INFORMATION

BACKLIGHT: Multi-Color LED

OPERATING VOLTAGE: 9-32 VDC

INPUT: Ignition (coil or electronic module), Magnetic Sensor, Pulse Generator, Hall Effect Sensor, Alternator AC Tap, or SAE J1939 CANbus



ENVIRONMENTAL PROTECTION: Sealed to IP67




TRANSIENT PROTECTION: +100V, -400V

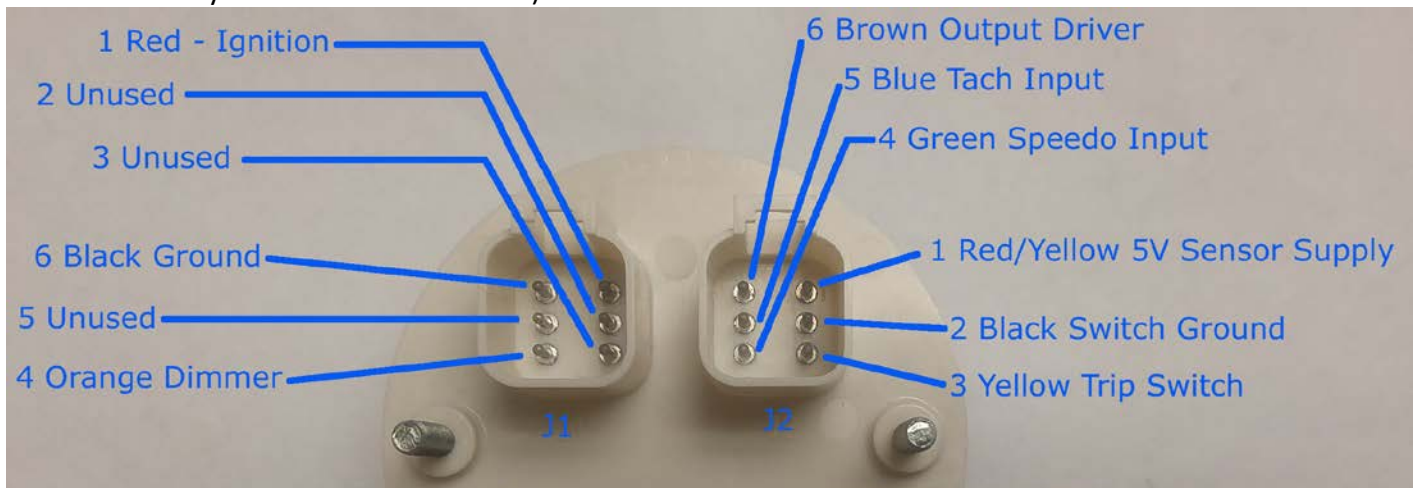
REVERSE VOLTAGE: Protected

CALIBRATION: Speedo - 1 Pulse Per Mile (PPM) to 327675 PPM. Tach- 1 Pulse Per Revolution to 255 PPR

INSTALLATION

-  **Disconnect batteries.** Do not reconnect battery power until wiring is fully completed to avoid risk of shock or fire.
-  **Connect wiring harness to the vehicle as listed below (pin number followed by wire color and function):**

| ICON KEY | |
|---|-----------------------|
|  | CAUTION |
|  | Tools may be required |
|  | Shown in picture |



Connector J1 (on left when viewing the back of the gauge):

Pin 1 – Red: Gauge Power; connect to a circuit that switches on with the key switch. If the circuit does not have a fuse or the existing fuse is higher than 3 amps, use a 3 amp inline fuse.

Pin 2 – Not Used: Green wire for CAN Lo when used with CANbus SAE J1939 input

Pin 3 – Not Used: Yellow wire for CAN Hi when used with CANbus SAE J1939 input

Pin 4 – Orange: Dimmer; connect to the factory dimmer circuit either by tapping into the in-cab fuse block or by connecting directly to the wire running from the dimmer on the headlight switch. Not used if programmed to follow J1939 dimmer commands.

Pin 5 – Not Used: Gray wire for CAN Shield when used with CANbus SAE J1939 input

Pin 6 – Black: Ground; connect to a clean ground, such as a factory ground bolt.

Connector J2 (on right when viewing the back of the gauge):

Pin 1 – Red/Yellow: 5V output, used if a speed sensor (e.g., Hall Effect sensor) requires a 5V source.

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Pin 2 – Black: Trip Switch Ground, connected to Trip/Mode switch.


Pin 3 – Yellow: Trip Switch Signal, connected to Trip/Mode switch.

Pin 4 – Green: Speedometer input (see input list above); connect to the output of the speed sensor.

Pin 5 – Blue: Tachometer input (see input list above); connect to the output of the engine speed sensor or ignition.

 **CARE SHOULD BE TAKEN WHEN ROUTING THESE WIRES FROM THE ENGINE COMPARTMENT TO THE INTERIOR. SECURE THE WIRES SUCH THAT THEY DO NOT INTERFERE WITH MOVING PARTS AND USE A GROMMET WHEN PASSING THROUGH THE FIREWALL OR ANY SHARP EDGES.**

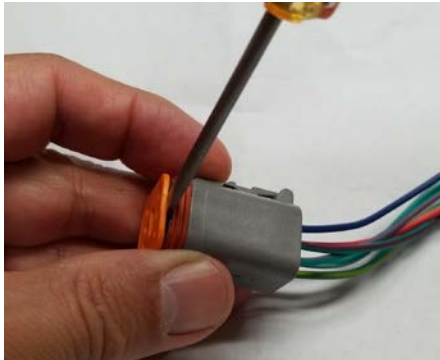
Pin 6 – Brown: Programmable Output Driver. Connect to ground side of relay coil, with the other side of coil connected to a battery + circuit fused for no more than 1 amp, activated at a programmed level of vehicle or engine speed. Examples include overspeed warning buzzers or shift solenoids.

3  Optional: Install the trip switch into a dash panel.

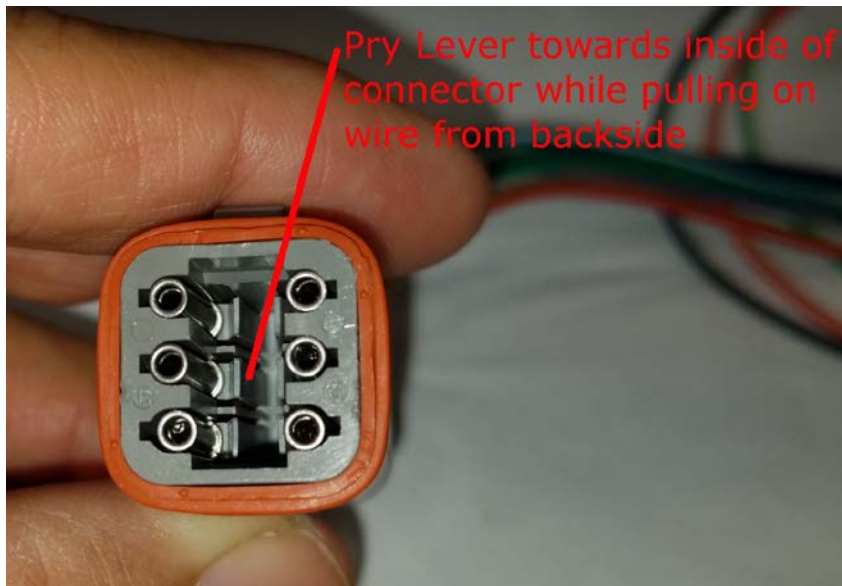
1. Drill a 15/32" mounting hole in the panel

2. Remove switch wires from J2 connector:

a. Use a small screwdriver to pry the orange Wedge-lock from the connector:



b. Use the screwdriver to pry the retaining levers inward as you pull each switch wire from the rear:



c. Pull the wires through the switch mounting hole, pass the washer and nut over the wires and tighten the switch, then secure the wires as they route back to the gauge.

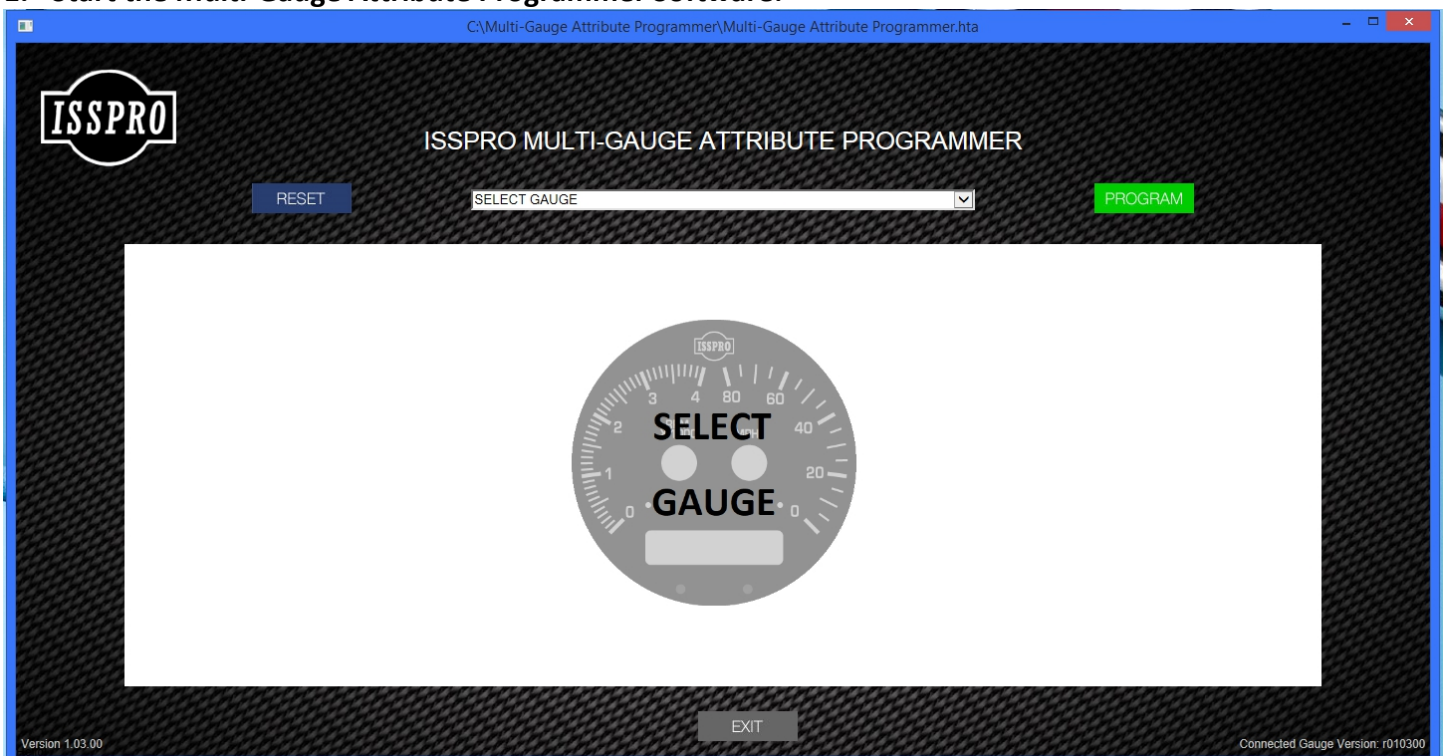
- d. Insert the wire terminals back into their respective holes in the J2 connector, pushing until they seat fully, then making sure the terminal is flush with the open end.
- e. Push the orange Wedge-lock back into place, then plug connector J2 back into the gauge.



PROGRAMMING

Using the Attribute Programming software and cable, the user can program a number of items including the dial and pointer color, speed light activation level, backlight curve, and pulse calibration. A limited set of adjustments can be made using the on-board menu with the Trip Switch, as detailed starting in section 7.

1. Start the Multi-Gauge Attribute Programmer Software:

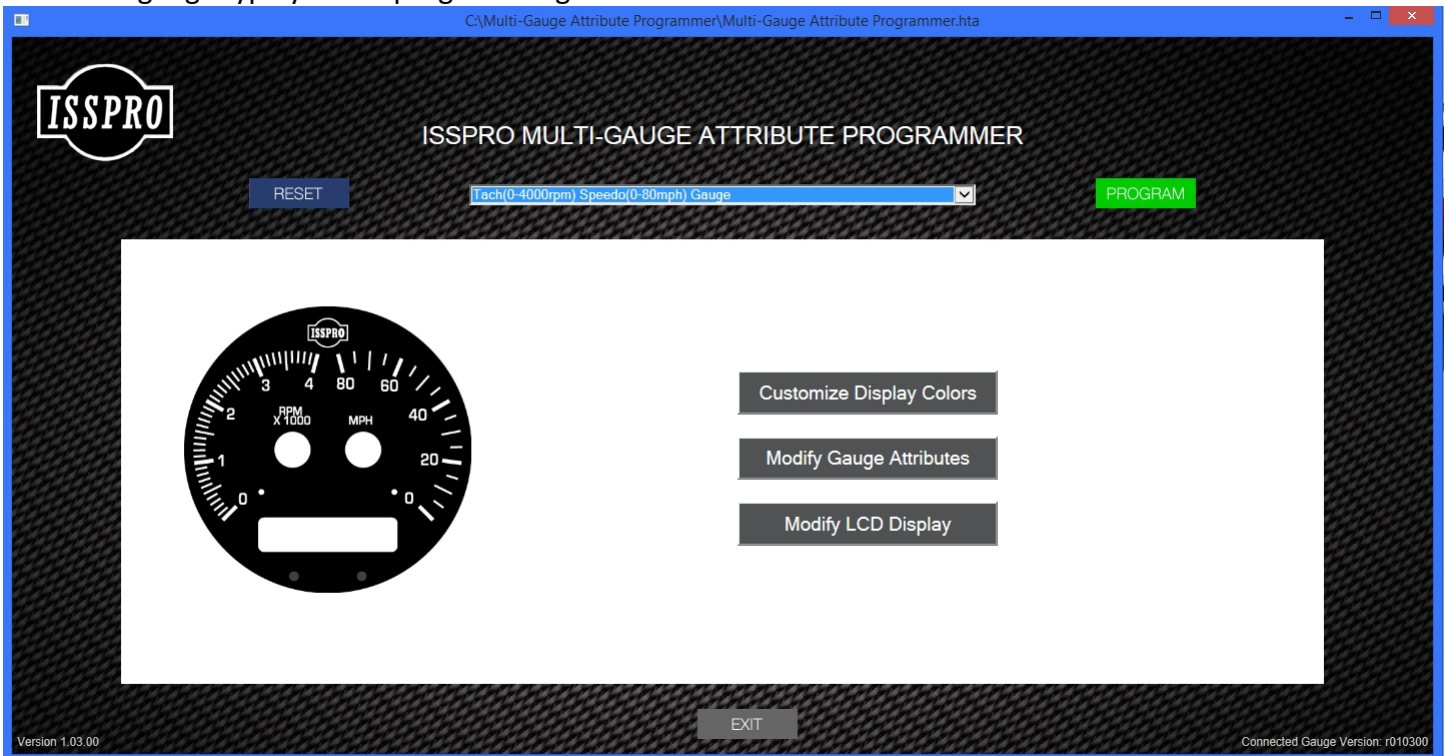


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2. Select the gauge type you are working with:



If you are programming from a saved text file, select that option then browse to the file location, otherwise select the gauge type you are programming.

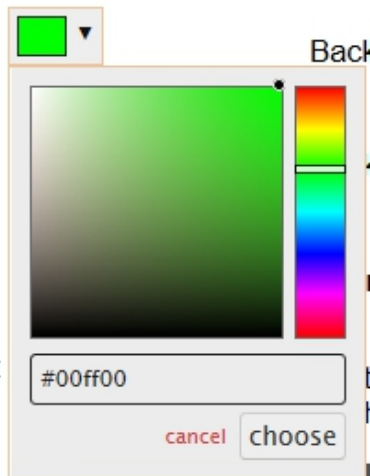


3. Select “Customize Display Colors” to change the following items:



a. Choose a color for Tachometer :

Selecting this drop-down menu allows choosing a color for the backlighting in the tachometer section. This can be done by clicking in the color band on the right, then “fine-tuning” the color by clicking in the large colored square. The color may also be specified using the RGB values in Hexadecimal format (e.g., #00ff00 for pure green), by typing in the value in the text box.



b. **Choose a color for Speedometer:** Same color selection menu as Tachometer above

c. **Choose a color for the pointers:** Same color selection menu as Tachometer above

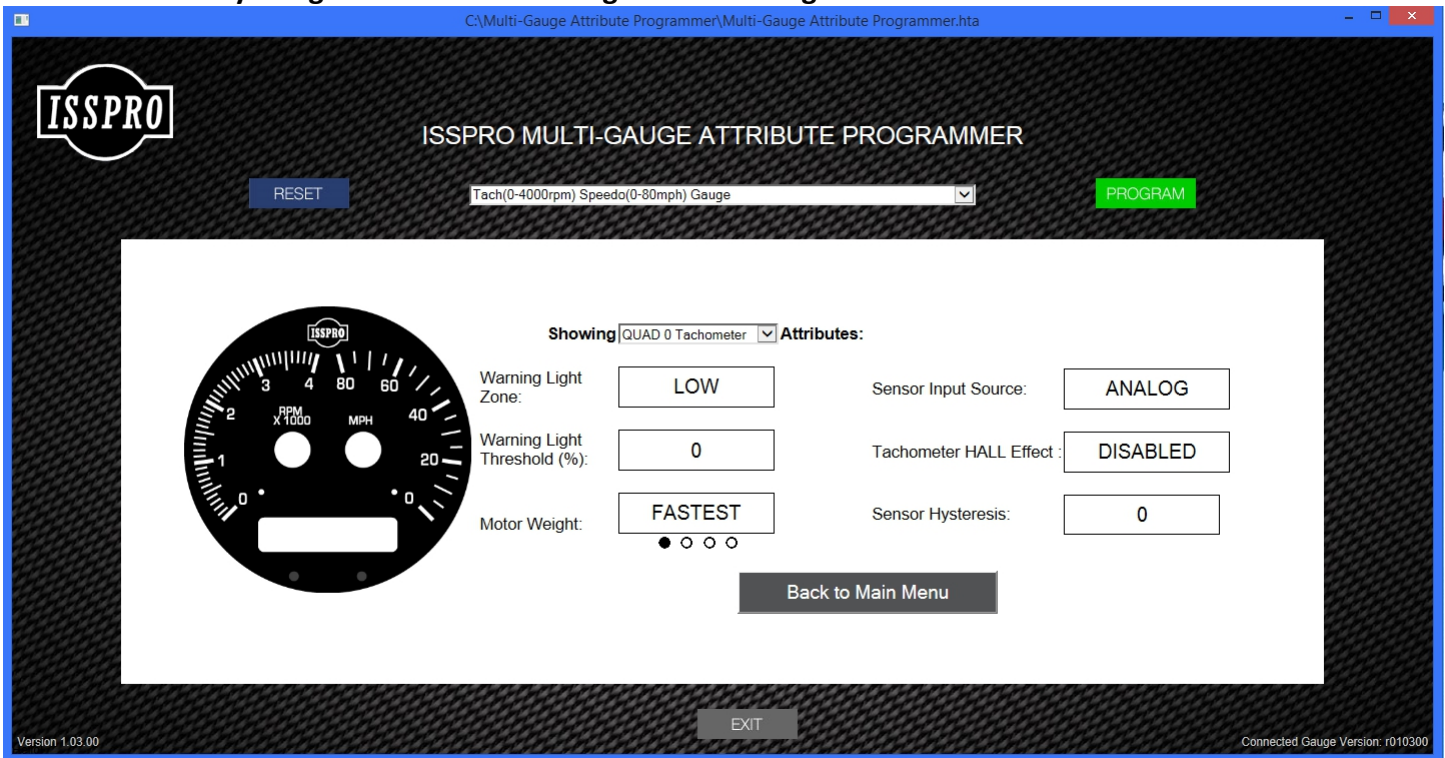
d. **Pointer/LCD Max Brightness:** From 0 to 100 Percent, this sets the level of brightness of the Pointers and LCD when maximum output is requested

e. **Dimmer Input Source:** Select between “J1939” for basing the dimmer on an incoming CANbus message or “ANALOG” for basing the dimmer on the voltage at the dimmer wire input.

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- f. **Backlight Max (V):** If the gauges are too bright with the dimmer adjusted at maximum then set the Backlight Max value **higher** than its default value.
- g. **Backlight Min (V):** Set the Backlight Min to match the voltage of the dimmer circuit when the factory dash turns off or is at a minimum.
- h. **Warning Light Flash:** Set to “Enabled” to cause the backlight of the gauge to flash while the warning light is on.
- i. **Daytime Pointer/LCD Brightness :** From 0 to 100 Percent, this sets the level of brightness of the Pointers and LCD when the lights are turned off or the dimmer input is at a minimum value.

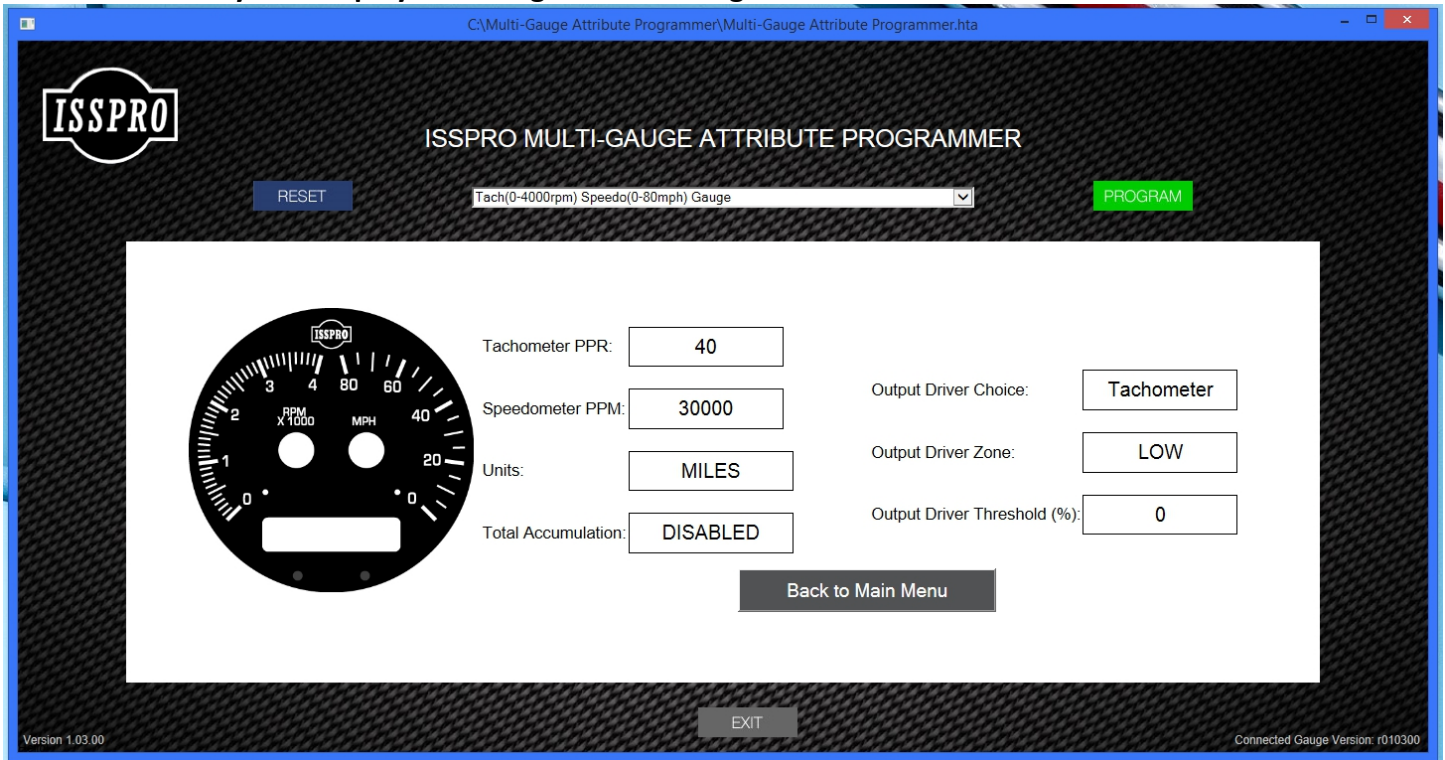
4. Select “Modify Gauge Attributes” to change the following items:



- a. **Quadrant Selector :**
This drop-down menu allows choosing between the gauge sections (Tachometer or Speedometer) for setting the following items:
- b. **Warning Light Zone:** Select HIGH to have the warning light turn on above the Warning Light Threshold, or LOW to have it turn on below the threshold.
- c. **Warning Light Threshold:** The level (in percentage of full scale) at which the warning light turns on. For example, if the tachometer is 4000 RPM and the threshold is at 50, the warning light will switch on or off at 2000 RPM.
- d. **Motor Weight:** An adjustment of software filtering of pointer movement, between “FASTEST”, “FAST”, “SLOW” & “SLOWEST”. Faster settings cause the pointer to respond quicker and slower settings will cause the pointer movement to be smoother.
- e. **Sensor Input Source:** Select between “J1939” for basing the sensor value for the gauge selected in “a” above on an incoming SAE J1939 CANbus message or “ANALOG” for basing the sensor input on the measured value at the analog wire input.
- f. **Tachometer (or Speedometer) HALL Effect:** “ENABLED” or “DISABLED”, this selects the circuitry for using Hall Effect sensors on this gauge input.

- g. **Sensor Hysteresis:** A setting (from 0 to 3) which defines how much the sensor output must change before the gauge pointer moves. With a lower number the gauge will show small movements including small oscillations. With a higher number the gauge will stay steady with small oscillations but the pointer will move farther in each step.

5. Select “Modify LCD Display” to change the following items:



- a. **Tachometer PPR:** Pulses Per Revolution for the input signal to the tachometer, adjustable from 1 to 255.
- b. **Speedometer PPM:** Pulses Per Mile for the input signal to the tachometer, adjustable from 1 to 327675.
- c. **Units :** Toggle between “MILES” & “KILOMETERS” for the odometer display.
- d. **Total Accumulation:** Requires dealer password, allows revising of odometer and hour meter accumulation totals. If revising both, they must be completed in separate programming actions (i.e., change one then jump to the “PROGRAM” step below, then come back to this step and repeat for the other accumulation total).
- e. **Output Driver Choice :** Toggle between Tachometer and Speedometer, to determine which value controls the Programmable Output Driver.
- f. **Output Driver Light Zone:** Select HIGH to have the output driver turn on above the Output Driver Threshold, or LOW to have it turn on below the threshold.
- g. **Output Driver Threshold:** The level (in percentage of full scale) at which the output driver turns on. For example, if the Tachometer is a 6000 RPM max and the threshold is set at 50, the output driver will switch on or off at 3000 RPM.

6. Press the “PROGRAM” button after all changes have been made:

- a. The programming of the gauge will proceed. After it is completed (as shown on the progress screen on the PC), the gauge should re-start (pointers move to pointer stops, backlights turn off and LCD

resets). If the re-start does not happen, unplug the connector from the gauge, plug it back in, then press the "PROGRAM" button again.

- b. **File save:** After programming you will be prompted "Would you like to save the current gauge's attribute settings in a text file?" to optionally save the gauge configuration for later re-use. Standard Windows browsing and file naming rules apply.

7. On-Board Menu: May be used to set backlight curves, warning levels, backlight and pointer colors by preset styles, Pulses Per Rev (PPR), Pulses Per Mile/Kilometer (PPM/PPK), speedometer & tachometer input type, and to view and clear peak RPM value.

a. **Entering and navigating the menu:**

- i. Depress and hold the trip switch while turning on power to the unit. While still holding the switch it will display the software version (e.g., r010000) on the LCD.
- ii. After releasing the switch it will display the 1st menu item (dimmer).
- iii. A short press (less than 3 seconds) will jump to the next menu section (see menu listing below) or increment a displayed value
- iv. A medium press (between 3 and 8 seconds) will cause the left warning light to illuminate and will enter the currently displayed menu section or jump to the next digit of a multi-digit stored value (such as Pulses Per Mile)
- v. A long press (over 8 seconds) will illuminate the left then the right warning light, save the current value being entered and either move to the next setting (in the case of grouped settings such as high and low dimmer voltage) or exit the menu (displaying "StOred" momentarily before resuming normal operation).
- vi. If power is turned off before the final "save and exit" is performed, the settings will revert to the values last saved.
- vii. The numeric LCD display limits how some letters can be displayed, as a result words such as "Dimmer" will appear as "dinnEr".

The following sections are in the menu:

- b. **Dimmer** (shown on LCD as "dinnEr"). Selection for setting the voltages at which the maximum and minimum backlight output occur. For a lower light output across the adjustment range, set the maximum voltage to a higher value. Lower voltage should be set to the level at which the factory dash lights either turn off or are at their minimum output. Perform a medium switch press to enter.
 - i. **High Dimmer Voltage** (shown on LCD as "Hi" followed by the current value in 0.1 volt increments). Perform a short switch press to increment each digit starting with the far right, then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and move to the Low Dimmer Voltage.
 - ii. **Low Dimmer Voltage** (shown on LCD as "Lo" followed by the current value in 0.1 volt increments). Perform a short switch press to increment each digit starting with the far right, then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and exit the menu.
- c. **Warning Light 1** (shown on LCD as "UUarn 1"). This allows setting a warning light level for gauge side #1 (left side), such as a shift light which illuminates if the engine speed is above the set value. Perform a medium switch press to enter.
 - i. **Warning Value** is now shown as a 3-digit number, to be entered as a percentage of the full scale value. Perform a short switch press to increment each digit starting with the far right,

- then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and move to the Zone entry.
- ii. **Zone** is shown as either “Hi” or “Lo”. If “Hi” it turns on the warning light when the value is above the Warning Value, and if “Lo” it turns on the warning light when the value is below the Warning Value. Perform a short switch press to toggle between “Hi” and “Lo”, then perform a long switch press to save and exit the menu.
- d. **Warning Light 2** (shown on LCD as “UUarn 2”). This allows setting a warning light level for gauge side #2 (right side), such as a warning light which illuminates if the vehicle speed is above the set value. Perform a medium switch press to enter.
 - i. **Warning Value** is now shown as a 3-digit number, to be entered as a percentage of the full scale value. Perform a short switch press to increment each digit starting with the far right, then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and move to the Zone entry.
 - ii. **Zone** is shown as either “Hi” or “Lo”. If “Hi” it turns on the warning light when the value is above the Warning Value, and if “Lo” it turns on the warning light when the value is below the Warning Value. Perform a short switch press to toggle between “Hi” and “Lo”, then perform a long switch press to save and exit the menu.
 - e. **Preset Styles** (shown on LCD as “PrESEtS”). This allows selecting between several preset styles (combinations of backlight and pointer colors). Perform a medium switch press to enter, then perform short switch presses to cycle through the preset styles. When the desired style is displayed perform a long switch press to save and exit the menu.
 - f. **Pulses Per Revolution** (shown on LCD as “PPr”). This allows setting the number of pulses per revolution being input by the engine speed sensor. Perform a medium switch press to enter.
 - i. **PPR Value** is now shown as a 3-digit number. Perform a short switch press to increment each digit starting with the far right, then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and exit the menu. Example PPR values: Most gasoline engines will output a signal of 0.5 x number of cylinders (e.g., 4 PPR for an 8 cylinder engine). Electronic diesel engines will typically use a tonewheel on either the crankshaft or camshaft, and larger/industrial diesel engines will typically use a sensor on the flywheel teeth (PPR = number of flywheel teeth).
 - g. **Pulses Per Mile** (shown on LCD as “PPnn”). This allows setting the number of pulses per mile being input by the vehicle speed sensor. Perform a medium switch press to enter.
 - i. **PPM Value** is now shown as a 6-digit number. Perform a short switch press to increment each digit starting with the far right, then perform a medium switch press to save that digit and move one digit to the left. Once the value has been entered, perform a long switch press to save and exit the menu. If actual PPM is unknown, set it to 30000 then drive the vehicle while comparing indicated speed to actual speed (either by GPS, smart phone or timed intervals between mileposts), then enter a new PPM value from the following formula: $\text{New PPM} = \text{Old PPM} \times (\text{Displayed Speed} / \text{Actual Speed})$.
 - h. **Hall Effect** (shown on LCD as “Hall”). This configures the gauge’s input circuitry to work with a Hall Effect sensor. Hall Effect sensors are typically 3-wire sensors, while conventional inductive sensors are typically 2-wire. Select “Off” for the given input if a non-Hall Effect sensor is being used. Perform a medium switch press to enter.

- i. **Tachometer Hall Effect input status** is now shown on the LCD as “taC OFF” or “taC On”.
Perform a short switch press to toggle between the two choices, then perform a long switch press to save and move to the Speedometer entry.
- ii. **Speedometer Hall Effect input status** is now shown on the LCD as “SPd OFF” or “SPd On”.
Perform a short switch press to toggle between the two choices, then perform a long switch press to save and exit the menu.
- i. **Peak RPM display & reset** (shown on LCD as “rPnn”). Perform a medium switch press to enter. LCD will initially display “OFF”, perform a short switch press to toggle to “On”, at which time the pointer will move to the highest stored RPM since the last reset. To reset the stored value, perform a medium switch press. To exit the menu, perform a long switch press.