

PERFECT

TORC Transmission Control

Installation Instructions



PERFECT TORC
GM 4L60/65E and 4L80/85E
Part #66501

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If you have any questions concerning the installation of this product or having trouble in general, feel free to call Painless Performance Product's tech line at 1-800-423-9696. Calls are answered from 8am to 5pm central time, Monday thru Friday, except holidays.

We have attempted to provide you with as accurate instructions as possible, and are always concerned about corrections or improvements that can be made. If you have found any errors or omissions, or if you simply have comments or suggestions concerning these instructions, please write us at the address on the cover and let us know about them. Or, better yet, send us a fax at (817) 244-4024 or e-mail us at painless@painlessperformance.com. We sincerely appreciate your business.

Perfect Performance Products, LLC shall in no event be liable in contract or tort (including negligence) for special, indirect, incidental, or consequential damages, such as but not limited to, loss of property damage, or any other damages, costs or expenses which might be claimed as the result of the use or failure of the goods sold hereby, except only the cost of repair or replacement of the Painless Product.

P/N 66501 Painless Instruction

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Version I

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➤ INTRODUCTION

Painless Performance Products thanks you for your purchase of this TORC Transmission Controller System. We strive to provide the most reliable, well designed, vibration resistant and simple to program transmission control system on the market. It was designed for ease of installation, even with little or no electrical or programming experience.

The **PERFECT TORC Transmission Controller** is equipped with two separate shift tables, on the fly calibrating and a digital display on the controller to allow for on-board diagnostics and tuning. This system will also support paddle or push-button shifting. The harness included in this kit is made with 600 volt, 257°F, TXL abrasion resistant wire and is covered in our **Power Braid** abrasion and heat resistant wire loom.

- Painless Performance Products recommends you, the installer, read this installation manual from front to back before installing the PERFECT TORC system. Due to the variables in modifications done to transmissions and vehicles; reading this manual will give you considerable insight on the proper installation of this product. **It is likely if this manual is not read completely that either the product not work due to improper installation and/or damage to this product or the transmission may result. SO PLEASE READ THIS ENTIRE INSTALLATION MANUAL BEFORE PROCEEDING!!! THANK YOU.**

➤ **IMPORTANT INFORMATION!!! READ THIS FIRST!!!**

4L60E/65E Transmission:

- The PERFECT TORC Transmission Controller only supports 1996 and newer 4L60E transmissions.
- When using a later model 4L65E transmission it will not be necessary to plug into the input shaft speed sensor. The TORC Controller does not need the input shaft speed to properly control the transmission.

4L80/85E Transmission:

- The PERFECT TORC Transmission Controller supports 1993 to present 4L80E transmissions. However, the 1993 and earlier 4L80E transmissions use a different internal wiring harness and main pass through connector. These early designs inherently leak fluid through their pass through connector. General Motors has several Technical Service Bulletins recommending the upgrade to the newer style connector and harness. The TORC Controller's main harness connector is not compatible with the early harnesses. If an early 4L80E transmission is being used the harness must be upgraded to the 1993 and newer style to use with this system.
- The 1994 and earlier 4L80E transmissions use a "Bosch" style pressure control solenoid. This solenoid is not compatible with the PERFECT TORC Transmission Controller. It is necessary to upgrade to the 1994 and later "Holley" style pressure control solenoid. The "Bosch" solenoid is silver in color and the later "Holley" style solenoid is black in color. If your solenoid is black in color, it is the correct one and does not need to be changed. If your solenoid is silver in color, it is the incorrect one and the GM part number 8684216 must be installed. This number can also be cross referenced at most transmission parts suppliers and purchased.

Kit Contents Photo: 66501



- Included:**
- (1) PERFECT TORC Module**
 - (1) 4L60/65E / 4L80/85E Transmission Harness**
 - (1) PERFECT TORC Vehicle Harness**
 - (1) Spare 10amp ATO Fuse**
 - (1) 1 3/8" Firewall Grommet w/ 1/2" Hole**
 - (2) Mounting Screws**
 - (10) Large 7" Zip Ties**
 - (30) Small 4" Zip Ties**
 - (1) Installation Instruction Manual**
 - (1) PERFECT TORC Laptop Software CD**
 - (1) USB communication cable**
 - (X) Necessary crimp on terminals to complete installation**

Installation Steps: Transmission Harness

1. Start by removing the system from the box and carefully laying it across a workbench or table. Take notice of the main transmission connector and vehicle speed sensor connector. These are only two connections needed for both 4L60E (65E) or a 4L80E (85E) transmissions. This system does NOT require the use of the input shaft speed sensors on the 4L65E or the 4L80E/85E transmissions. See Figure 1 for the pin out of required connections.
2. Next plug in the transmission connector and the vehicle speed connector into their appropriate locations. The transmission connector is located on the passenger side of the 4L60E transmission housing and on the driver side of the 4L80E transmission housing. The vehicle speed sensor is located in the tail shaft housing on the passenger side. See Install Pictures 1 & 2 below.



Install Picture 1 – Main Transmission Connector



Install Picture 2 – VSS (Vehicle Speed Sensor) Connector

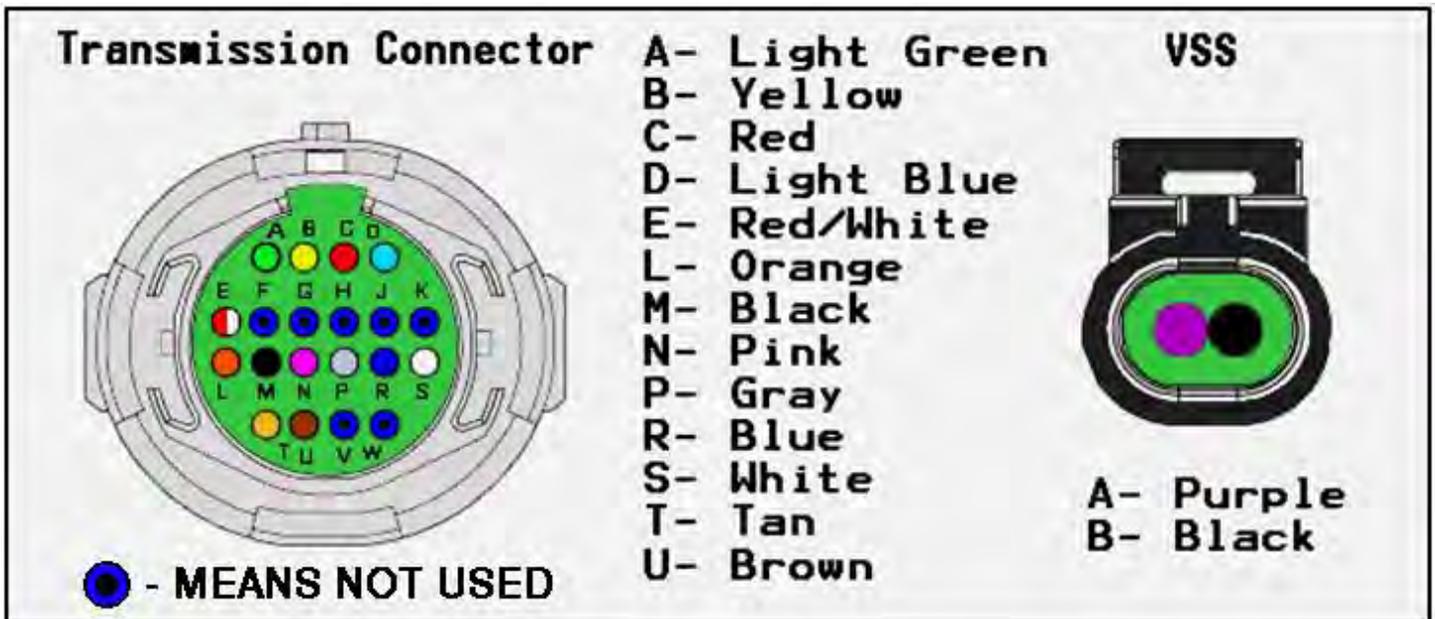


Figure 1 – Transmission Harness Connections on Transmission

3. The Transmission harness has three connectors which plug into the bottom of the TORC Module. Each of the three connector positions are labeled on the TORC Module: (1) Solenoids, (2) PRNDL, and (3) VSS. These are the only connections needed for the Transmission harness to the TORC Module. Each connector has a different number of pins; therefore preventing them from being connected improperly. See Figure 2.



Figure 2 – Transmission Harness Connections on TORC Module

For an internal schematic of the 4L60E/65E see Diagram 1 on page 9 and for the 4L80/85E see Diagram 2 on page 10. These two diagrams show the layout of the transmission harness and every connection made within them.

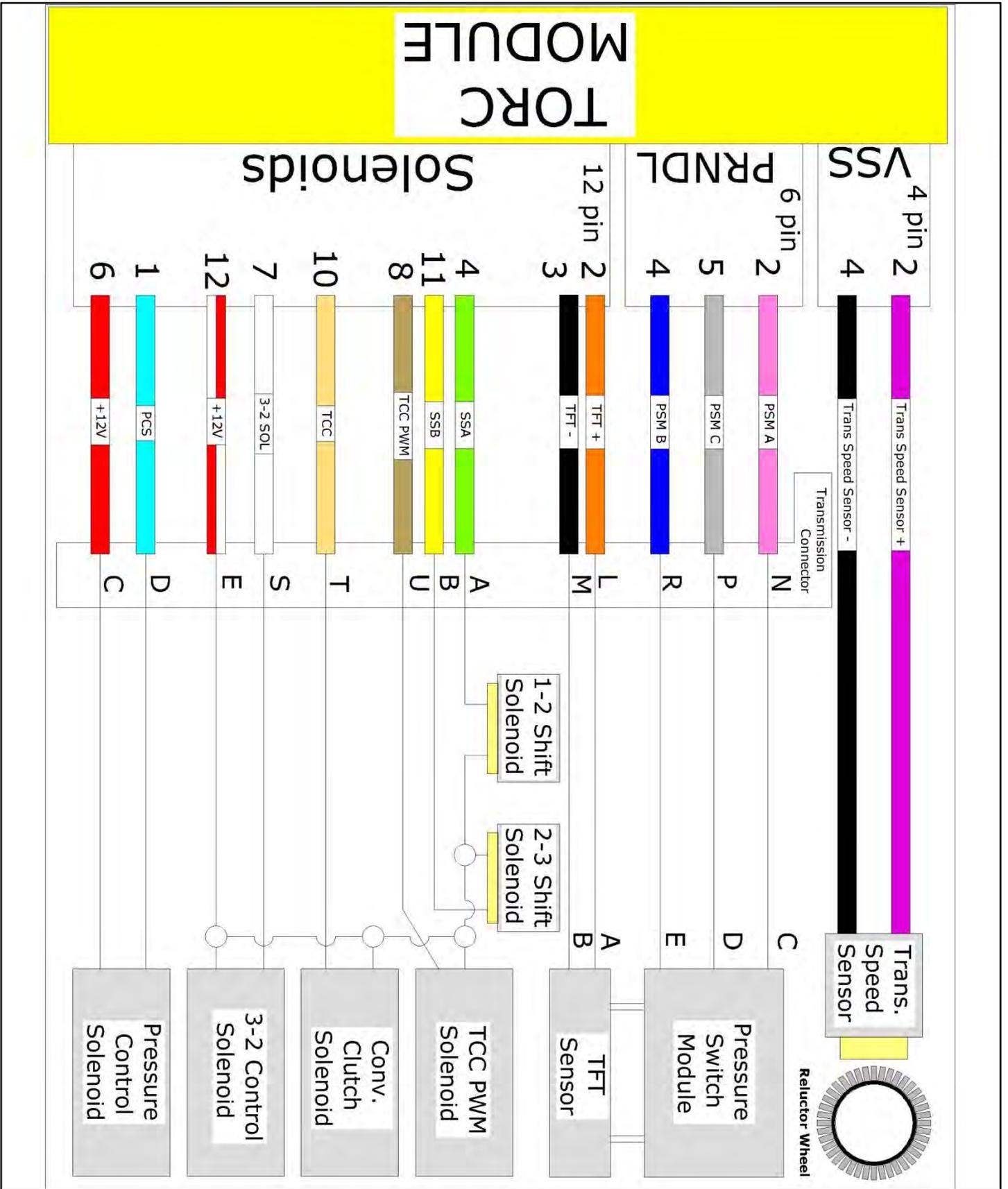


Diagram 1 – 4L60E/65E Connection Diagram

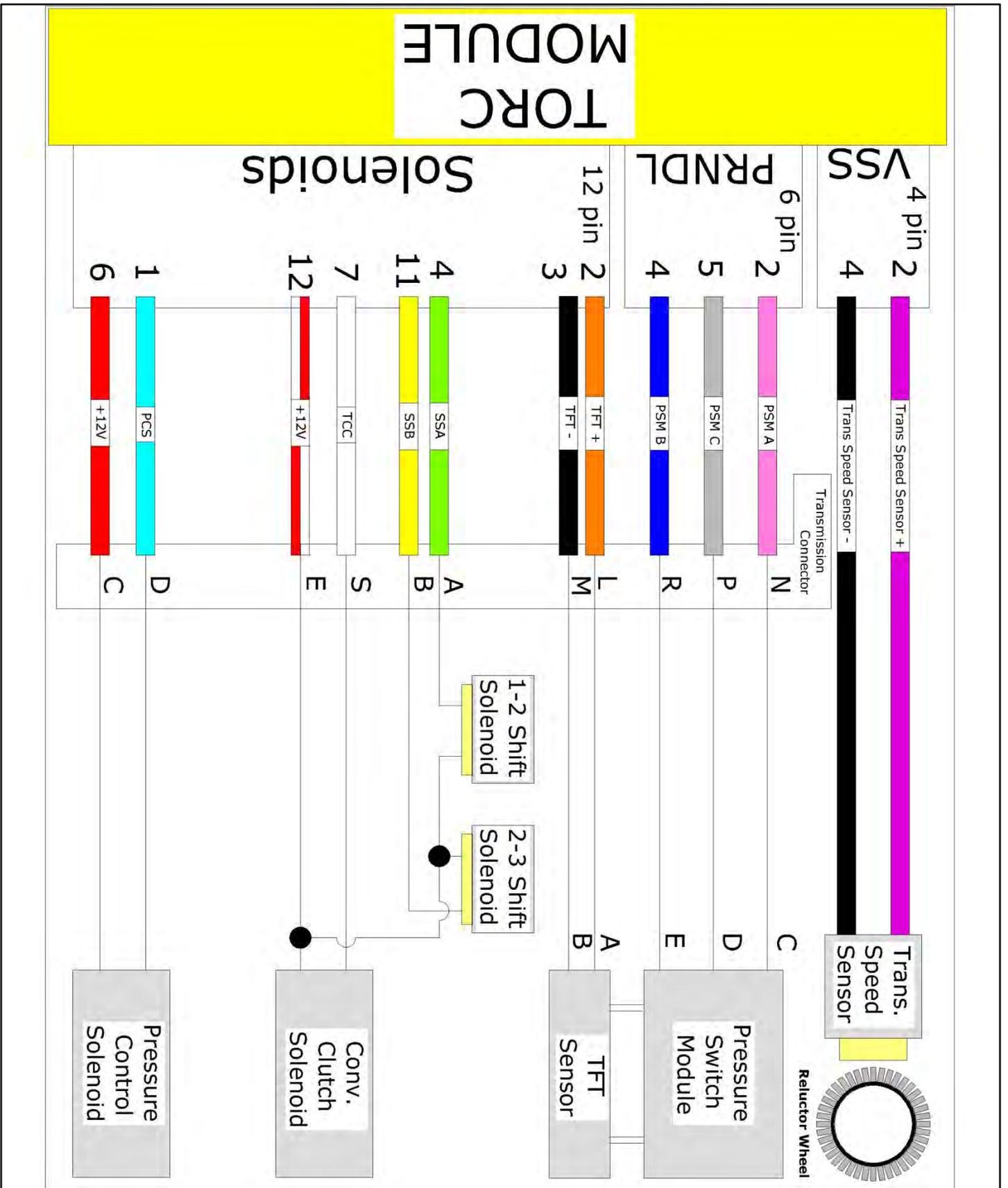


Diagram 2 – 4L80E/85E Connection Diagram

Installation Steps: Vehicle Harness

1. The Vehicle Harness has a 16 pin connector that plugs into the left side of the TORC Module. See Figure 2 on page 9.
2. See Table 1 below for a detailed list of all the individual connections needed for the Vehicle Harness with this system.

Table 1 – Vehicle Harness Connections

A. Red Wire – “Ignition Switched B+”
B. Black Wire(s) – “System Ground One” and “System Ground Two”
C. Green Wire – “Throttle Position Sensor”
D. Tan Wire – “Speedometer Signal Output”
E. Orange Wire – “+5 Volt Feed” Throttle Position Sensor
F. Purple Wire – “Table Select”
G. Light Blue – “Upshift”
H. Dark Blue – “Downshift”

A. Red Wire Labeled – “Ignition Switched B+”

- a. Connect to a 12 volt power source that is on when the Ignition Switch is in the “Run” or “Start” position.
- b. See Diagram 3 on page 15.

B. Black Wire(s) Labeled – “System Ground One” & “System Ground Two”

- a. If wiring this system into a vehicle with an Electronic Fuel Injection System; connect both black wires together and as close to the EFI systems computer GROUND as possible. This is usually a couple of black wires connected to the rear of the cylinder head or on the intake manifold on the engine. Regardless of its location; be sure to connect these wires as close as possible to the EFI Computer’s grounds.

- b. If this step is overlooked there is a good possibility the Throttle Position Sensor (TPS) will not read correctly.
- c. See Diagram 3 on page 15.

C. Green Wire Labeled – “Throttle Position Sensor”

- a. Connect this wire to the Throttle Position Sensor signal on a “Throttle-By-Cable” engine or an Accelerator Pedal Position Sensor signal on a “Throttle-By-Wire” engine.
- b. On most GM “Throttle-By-Cable” applications this is the Dark Blue wire at the Throttle Position Sensor connector.
- c. See Diagram 3 on page 15.

D. Tan Wire printed – “Speedometer Signal Output”

- a. Connect this to the electronic speedometer input if your vehicle is equipped with an electronic speedometer.
- b. This signal is fully adjustable to synchronize a speedometers indicated speed to the actual vehicle’s speed.

NOTE: A GPS (Global Positioning Device) commonly a Garmin or a Tom Tom can be very useful when completing this step. Simply compare the indicated speed on the electronic speedometer to the GPS and adjust accordingly until they match.

- c. See Diagram 5 on page 21 for a diagram of where to connect this wire to your aftermarket speedometer. Then see Step 20 on page 42 Figure 20 on the procedure for speedometer signal calibration.

E. Orange Wire printed – “+5 Volt TPS Feed”

- a. This is the +5 volt power source for applications where an external Throttle Position Sensor must be installed.

- b. Most carbureted and diesel engines will require an external Throttle Position Sensor.
- c. See Diagram 4 on page 17.

F. Purple Wire printed – “Table Select”

- a. This wire is used to select either “Table A” or “Table B” in the system.
- b. With this wire open and not connected to a ground the controller will default to “Table A”. If this wire is grounded the controller will use “Table B”.
- c. This feature is especially useful when a street calibration is desired for normal driving and a strip calibration is desired for racing.
- d. See Diagram 5 on page 21 to see how the provided grounding switch should be installed.

G. & H. Light Blue and Dark Blue wires printed “Upshift” & “Downshift”

- a. These two wires are used to manually upshift and downshift through the different gears on the transmission. A common application for this feature is called “Paddle Shifting”.
- b. Read the description on how these two wires are used on Page 20, #3. Then refer to page 21 Diagram 5 to see which connector these wires are located on the TORC controller. And finally see page 22 Diagram 6 for a diagram on how to wire in the provided push button switches.

Basic Required Connections with Electronic Fuel Injection

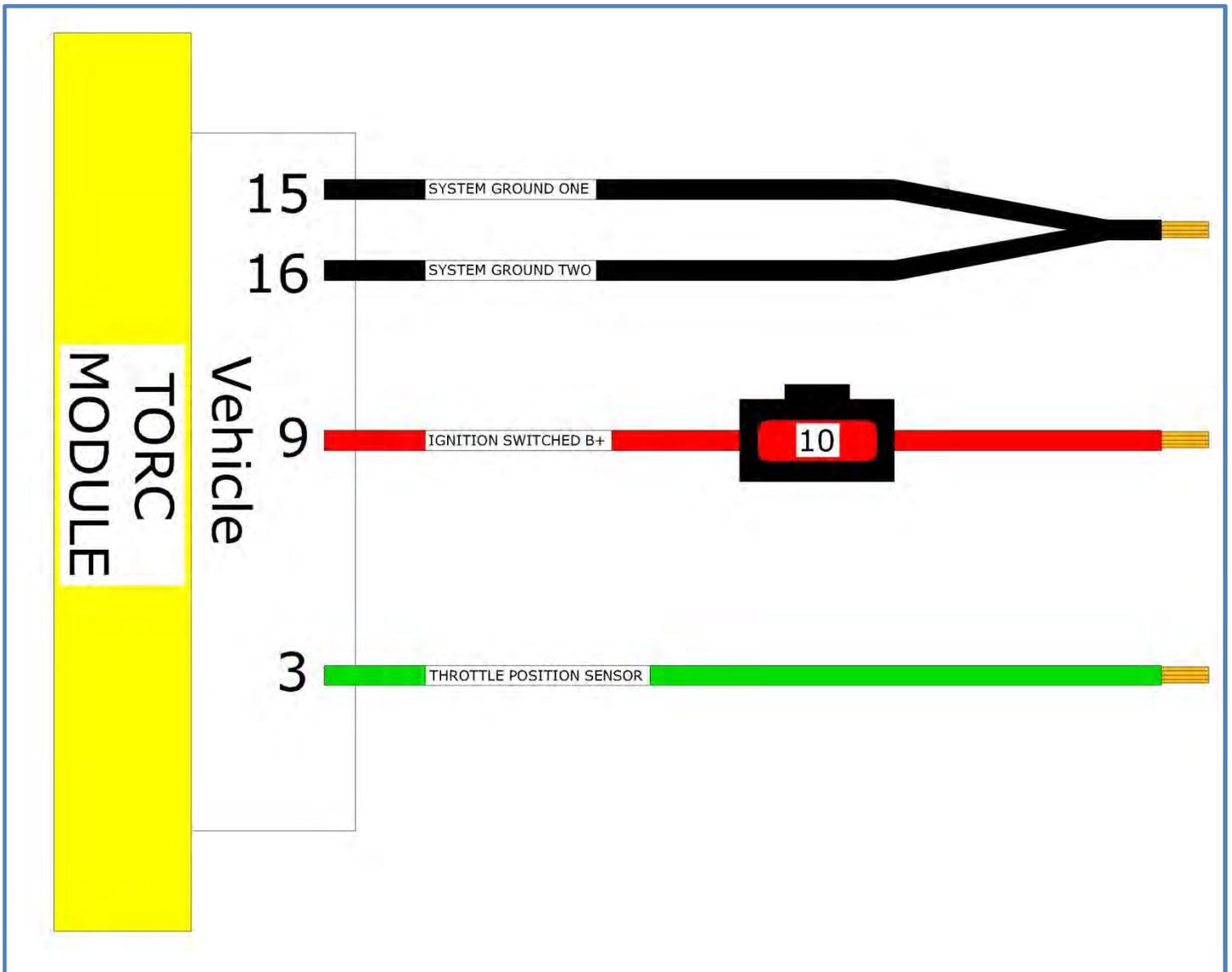


Diagram 3 – Electronic Fuel Injection

1. Tie together the two black wires labeled System Ground One and System Ground Two and crimp on the provided ring terminal.
2. Connect these wires as close to the EFI Computer as possible. This is normally on the cylinder heads or intake manifold of the engine. Be sure to use the provided star washer between the ring terminal and then engine. *This will ensure the two computers will be as close to the same ground plane as possible. In the electronics world, this is very important.

NOTE: If this step is not completed correctly, the Throttle Position Sensor may not send the correct signals, resulting in improper operation of the transmission.

3. Connect the **red** wire printed IGNITION SWITCHED B+ to the same reliable ignition switched source of power that the EFI computer is connected to. Many times this is the same circuit that supplies the ignition coil(s) for the engine. Be sure to use the provided butt splices and shrink tubing.
4. Next connect the **green** wire printed THROTTLE POSITION SENSOR to the signal wire coming out of the Throttle Position Sensor on the engines throttle body. If the engine is a “Throttle by Wire” or it will be necessary to tap into the Throttle Position Sensor #1 or #2 signal. Using a voltmeter, measure between each signal wire and ground to determine which signal wire increases in voltage as the throttle is opened.
5. Technically after these three connections are made the TORC module can control the transmission with some basic programming. If there isn’t an electronic speedometer to connect or a desire for paddle shifting, the rest of the wires need to be simply terminated with red butt splices (18-20ga size) and stowed under the dash of the vehicle.

Skip to page 22 for instruction on programming the TORC module for your specific application.

If running a diesel or carbureted gasoline engine **with** an existing Throttle Position Sensor, follow the same steps for an EFI engine starting on the previous page 15.

If running a diesel or carbureted gasoline engine **without** an existing Throttle Position Sensor, skip to page 17 for instruction on connecting a universal Throttle Position Sensor to the Vehicle harness.

Basic Required Connections with Carburetor or Diesel

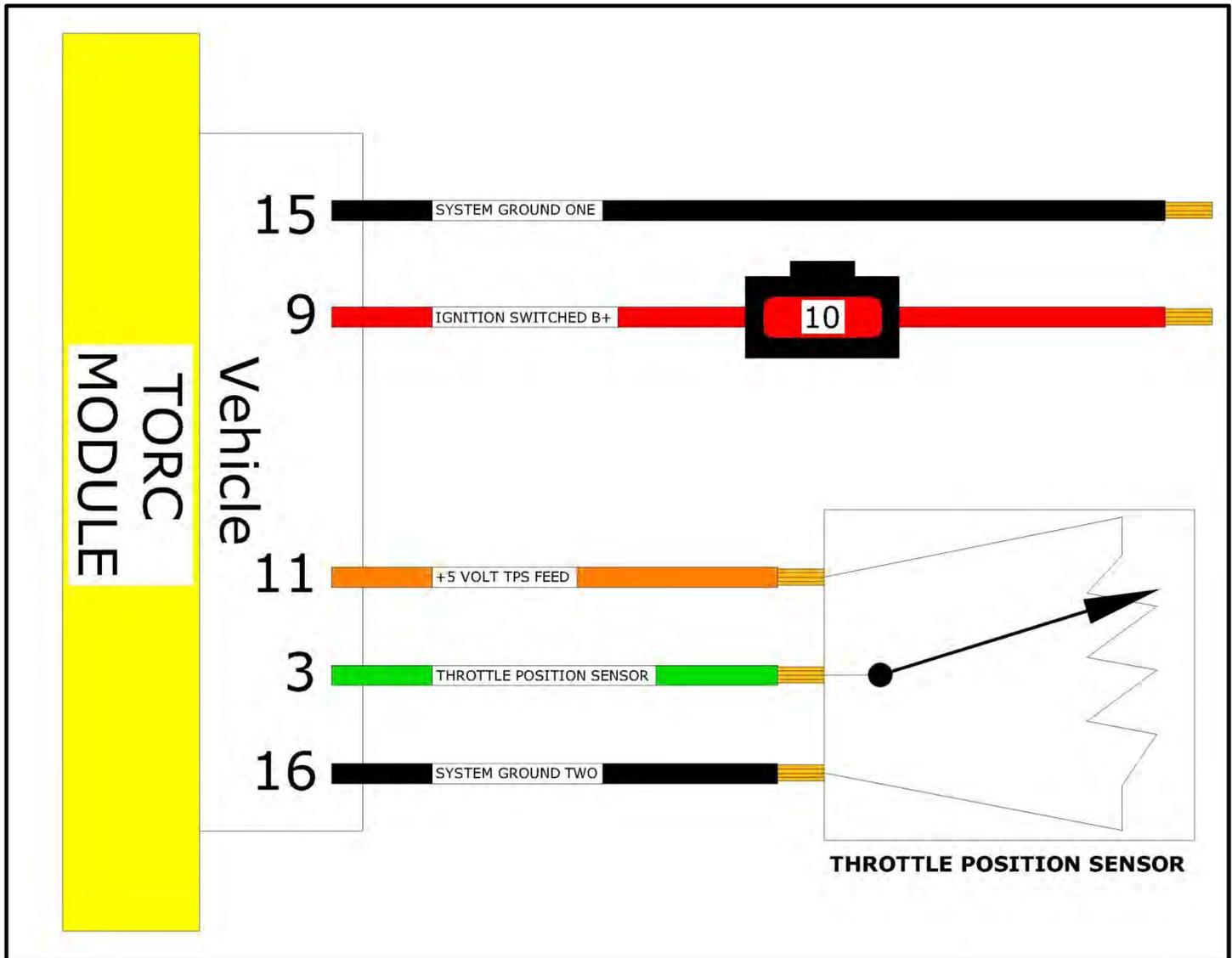


Diagram 4 – Mechanically Injected Diesel or Carbureted Gasoline

1. Crimp on the provided ring terminal to the SYSTEM GROUND ONE wire and connect as close to the batteries ground terminal as possible. The same bolt where the ground battery cable bolts to the engine block is the best choice.
2. Connect the red wire printed IGNITION SWITCHED B+ to the same reliable ignition switched source the ignition coil is powered from. Be sure to use the provided butt splices and shrink tubing.

3. See Diagram 4 for the proper connection of a remote mounted Throttle Position Sensor. The TORC module provides the following dedicated circuits: **+5 VOLT TPS FEED**, **SYSTEM GROUND TWO AND THROTTLE POSITION SENSOR**.
4. It is HIGHLY RECOMMENDED to solder these three connections and make them weatherproof by using the heat shrink provided that has glue in them.

NOTE: In most circumstances for the Mechanical Diesel and Carbureted Gas applications it will be necessary to purchase an aftermarket “stand-alone” Throttle Position Sensor and bracket.

How to identify the terminals of an unknown, three pin Throttle Position Sensor:

To complete the following procedure you will need either a Digital Volt/Ohm Meter or an Analog Ohm Meter.

1. Set the meter to Ohm meter mode and set the scale to 10K on an analog meter or auto ranging for a digital meter.
2. Connect the meter to two pins at a time while moving the lever or cam on the TPS. Watch the meter while rotating the sensor. Check all three pairs of pins until you find a pair that does not change resistance when you move the lever or cam on the TPS. The two pins that do not change resistance are the fixed ends of the resistance element (+5V and ground). The remaining pin that did change is known as the “wiper”. It is the moving contact that slides along the resistance element to give the varying voltage signal. This is the output terminal of the sensor and should be connected to the PERFECT TORC’s “THROTTLE POSITION SENSOR” green wire. (Vehicle Pin 3) See Diagram 3 on page 15.
3. Next with the sensor at the idle or closed throttle position, measure the resistance between the wiper (Green Wire) and each of the end terminals. The end terminal with the least resistance to the wiper (green wire) at idle is

the ground terminal and needs to be connected to the PERFECT TORC's "SYSTEM GROUND TWO" black wire. (Vehicle Pin 16) The other terminal with the higher resistance to the wiper (green wire) at idle is the 5 volt reference input to the sensor and needs to be connected to the PERFECT TORC's "+5 VOLT TPS FEED" orange wire. (Vehicle Pin 11)

Basic Guidelines for setting up a universal type Throttle Position Sensor:

- 1.** When properly adjusted the linkage connecting to a universal TPS needs to use most if not all of the sensor's rotating range. Most often this can be adjusted by changing the ratio of the linkage on the throttle lever horn on the side of the carburetor or diesel injection pump lever. It is necessary for the TPS voltage to be at least 0.35 volts at idle for this system to work properly. This can be achieved by making sure a small amount of the sensor travel is being used in the idle position.
- 2.** The reason for a small amount of the sensor's travel to be used in the idle position is to allow the TORC module to detect problems with the TPS. If the sensor becomes disconnected or the linkage falls off the TPS voltage will fall below the set idle threshold. The TORC module is designed to recognize this and then switch to "Failsafe Mode" which raises the line pressure and enables preset shift points to minimize any damage to the transmission due to clutch slippage.

Optional Accessories within the TORC Module

1. **Speedometer Signal Output** – this is the signal to be connected to an aftermarket electronic speedometer. It is fully adjustable to allow for a speedometer to be synchronized with a known speed. Easiest way to achieve this is to use a GPS device in the car to tell what speed the vehicle is traveling and then follow the laptop software procedure as described on page 38 or the tuning interface as explained on pages 56 & 57.
2. **Table Select** – This allows for two different shift tables to be calibrated for one vehicle. The most common use for this option is to have a daily driver normal shift schedule and then to also have a harder performance type of shift schedule. The toggle switch provided may be used to apply a ground to the table select input on the Vehicle harness “**Table Select**” purple wire. When the purple wire is not grounded Table 1 will be used and when the purple wire is grounded Table 2 will be used.

See Diagram 5 on page 20 for details on how to wire a toggle switch for the Table Select option. A push button switch may be used but it must be a latching type of switch.

3. **Manual Shift** – This allows for manual shifting of all forward gears of the transmission. The most popular method of this type of shifting is commonly called “Paddle Shifting”. Several aftermarket companies offer paddles that can be attached to a steering wheel to allow for this type of shifting. Or if desired a couple of momentary push buttons and a single toggle switch may be used as well.

See Diagram 5 for the locations of the “**DOWN-SHIFT**” blue wire and the “**UP-SHIFT**” light blue wire.

See Diagram 6 on page 22 Manual Shift with Push Buttons for details on how to wire in the provided push buttons for “Push Button Shifting”.

TORC MODULE

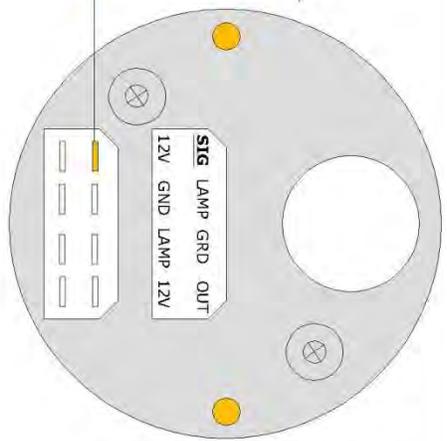
12 pin

Vehicle

12

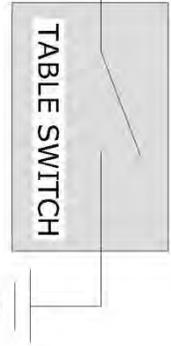
SPEEDOMETER SIGNAL OUTPUT

**TYPICAL
AFTERMARKET
SPEEDOMETER**



5

TABLE SELECT



14

DOWN - SHIFT

6

UP - SHIFT

**SEE Manual Shift with Push Buttons in
Diagram 6, page 22.**

Diagram 5 – TORC Module Optional Accessories

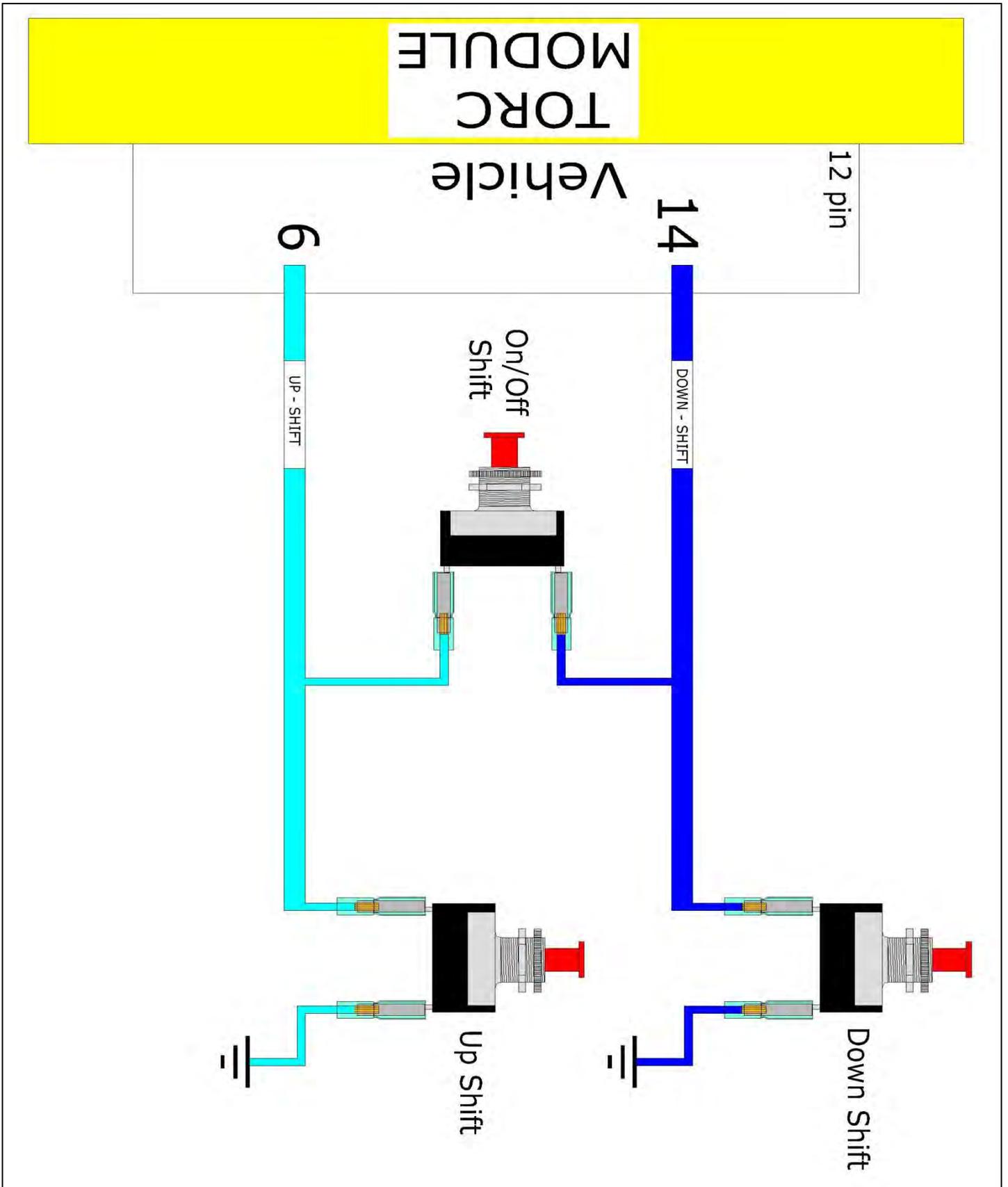


Diagram 6 – Manual Shift with Push Buttons (All Momentary)

TORC Calibration Software

Introduction:

The TORC Calibration Software included in this kit is on a CD for easy installation onto a laptop. This software allows you to change the miles per hour for each upshift and downshift and shift firmness. The software will also allow adjustment of how the TCC (torque convertor clutch) is controlled.

On the fly calibration is also supported with the TORC software; meaning all adjustments are made in real time.

Setup:

The TORC Software comes with several base calibrations for each different transmission. It is recommended to first start with one of these calibrations and then make the desired changes for your specific vehicle.

Step 1:

Place TORC Software CD into the CD drive on your PC laptop computer. In some computers, this will automatically open up a window to install the software.

Step 2:

If Step 1 did not automatically pull up a window, then GOTO START>PROGRAMS>RUN>TYPE IN D: > AND HIT (OK).

Step 3: File Contents of the TORC Software CD

Determine what version of Microsoft Windows is on your laptop computer and double click on the appropriate file.

See Figure 3 below.

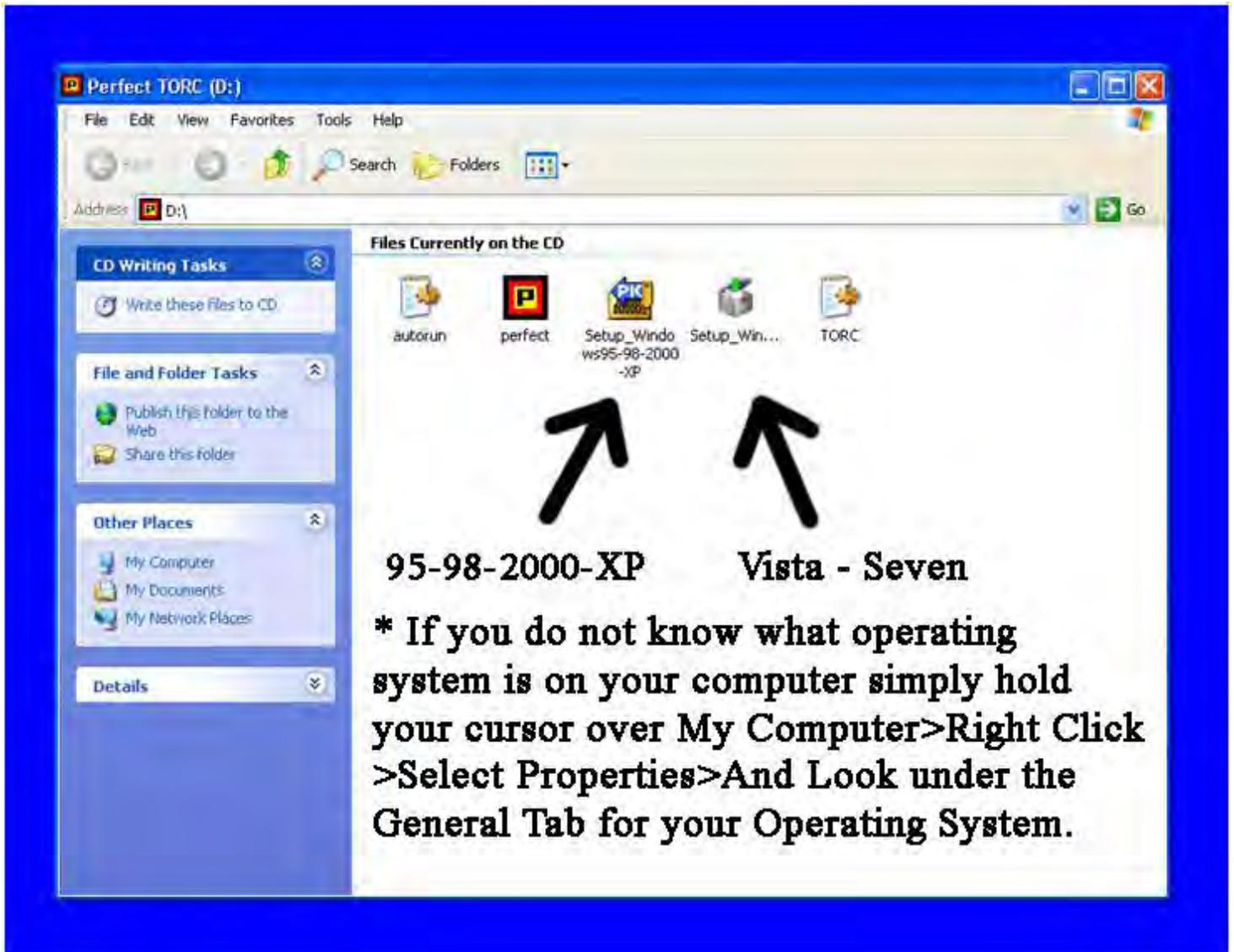


Figure 3 – File Contents of the TORC Software CD

Step 4: TORC Transmission Controller Installer Window

The TORC Transmission Controller Installer window will pop up and display a “TORC” directory that it wants to create on your C:\ drive. Simply click on the FINISH button on the lower right of the window to start the software installation process.

See Figure 4 below.

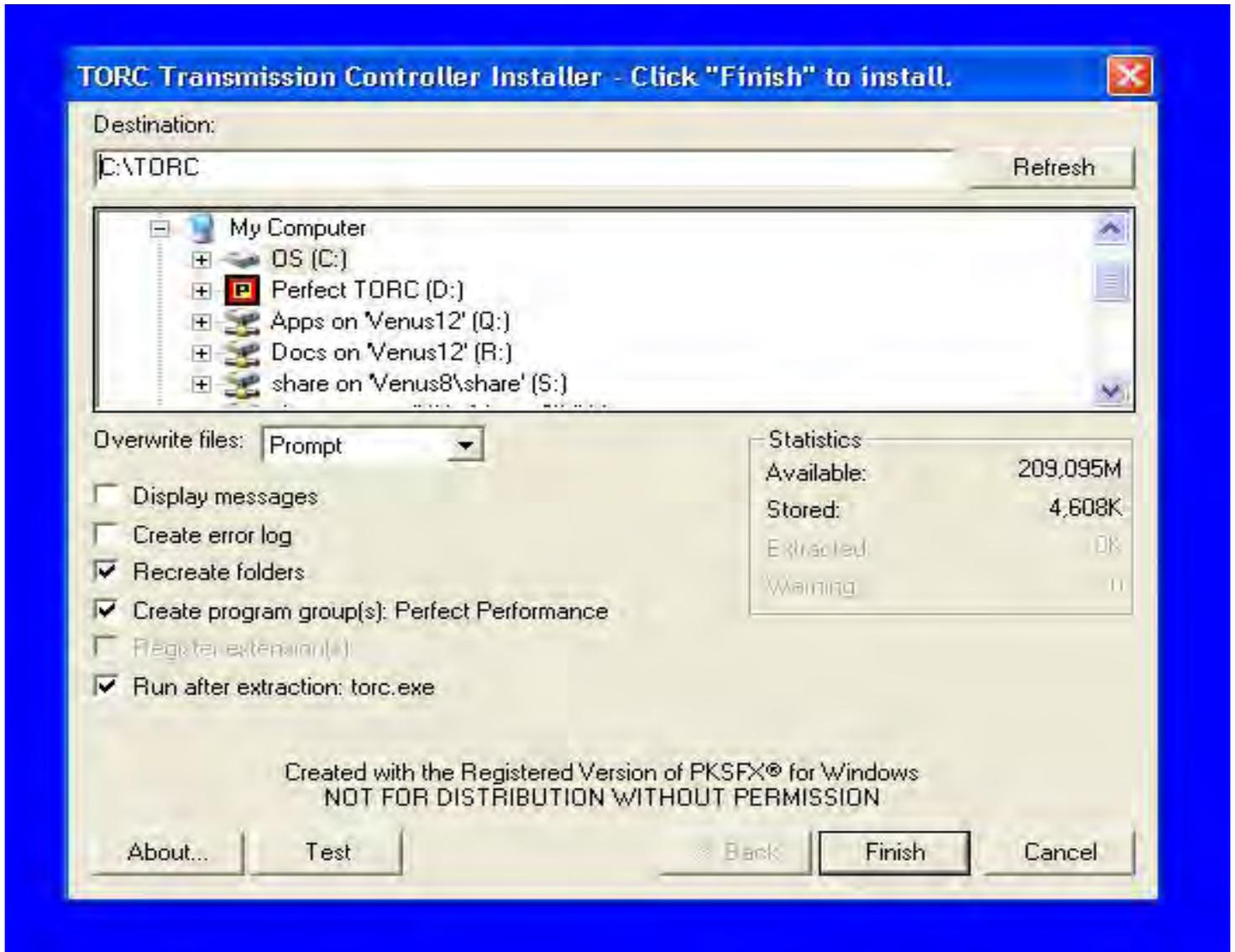


Figure 4 – TORC Transmission Controller Installer Window

Step 5: TORC directory

A window will pop up and ask if you want it to “Creat „C:\TORC” directory?” Click on the “Yes” button and then proceed to Step 6.

See Figure 5 below.

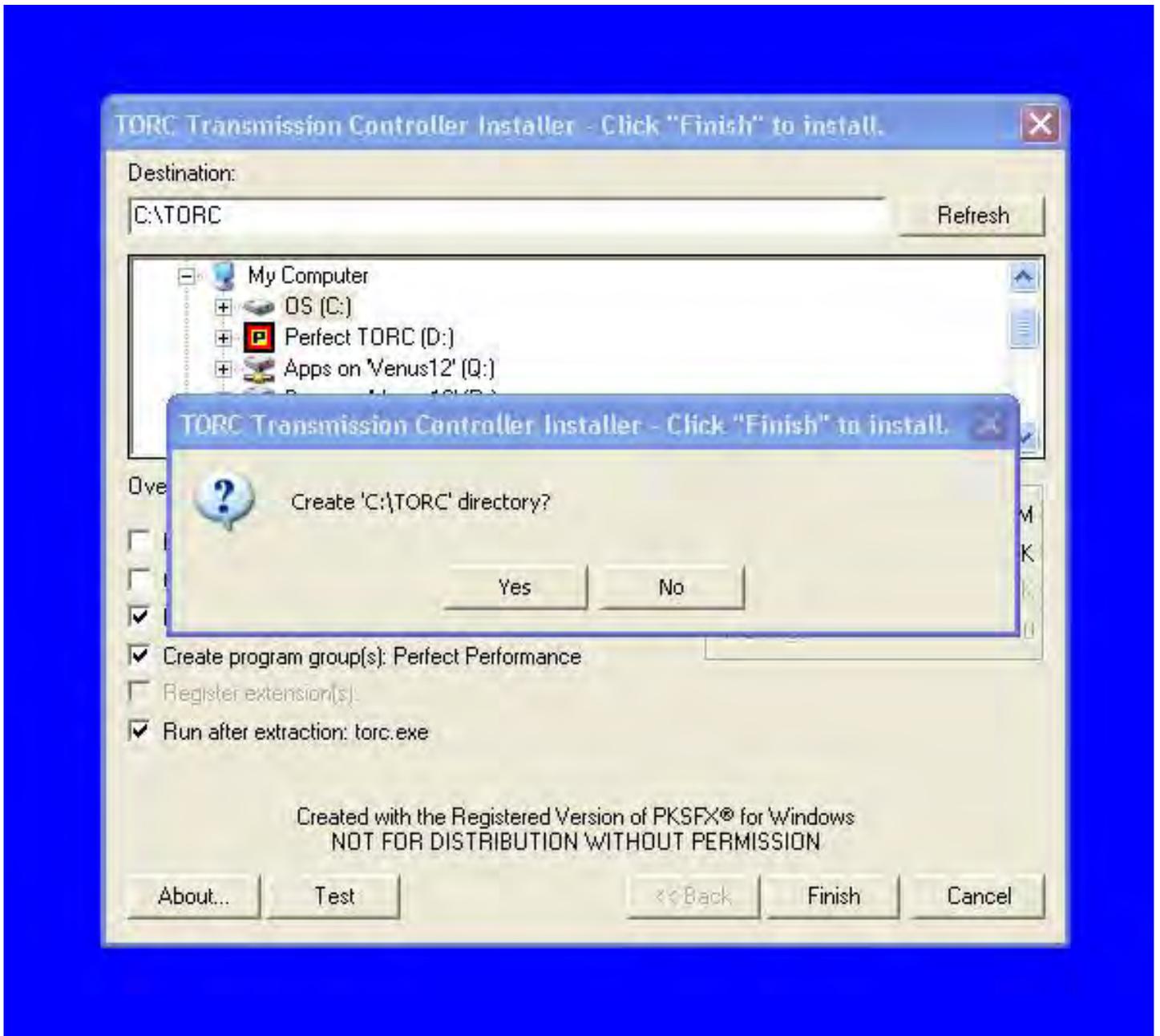


Figure 5 – Creation of the “TORC” directory on your computer.

Step 6: TORC.exe

A window will pop up and ask, “Do you want to run the following program? Torc.exe” Click on the “Yes” button and then proceed to Step 7.

See Figure 6 below.

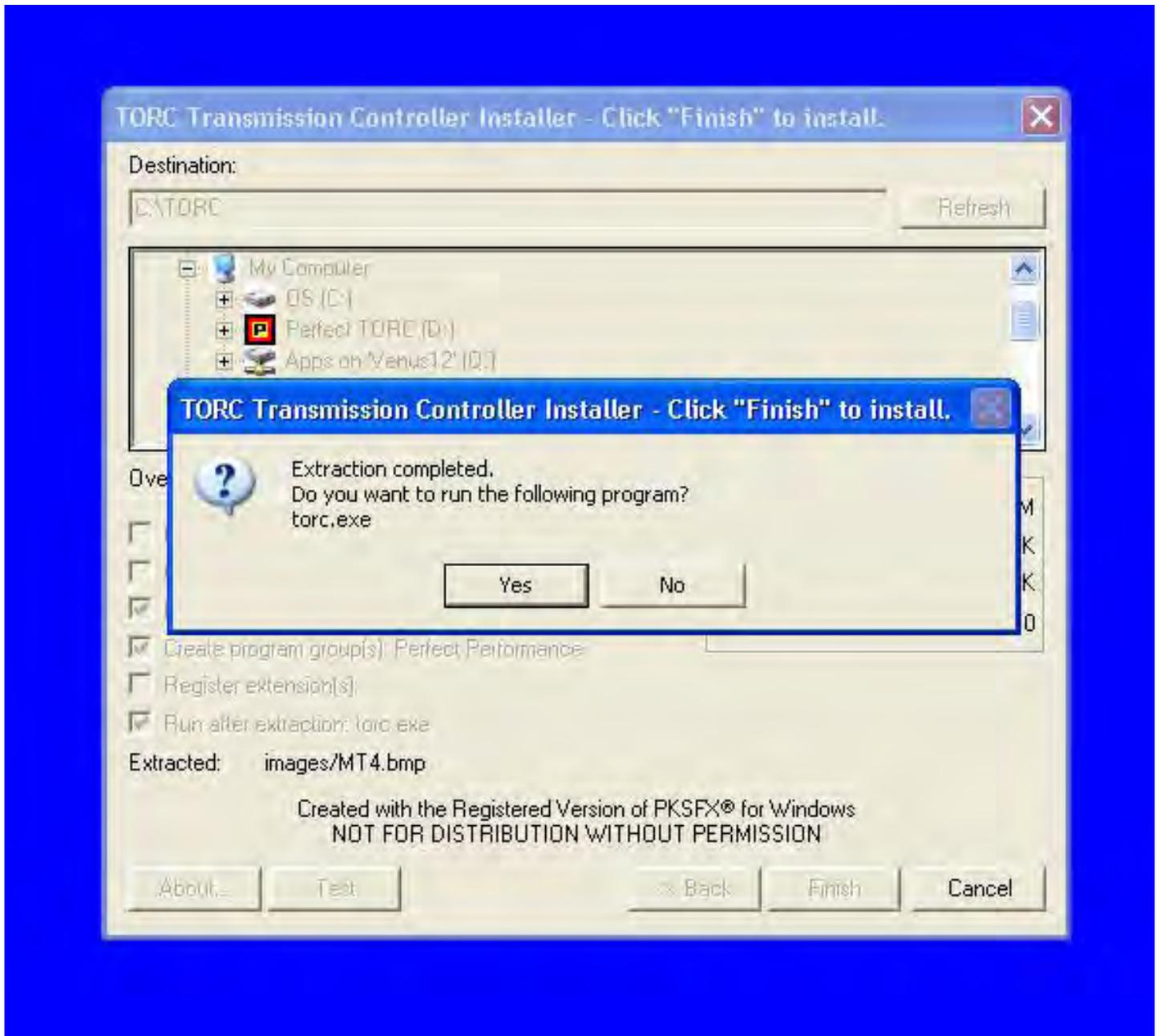


Figure 6 – Do you want to start the TORC.exe program?

Step 7: The TORC Warranty page and a TORC Shortcut

After reading the warranty on the PERFECT TORC Transmission Control system simply click on the “OK” button. Notice the premade shortcut in the next window. It’s there to simply drag and drop onto your Desktop screen for future use. This will allow you to open the TORC Tuning software by simply double clicking on the TORC icon on your desktop next time you want to open the TORC software. It is not necessary for you to keep the TORC software CD in your computer’s CD drive once the software has been installed.

See Figure 7 below.

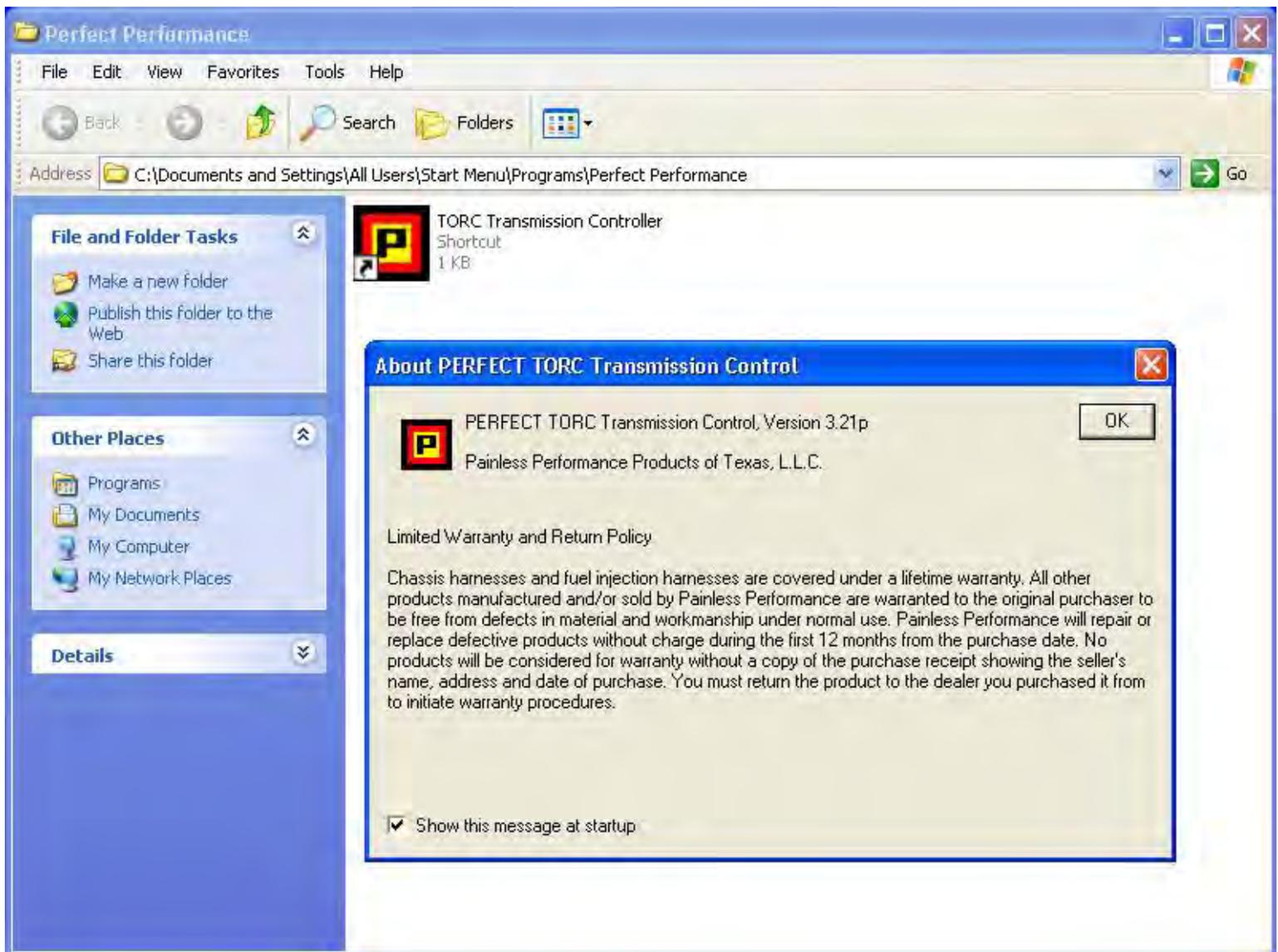


Figure 7 – The TORC Warranty page and a TORC Shortcut.

Step 8: Getting Started

Now that the TORC software is installed onto your laptop computer, read the “Getting Started” window to help decide on how to customize the calibration to your specific needs. The window below is asking if you want to open an “Existing Calibration” or “Create a new one from scratch”. Since this is your first time running through this process we are going thru the “Initial Setup Wizard” under the “View” tab go ahead and click “OK” and proceed to Step 9. See Figure 8 below.

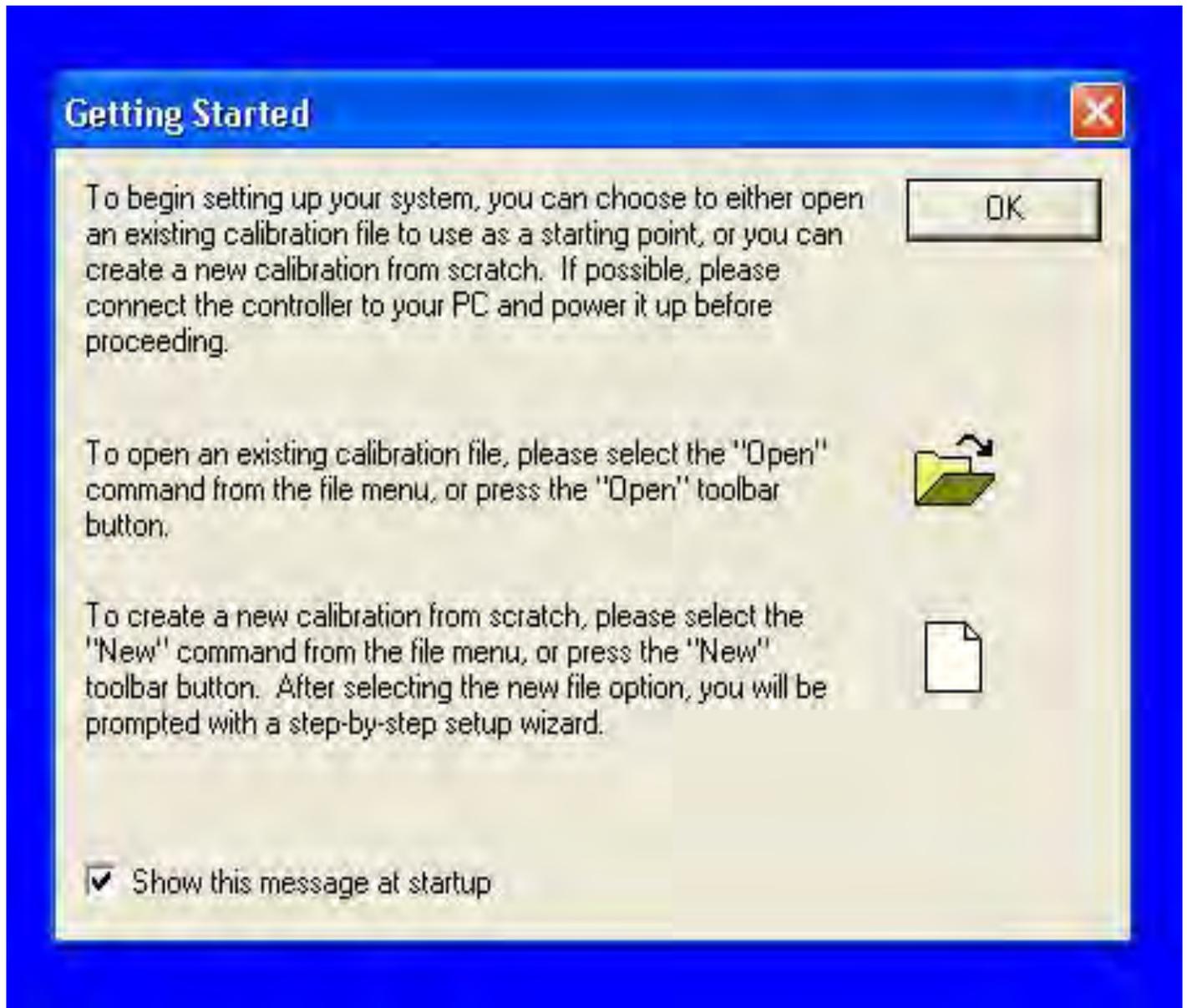


Figure 8 – Getting Started

Step 9: Initial Setup Wizard / USB Communication Cable

Plug in the provided USB Communication cable before proceeding with the Initial Setup Wizard. Once connected, turn the ignition power on to the TORC controller, click on the word “View” and then click on Initial Setup Wizard.

See Figure 9 below.

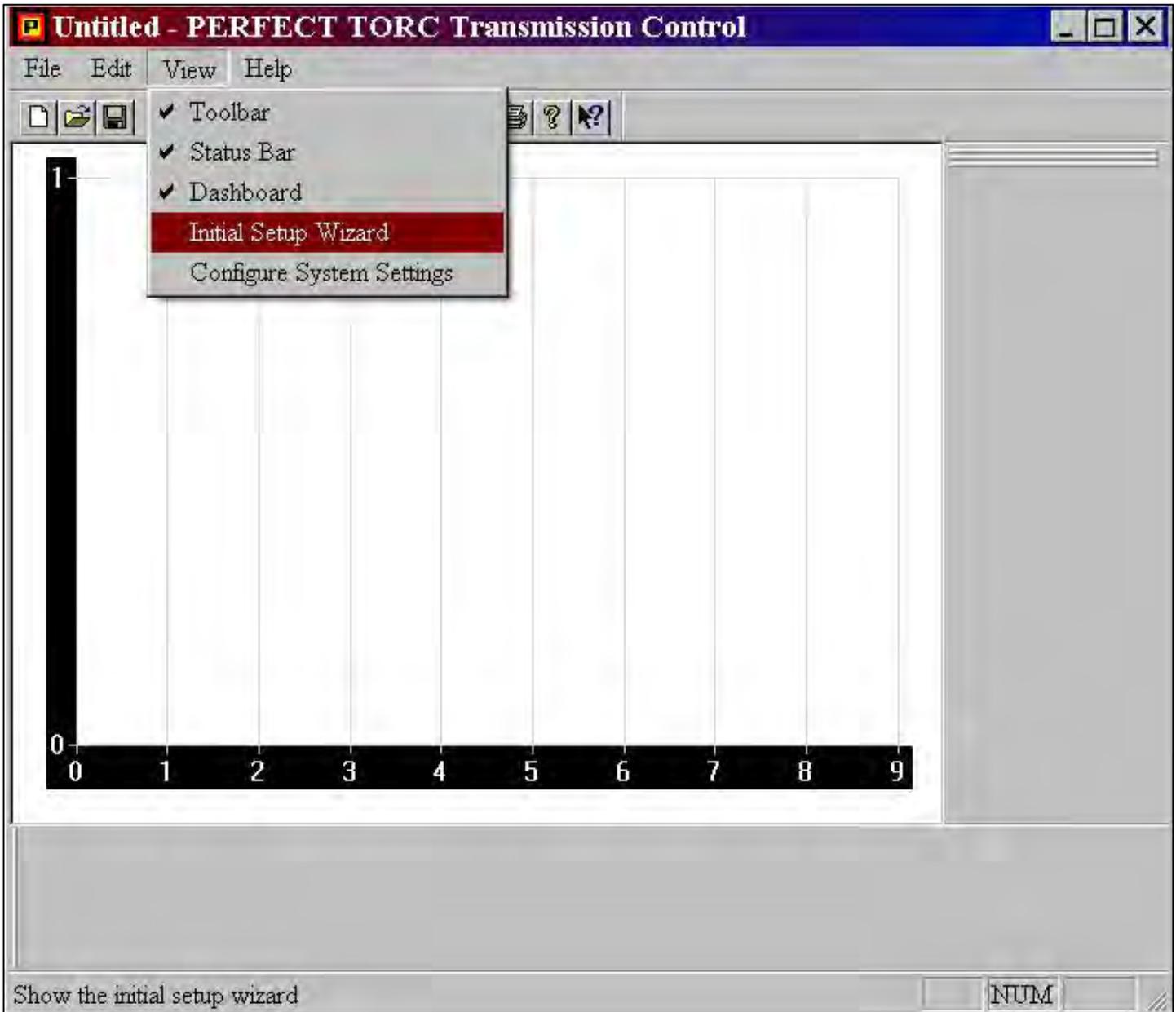


Figure 9 – Initial Setup Wizard

Step 10: Transmission Type

To setup the desired transmission to be controlled, simply use the pull down menu to choose the early or late model 4L60E/4L65 or the 4L80E/4L85.

See Figure 10 below.

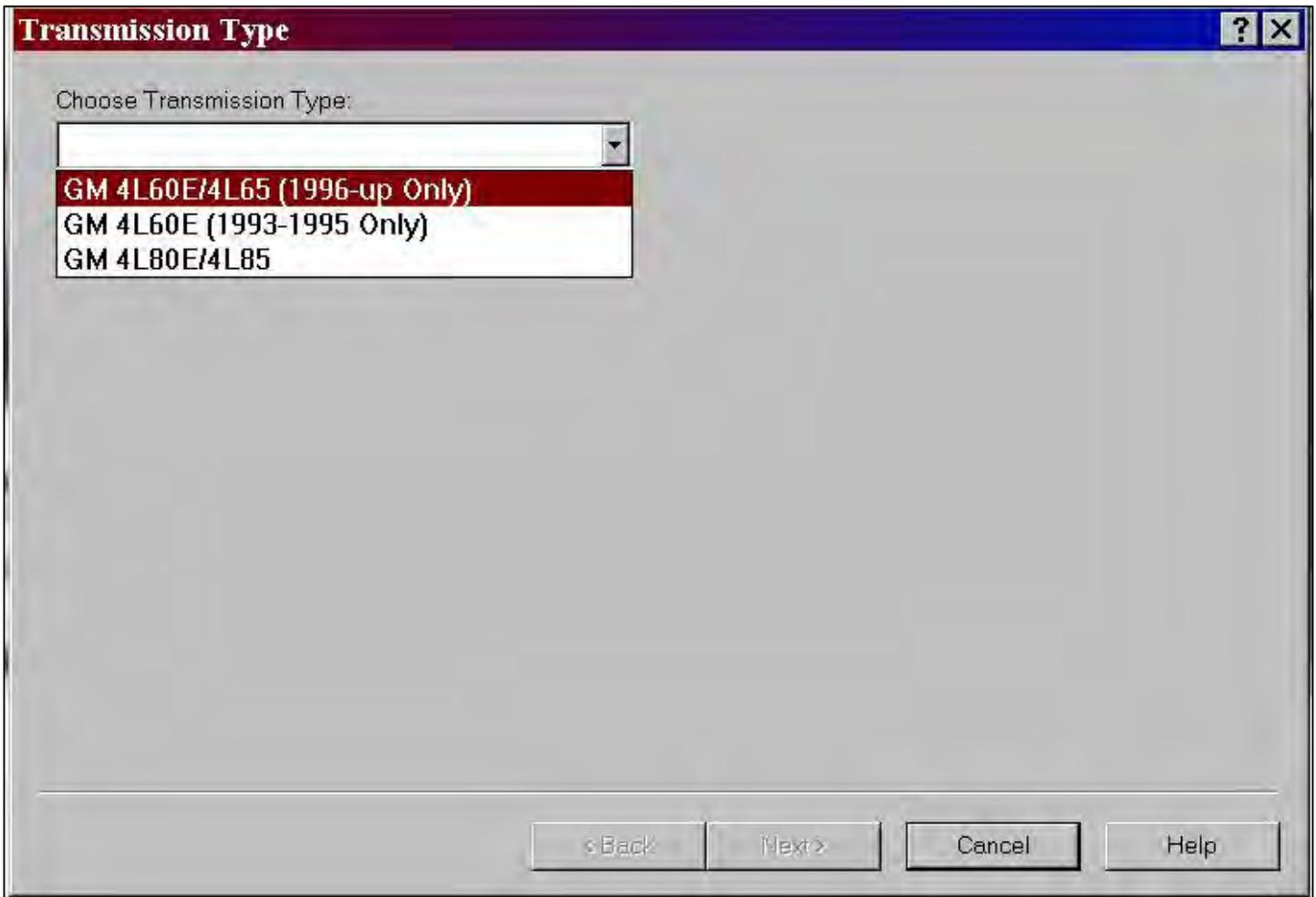


Figure 10 – Transmission Type

Step 11: Transmission Gear Ratios

Next we need to select either the “Standard Ratio Gear Set” or “Custom Gear Set”. The most common choice for this part of the wizard is the “Standard Gear Set”; unless your transmission has custom/aftermarket gear sets installed. If your transmission does have a “Custom Gear Set” select this option and type in the gear ratios. NOTE: It is not common to need to input the custom gear set ratios.

See Figure 11 below and then proceed to Step 12.

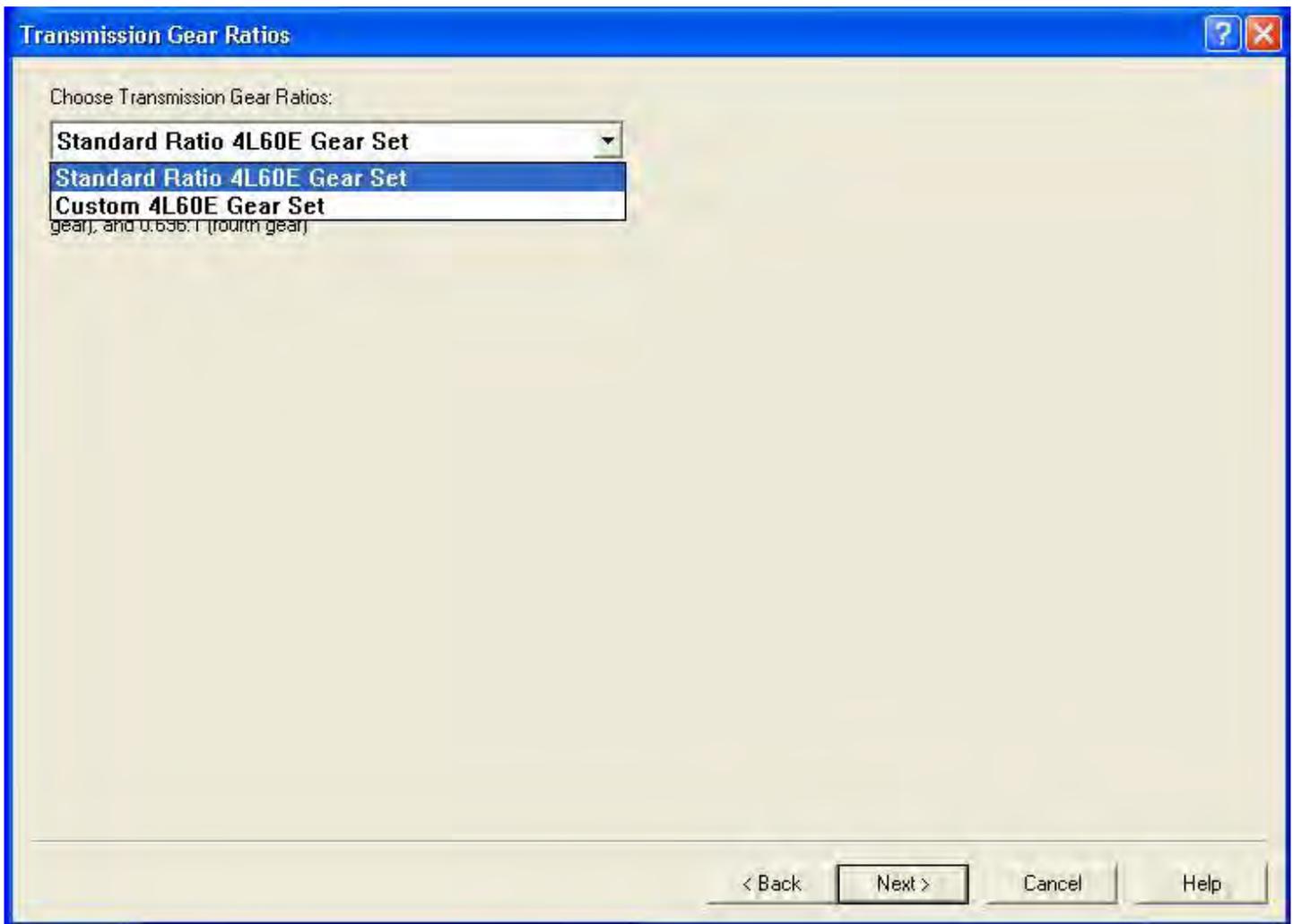


Figure 11 – Transmission Gear Ratios

Step 12: Speed Sensor and Gearing

There are three different configurations for the output shaft speed sensors on GM 4L60E transmissions and two different configurations for the GM 4L80E.

See Figure 12 below.

It is important to know what vehicle your transmission came out of. Corvette transmissions use either a “High Ratio” or “Low Ratio” setting for the speed sensor. Most all other vehicles use the “Standard GM Output Shaft Speed Sensor” choice. Once the correct selection is made, simply enter your rear axle gear ratio (e.g. 3:73, 3:42, 3:08, 2:73, etc) and then measure and enter your rear overall tire diameter. Click next and proceed to Step 13.

Speed Sensor and Gearing

Choose Speed Sensor and Gearing:

Standard GM Output Shaft Speed Sensor

Standard GM Output Shaft Speed Sensor

Corvette Differential Speed Sensor, High Ratio

Corvette Differential Speed Sensor, Low Ratio

Axle Ratio: 3.55

Tire Diameter: 27.50

< Back Next > Cancel Help

Figure 12 Speed Sensor and Gearing

Step 13: Throttle Position Sensor

Once the Throttle Position Sensor is wired in as per page 12 for an Electronic Fuel Injected Gas Engine or per page 16 for a Diesel or Carbureted Engine proceed with the following instruction. See Figure 13 below.

1. Turn the ignition to the on position to power up the TORC module.
2. With the throttle in the idle position, press the “Set Idle TPS” button. A new voltage value should appear on the screen now.
3. With the KEY ON ENGINE OFF, Now push the throttle all the way to the WOT (Wide Open Throttle) position and press the “Set W.O.T. TPS” button. A new voltage value should appear on the screen now also.
4. You have just now successfully calibrated your TPS.

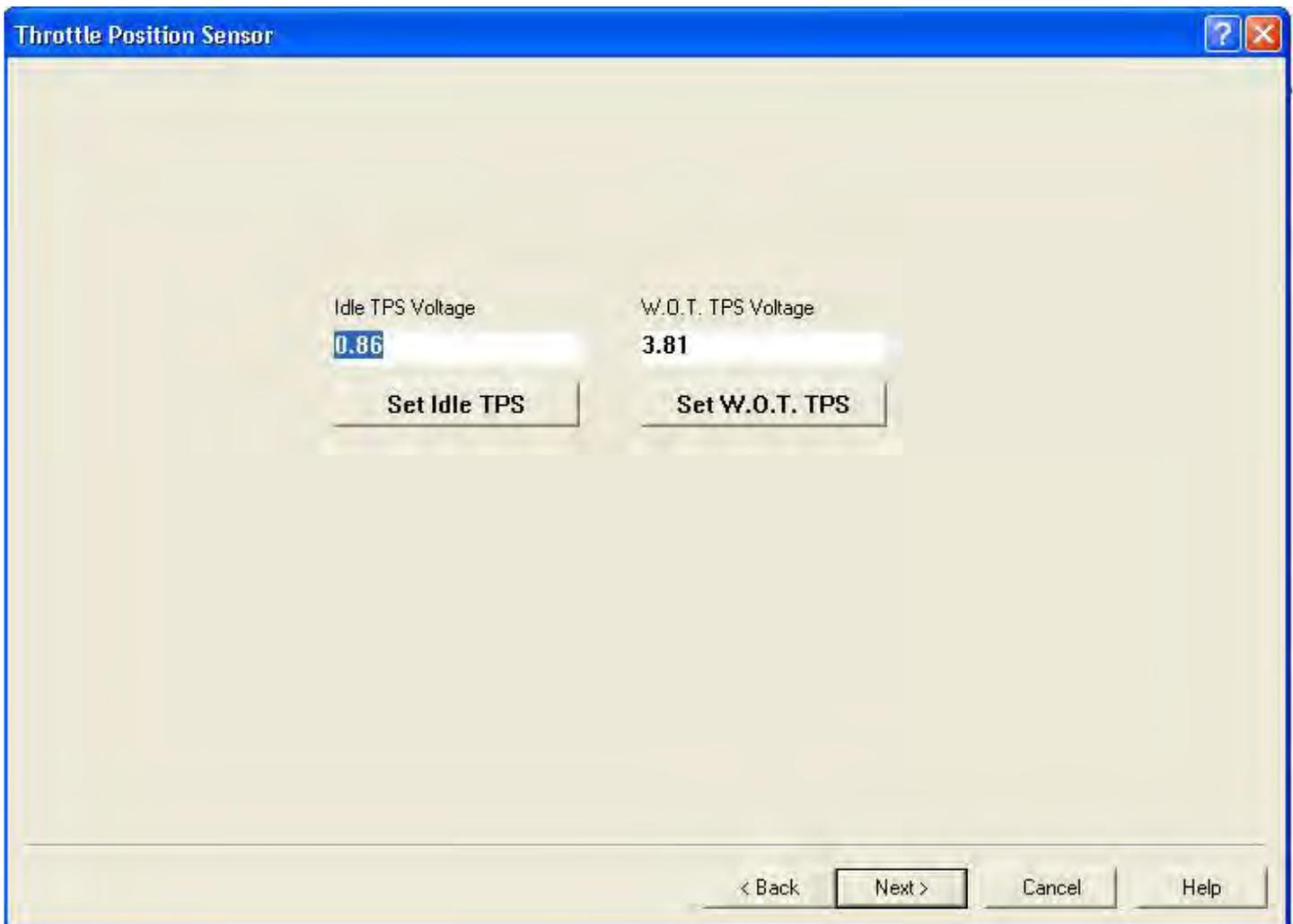


Figure 13 Throttle Position Sensor

Step 14: Pushbutton Shift Mode

There are three push buttons included in this kit for the optional Pushbutton Shift Mode; more commonly called Paddle Shifting. When the switches are configured as shown in Diagram 6 on page 21 or the picture in Figure 14 below, the transmission can be upshifted or downshifted manually. Several options can be chosen from when to disengage the mode once it is selected as well as options when to engage the mode. Under the “When Stopped” pull down are the following options: 1) Do Nothing, 2) Downshift to First Gear & 3) Disengage push-button mode. This will determine what will happen when your vehicle comes to a stop. See Figure 14 below.

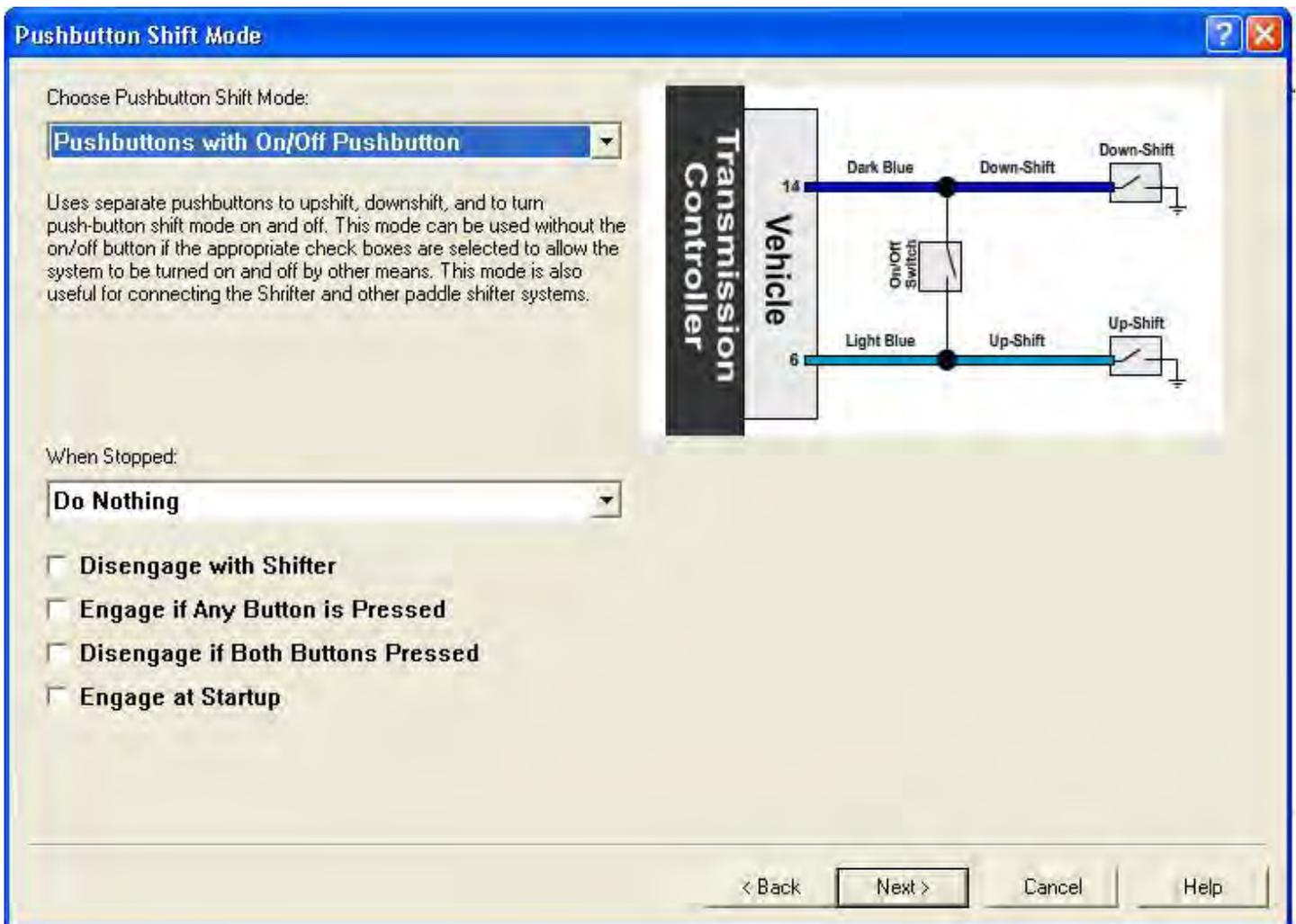


Figure 14 Pushbutton Shift Mode

Step 15: Converter Clutch Settings

These Converter Clutch Settings allow you to setup when your torque converter will be allowed to lock and unlock. Thresholds such as Miles Per Hour, TPS voltage, 3rd or 4th gear, MPH to stay locked up when coasting, minimum trans fluid temperature and a delay based on when all the listed parameters are met, help to control the Torque Converter Clutch. See Figure 15 below.

Converter Clutch Settings

Choose Converter Clutch Settings:

Advanced Converter Clutch Settings

Basic Converter Clutch Settings

Advanced Converter Clutch Settings

torque converter clutch controls.

Min MPH	Max TPS Voltage	Min Gear Allowed	
29	3.00	3	
MPH to Stay on at Idle	Minimum Temp (F)	Qualification Delay	
35	72.3	0.82	

< Back Next > Cancel Help

Figure 15 Converter Clutch Settings

Step 16 Manual Low Control

These two settings are included as a precautionary measure to prevent both over revving the engine in first gear by forcing an up shift with the manual lever in first gear AND not allowing a downshift from 2nd gear to 1st until a low MPH.

See Figure 16 below.

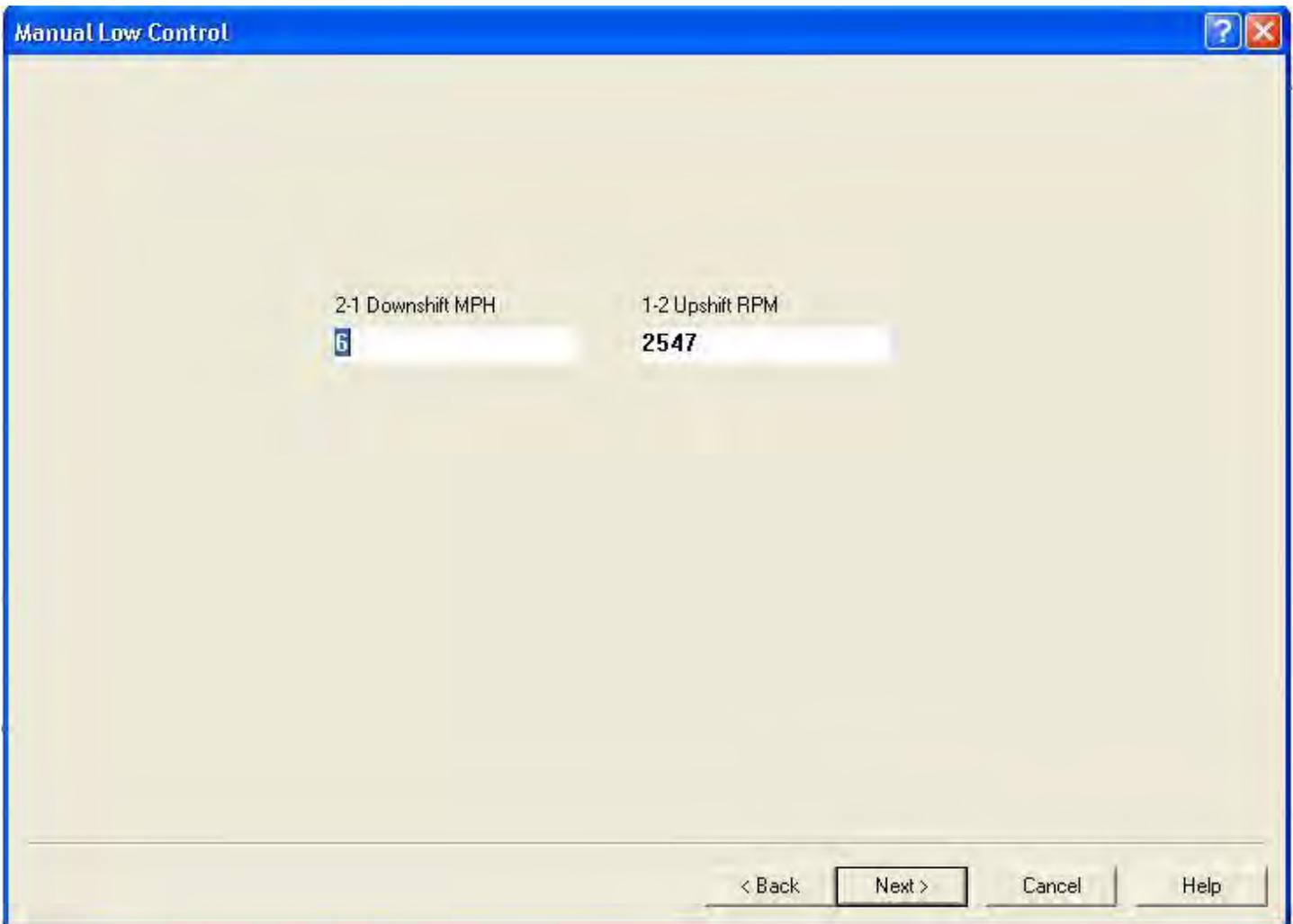


Figure 16 Manual Low Control

Step 17 Speedometer Output Settings

This is where you decide if you want to use the Speedometer Output wire for other electronics on your vehicle that require the Vehicle Speed Sensor signal. See Figure 17. Three options are:

- 1) Speedometer Output Disabled – not to use it at all
- 2) Replicated Speed Sensor Output – this is a direct pass through where the TORC module does NOT modify the signal it receives from the Vehicle Speed Sensor.
- 3) Ratio-Corrected Speedometer Output – using the “Speedometer Pulse Ratio” field shown below you can adjust this number up or down to calibrate your speedometer to read the exact MPH your vehicle is traveling. It is useful to have a GPS device that reads MPH in hand when comparing and adjusting this option.

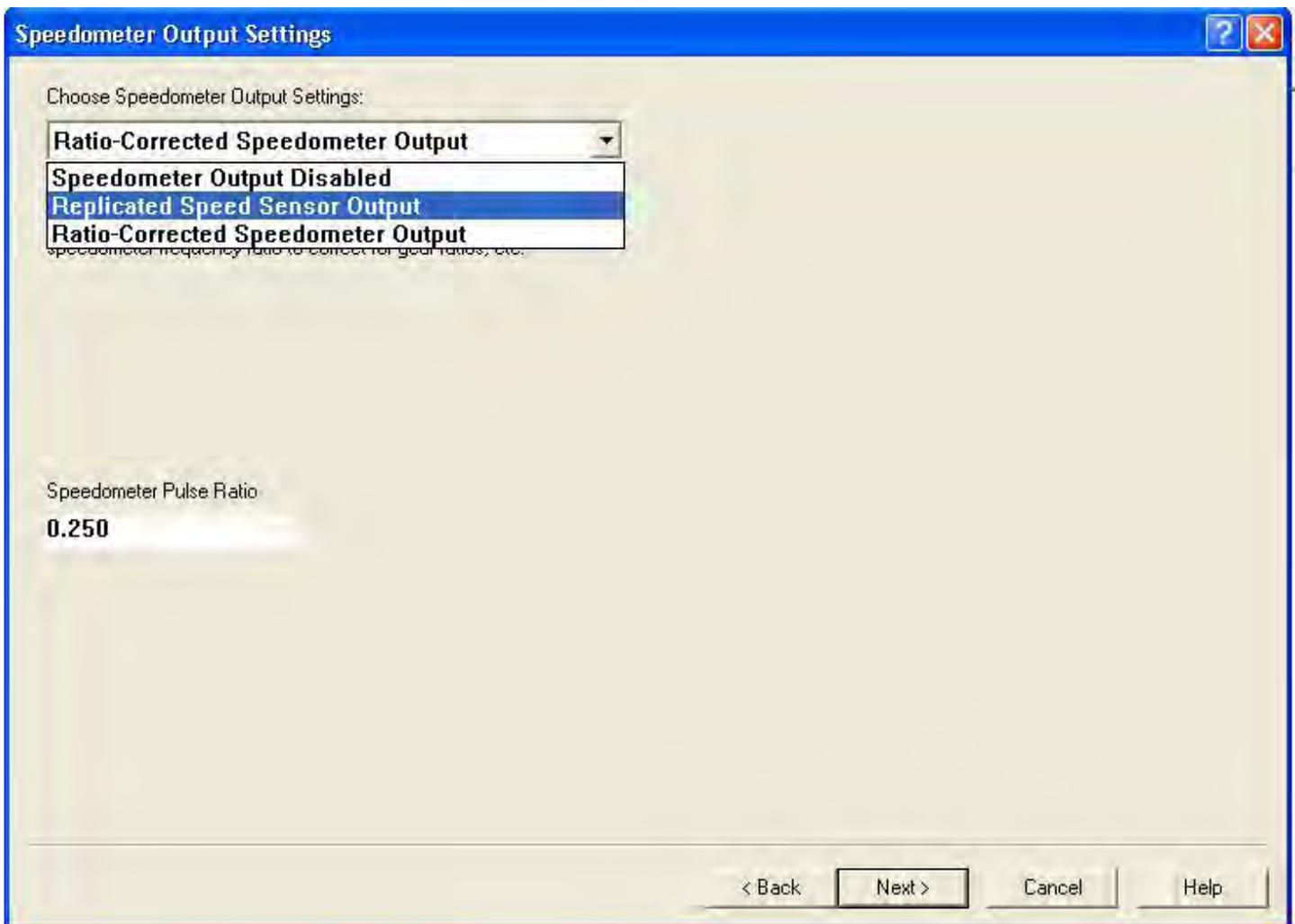
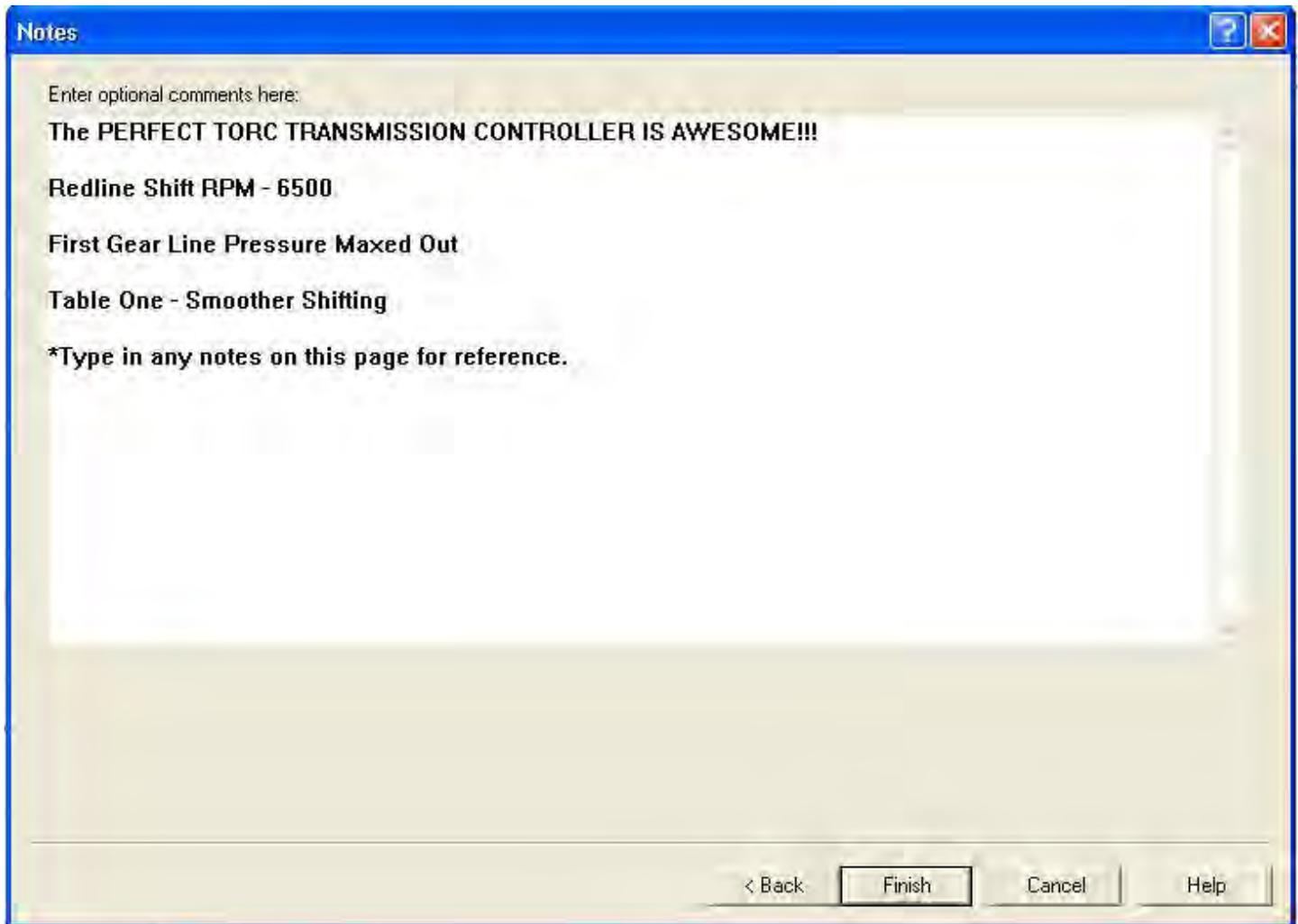


Figure 17 Speedometer Output Settings

Step 18 Notes

This page is just for keeping any notes on any changes made to each calibration. If you are on Table 1 then you can create a separate set of notes for it or if you're on Table 2 you can do the same. See Figure 18 below.



The image shows a screenshot of a software dialog box titled "Notes". The dialog box has a blue title bar with a question mark icon and a close button. The main area is a light-colored text field containing the following text:

Enter optional comments here:
The PERFECT TORC TRANSMISSION CONTROLLER IS AWESOME!!!
Redline Shift RPM - 6500
First Gear Line Pressure Maxed Out
Table One - Smoother Shifting
***Type in any notes on this page for reference.**

At the bottom of the dialog box, there are four buttons: "< Back", "Finish", "Cancel", and "Help". The "Finish" button is highlighted with a black border.

Figure 18 Notes

Diagnostics and Tuning Interface

Introduction – Diagnostics and Tuning Interface

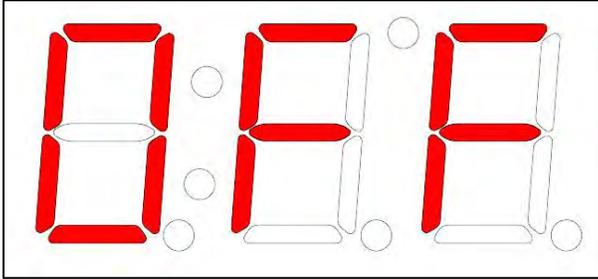
The PERFECT TORC system has a built-in DIAGNOSTIC MENU to allow most sensor values to be reviewed during transmission operation and allows the transmission to be manually shifted thru each gear. This is most useful to help diagnose possible transmission gear train issues or solenoid electronic issues.

The PERFECT TORC system also has a simple Tuning Interface capable of basic tuning of some transmission settings without the use of a laptop via the digital readout and Function Knob on the TORC controller. The Function knob will both rotate and push-click to choose different selections within each of the menus. Read about the meaning of each menu and selection in the following pages.



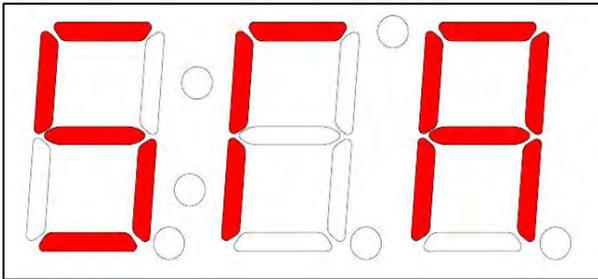
PERFECT TORC Controller –The **Function** Knob is next to the display.

Main Menu – The Ignition power must be in the position and the USB communication cable must be connected to both the TORC MODULE and Laptop for the following options.



OFF

In this mode the display is OFF and will nothing will be displayed.



STA – Status Display

This is the default display mode for the TORC controller.

The first character from the left shows what gear the manual lever has been moved to: Park, reverse, neutral, overdrive, drive, 2, 1. If there is a problem with the PSA (Pressure Switch Assembly) inside the transmission on the valve body, then an “E” standing for “Error” will be displayed.

The middle character is normally blank, but will show “P” if Manual Shift Mode (see page 37) is selected or an “L” if Manual Selection Mode is active.

The last character on the right shows the currently commanded or selected transmission gear.

See Figure 22 below to learn what information is displayed.

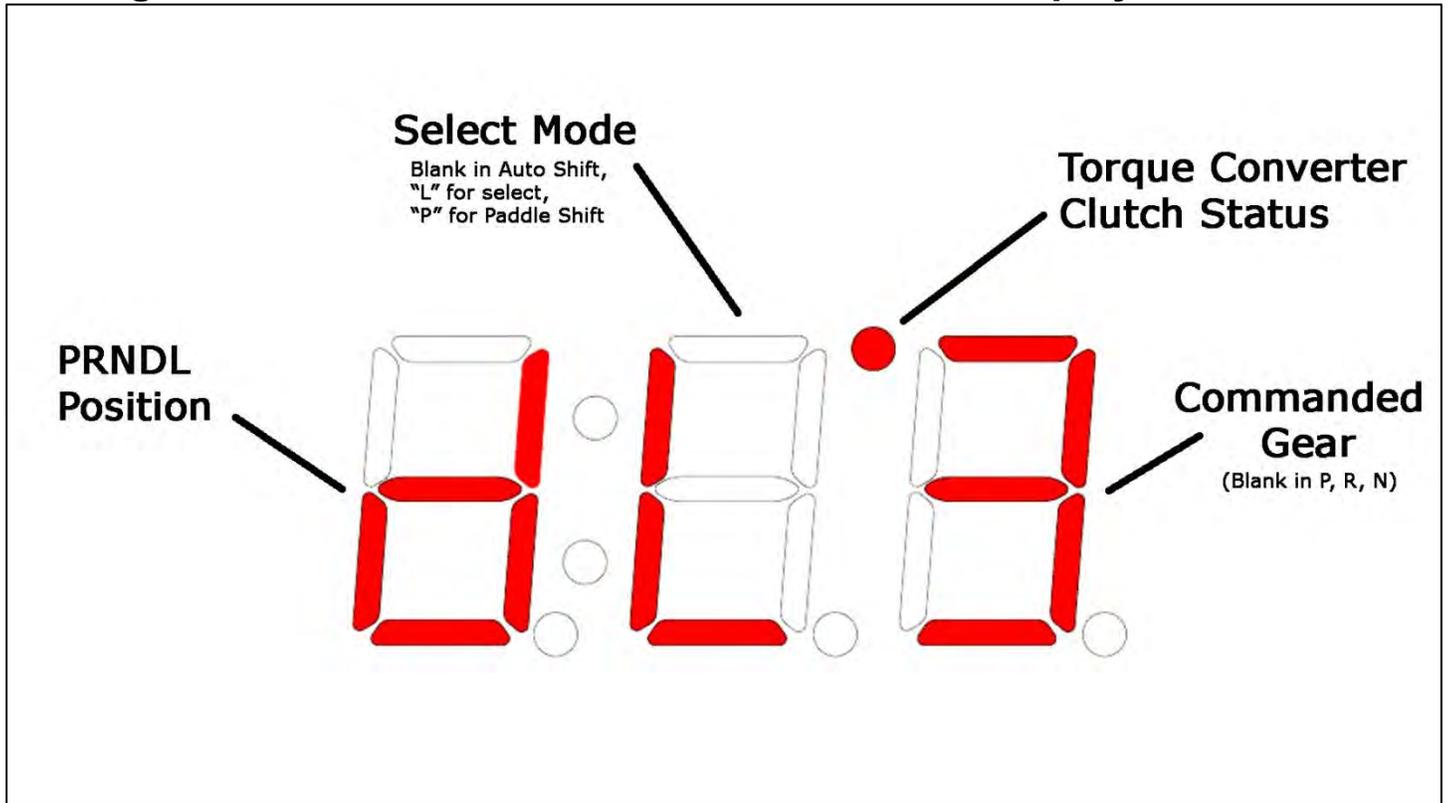
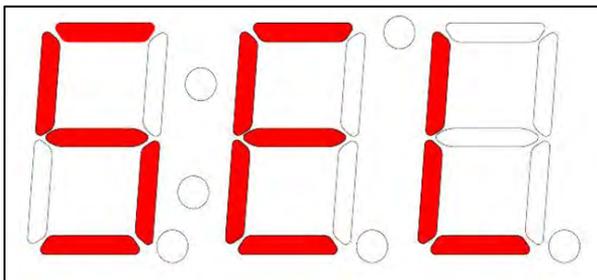


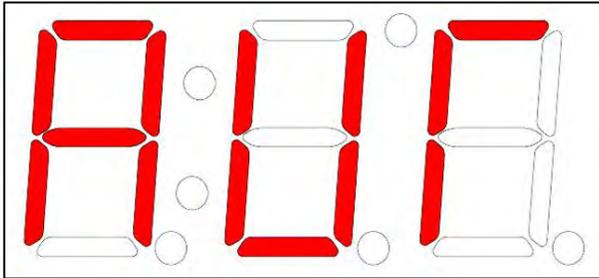
Figure 22 Status Display on TORC Controller Module



SEL – Manual Select

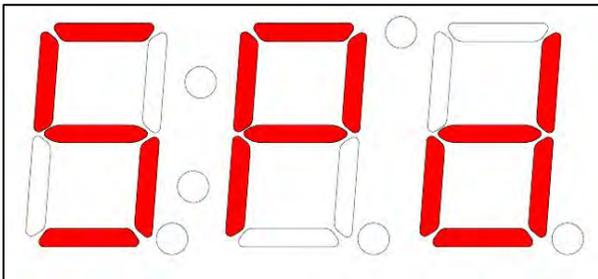
Once in Status mode, pushing the function knob one time will enable or disable Manual Select mode. Similar to Manual Shifting mode, Manual Select mode allows you to command a specific gear for the transmission to shift into. There is a safety feature built in to prevent a large rpm downshift that could cause your engine to over rev and/or your rear tires to slip. Manual Select mode is intended to be used as a diagnostic tool, so it does not enable all of the same features as

Manual Shift mode. Once enabled, simply rotate the Function Knob clockwise to up-shift or counter-clockwise to down-shift. The controller will remain in Manual Select mode until the Function Knob is pressed or the vehicle's ignition is turned off.



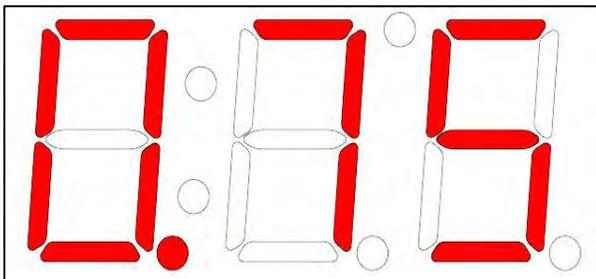
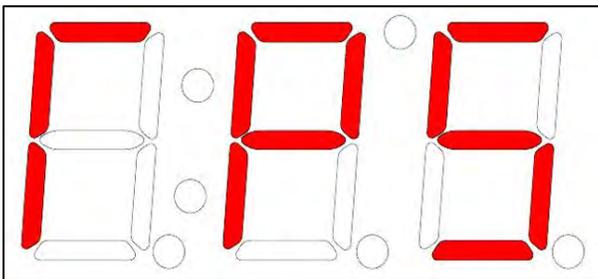
AUT – Automatic Select

This indicates you have left Manual Select mode and are in Automatic Select Mode.



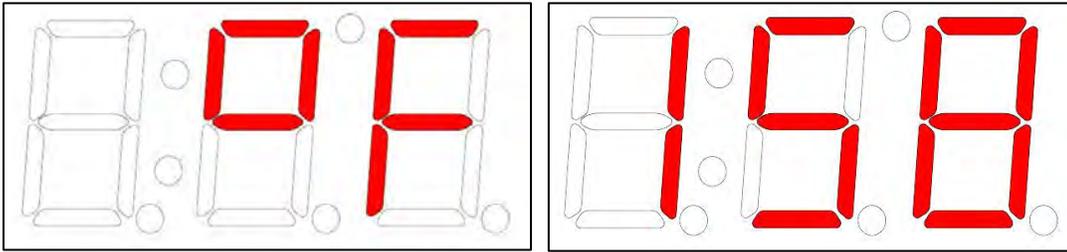
SPd – Speed

Indicates the vehicle speed based on the number of pulses received from the VSS (Vehicle Speed Sensor) in MPH (Miles Per Hour).



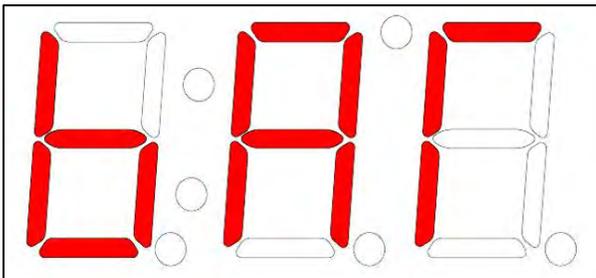
TPS Volts

Throttle Position Sensor signal in Volts.



TFT Sensor

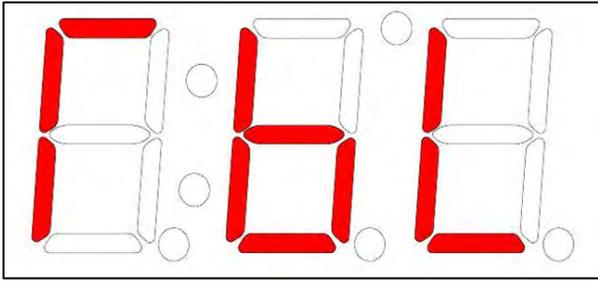
The Transmission Fluid Temperature Sensor is built into the PSA (Pressure Switch Assembly) which is bolted onto the valve body. The temperature of the transmission fluid in degrees Fahrenheit is displayed first by flashing the degree symbol of “°F” and then the actual numeric value will appear.



bAT – Battery Voltage

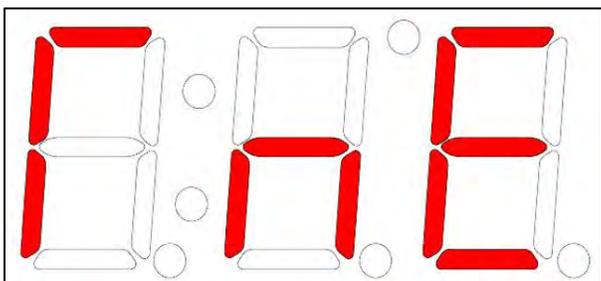
This is the voltage measured on the red wire in pin 9 on the Vehicle connector in the left side of the TORC module.

Note: The voltage must be at least 10 volts for the TORC module to be able to control the transmission. If the voltage at the controller does drops below this threshold the controller will not function properly.



TbL – Table

Scroll to this display to switch from one shift table to the other and wait 3 seconds for the screen to show which Shift Table is currently selected. **TB1** will display for Table 1 and **TB2** will display for Table 2. If you want to change from one table to the other push the Function Knob down once, rotate it right or left until the desired table is displayed and then push down the button one more time to select. **RET** will be displayed to indicate you have returned from select mode. You will also notice **rES** is an option; pressing the Function Knob with **rES** displayed will command the TORC module to look for a signal on the purple “Table Select” wire. When the purple wire is open or not grounded Table 1 will be used and when the purple wire is grounded Table 2 will be used. Only selecting the **TB1** or **TB2** in this menu will override the purple wires ground status. Once the ignition is cycled; the TORC controller will default back to sensing the purple wire.

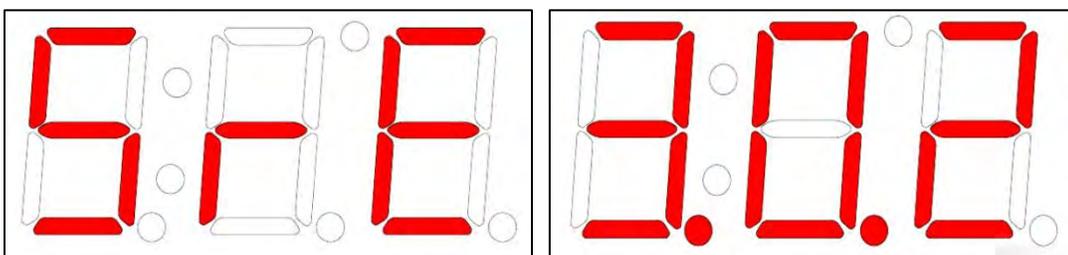


tnE – Tuning Mode

Tuning Mode allows for calibration of some of the most frequently used settings to be adjusted directly on the controller.

To enter Tuning Mode, simply scroll through the menu until **TnE** is displayed and press the Function Knob one time. For descriptions of each setting that is calibrateable in Tuning Mode see the Tuning Mode Menu on page 53.

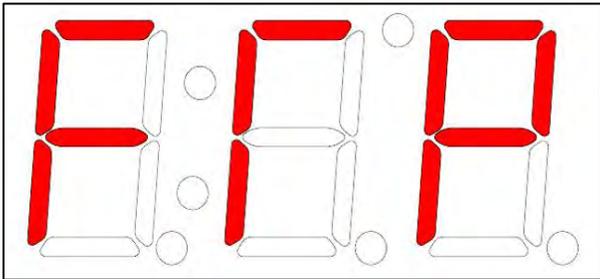
The TORC controller automatically creates a copy of the presently active calibration, when entering Tuning Mode to allow for “Live Editing” of the copied calibration without saving over your current functioning calibration. The original calibration is preserved until you choose to save over your changes. If you want to save your changes, simply scroll to **SAE** and press the Function Knob one time or if you don't want to save the changes scroll to **dIS** and press the Function Knob one time to discard the changes. If you choose to discard the changes they will be permanently deleted.



SrE - Software Revision – This identifies specifically what revision of software your TORC controller was manufactured with.

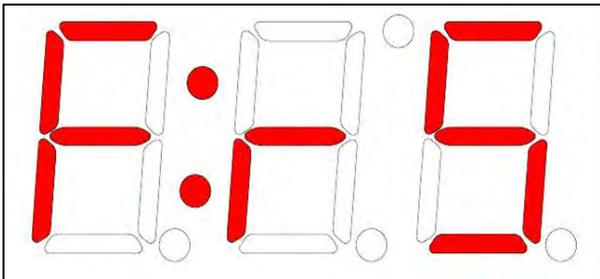
Diagnostic Codes

The TORC controller has several diagnostic codes to make you aware of when there is a problem with sensors, solenoids and pressure switches. If there is a serious failure with one of these components the TORC controller will display one of the following codes:



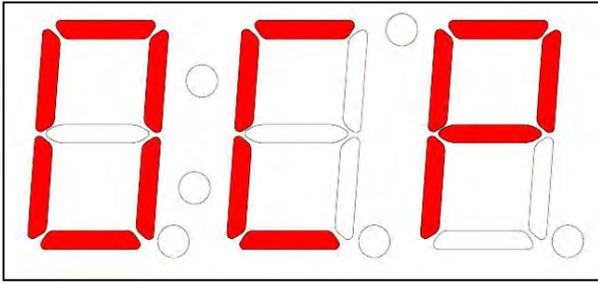
FTP – Throttle Position Sensor

This code is displayed if the TPS (Throttle Position Sensor) voltage is below the idle threshold that was set on page 36 figure 16 in the TORC calibration software setup wizard.



FrS – Pressure Switch Assembly

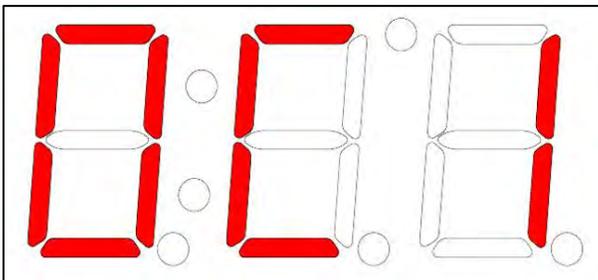
This code is displayed if the PSM (Pressure Switch Assembly) is not working correctly.



OCP – Over Current Pressure Control Solenoid

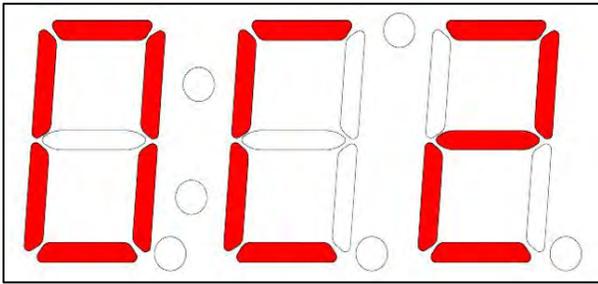
If the TORC controller senses an over current condition with the pressure control solenoid, it will attempt to disable the pressure control solenoid until the ignition is turned off. This code needs to be taken very seriously and the vehicle should not be driven until the problem is resolved.

NOTE: If it is absolutely necessary to drive the vehicle with this code; remove the 10 amp fuse from the main power wire on the TORC controller harness. This will ensure the transmission will stay in limp home mode regardless of the possible solenoid or wiring issue. By just following this step alone, the chances of saving your transmission from needing an overhaul because of a solenoid failure will increase greatly.



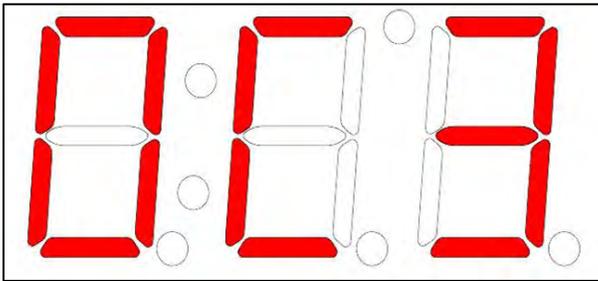
OC1 – Over Current Solenoid Bank 1

The solenoids in Bank 1 are Shift Solenoid B (or 2) and the Torque Converter Clutch (TCC) On/Off solenoid. (GM 4L60E transmissions only) Both solenoids should only have 20-40 ohms of resistance when measured at 68°F ambient. The TORC controller will attempt to disable the solenoid bank until the ignition is turned off.



OC2 – Over Current Solenoid Bank 2

The solenoid in Bank 2 is only the Shift Solenoid A (or 1). This solenoid should only have 20-40 ohms of resistance when measured at 68°F ambient. The TORC controller will attempt to disable the solenoid bank until the ignition is turned off.



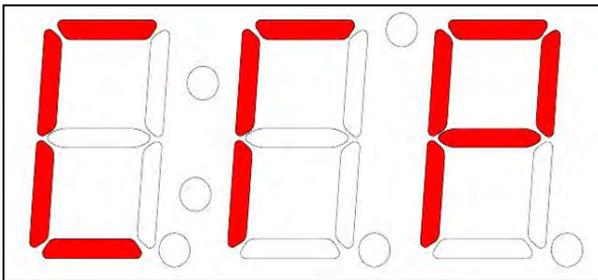
OC3 – Over Current Solenoid Bank 3

The solenoids in Bank 3 are the Torque Converter Clutch Pulse Width Modulated (TCC PWM) solenoid and the 3-2 downshift control solenoid. (GM 4L60E transmissions only) The TCC PWM solenoid should have 10-15 ohms of resistance with measured at 68°F ambient. The 3-2 downshift control solenoid should have 9-14 ohms of resistance with measured at 68°F ambient. The TORC controller will attempt to disable the solenoid bank until the ignition is turned off.

Tuning Menu Options

The following Tuning Menu Options are all calibratable by entering “Tuning Mode” **TnE** on the TORC controller using the Function Knob and Digital Display which are located directly on the controller.

Once a Tuning Menu Option is selected, the Function Knob can be rotated clockwise to increase the setting or counter-clockwise to decrease the setting. All changes will be effective immediately done in real time “Live Editing”, meaning all changes will take effect as soon as the knob is pressed to command the changes. To return to “Tuning Mode” after a calibration has been changed; press the knob a second time.

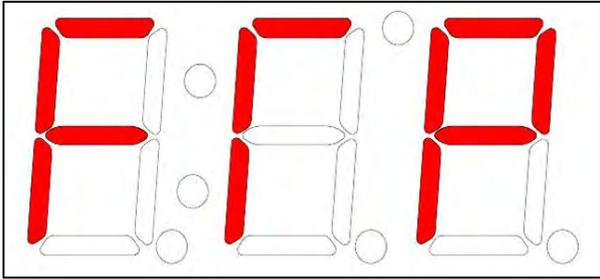


CTP – Closed Throttle Position

This option allows you to adjust the idle TPS (Throttle Position Sensor) voltage threshold. The TORC controller uses this voltage to determine where the idle position is and to prevent false detection of a TPS failure.

Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Once in adjustment mode, you can double-click the Function Knob (press it twice quickly) to automatically set this voltage. Before automatically setting this voltage, be sure the throttle body blade, accelerator pedal, carburetor or injector pump is at the hot idle position. On a carburetor it is especially important to make sure the choke is fully off and that

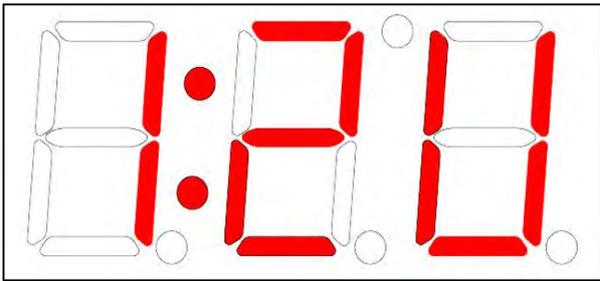
the primary throttle plates are in the hot idle position. The engine does not need to be running for this setting, but the ignition must be on.



FTP – Full Throttle Position

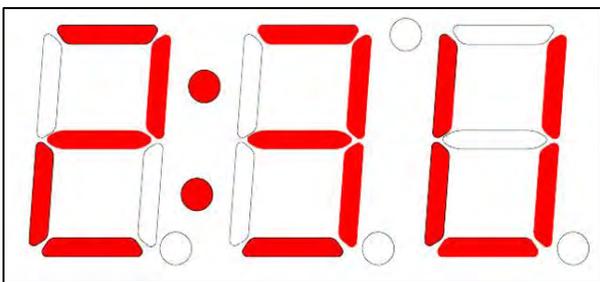
This option allows you to adjust the WOT (Wide Open Throttle) TPS (Throttle Position Sensor) voltage threshold. The TORC controller uses this voltage to adjust the system to the voltage span of your throttle position sensor or accelerator pedal position (APP) sensor. This ensures the full throttle shift points and the line pressure graph works properly.

Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. (Press once again to return to the menu) While in adjustment mode and with the engine off; press the accelerator to the floor and double click the Function Knob (press it twice quickly). Be sure your throttle cable allows you to truly reach WOT (Wide Open Throttle). Sometimes it may be necessary to manually throttle the engine from under the hood to obtain WOT; if this is so, be sure to adjust the cable/accelerator pedal to truly obtain WOT. The engine needs to be off during the adjustment of this setting; otherwise the engine will over rev and possibly cause serious engine damage.



1:2U – 1-2 Up Shift

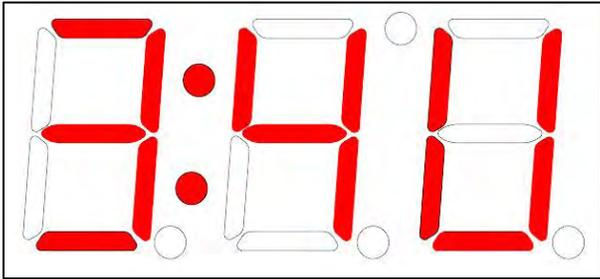
This option allows the adjustment of the full-throttle shift RPM for the 1-2 up shift. The RPM is displayed in thousands (e.g. 5.50 = 5,500 RPM). Keep in mind this is the RPM the shift is commanded electronically and that most transmissions take at least $\frac{1}{2}$ second for the hydraulics to react to the shift command. Taking that into consideration, it is not uncommon for the 1-2 shift to occur at 1000 RPM or more beyond this setting in faster vehicles. So, be sure to error on the lower side of your adjustments to prevent any vehicle/engine damage. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.



2:3U – 2-3 Up Shift

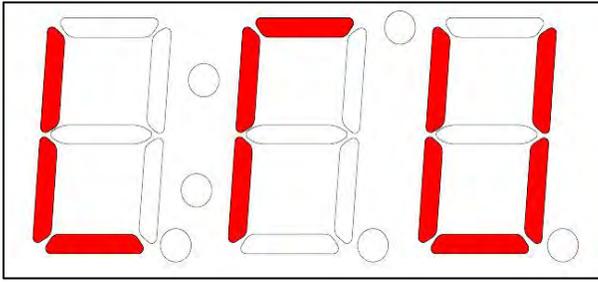
This option allows the adjustment of the full-throttle shift RPM for the 2-3 up shift. The RPM is displayed in thousands (e.g. 5.50 = 5,500 RPM). Keep in mind this is the RPM the shift is commanded electronically and that most transmissions take at least $\frac{1}{2}$ second for the hydraulics to react to the shift command. Taking that into consideration, it is not uncommon for the 2-3 shift to occur at 1000 RPM or more beyond this setting in faster vehicles. So, be sure to

error on the lower side of your adjustments to prevent any vehicle/engine damage. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.



3:4U – Up Shift

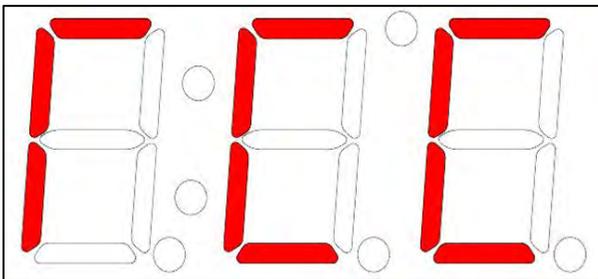
This option allows the adjustment of the full-throttle shift RPM for the 3-4 up shift. The RPM is displayed in thousands (e.g. 5.50 = 5,500 RPM). Keep in mind this is the RPM the shift is commanded electronically and that most transmissions take at least ½ second for the hydraulics to react to the shift command. Taking that into consideration, it is not uncommon for the 3-4 shift to occur at 1000 RPM or more beyond this setting in faster vehicles. So, be sure to error on the lower side of your adjustments to prevent any vehicle/engine damage. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.



LTU – Light Throttle Upshift

This option allows the adjustment of the light throttle shift RPM for all shifts. The value displayed is in thousands (e.g. 1.45 = 1450 RPM). The 1-2 and 3-4 shifts are scaled proportionally with the 2-3 shift RPM as it is changed. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.

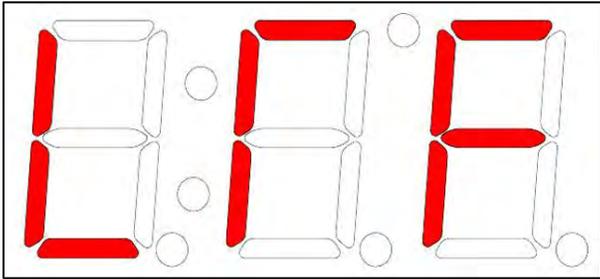
As the shift points are modified at either light or full throttle the values in between are automatically scaled proportionally. The light throttle RPM adjustment had the greatest effect at closed throttle and the influence of this adjustment diminishes to zero as you approach wide open throttle.



TCC – Torque Converter Clutch

This option allows for the adjustment of the approximate vehicle speed in MPH in which the torque converter clutch is commanded to lockup. All conditions calibrated in the TORC laptop software (see Figure 18 on page 38) must be met in order for the TCC to lockup. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob

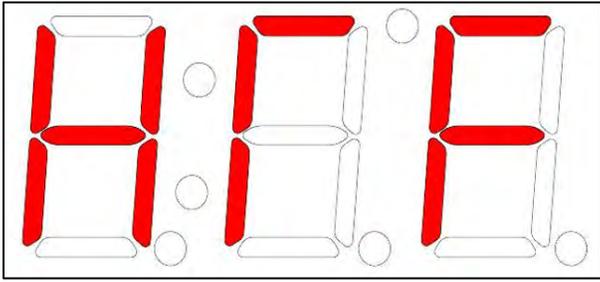
clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.



LTF – Light Throttle Firmness

This option allows the adjustment of light throttle shift firmness. This adjustment has a range from 0 to 55; 0 being the softest and 55 being the firmest. This should not be adjusted until after the shift points are set since the light throttle shift points have a considerable effect on shift feel. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.

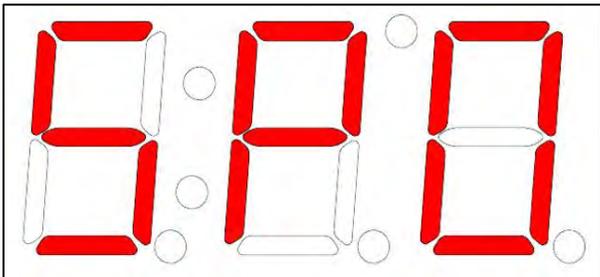
As the shift firmness is modified at light throttle the values in between are automatically scaled proportionally. The light throttle RPM adjustment has the greatest effect at closed throttle and the influence of this adjustment diminishes to zero as you approach wide open throttle.



HTF – Heavy Throttle Firmness

This option allows the adjustment of heavy throttle shift firmness. This adjustment has a range from 0 to 30; 0 being the softest and 30 being the firmest. This should not be adjusted until after the shift points are set since the heavy throttle shift points have a considerable effect on shift feel. Press the Function Knob once to enable the adjustment mode and allow the rotation of the knob to change this setting. Rotating the knob clockwise will increase the RPM setting and counter clockwise will decrease the RPM setting. Pressing the Function Knob once more will return you to the Tuning Menu.

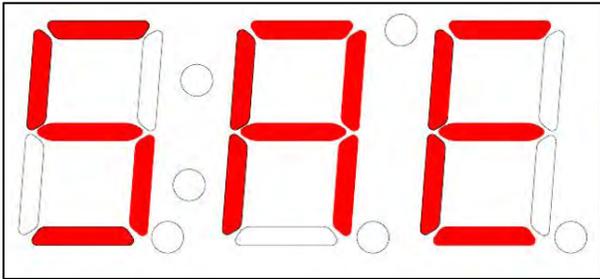
As the shift firmness is modified at full throttle the values in between are automatically scaled proportionally. The heavy throttle RPM adjustment has the greatest effect at wide open throttle and the influence of this adjustment diminishes to zero as you approach closed and light throttle.



SPO – Speedometer Output

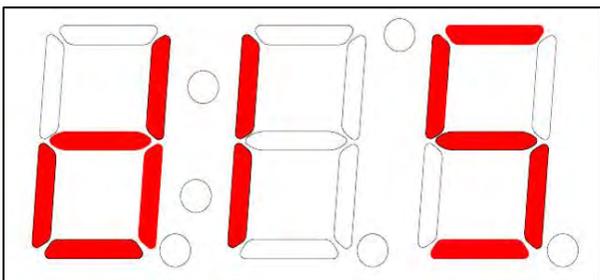
This option allows for the adjustment of the output signal on the tan wire printed “Speedometer Signal Output”. This wire is located in Pin 12 on the Vehicle connector. There are three options for this output: 1) OFF (output disabled), 2) rEP (replicated speed sensor output) this is a pass-through of the OEM signal, 3) Correction Factor (this allows for

the adjustment of the signal which is output) Adjusting this up or down will either multiply or divide from what is being sent to the speedometer. This option is particularly useful in tuning an aftermarket speedometer to be EXACTLY correct. The adjustment will be visible on the speedometer immediately. However, the changes will not be saved until the Save and Exit (SAE) is executed.



SAE – Save and Exit

This will save all of the changes made while in “Tuning Mode” to the currently selected table and then exits to the Main Menu. All of the changes will be lost if the Function Knob is not pressed once when “SAE” is displayed. If the Ignition power is turned off before this is executed any/all changes will be lost.



dIS – Discard and Exit

This will discard all of the changes made while in “Tuning Mode” to the currently selected table and then exits to the Main Menu. This allows you to experiment with different calibration changes and then if you didn’t like the outcome, simply choose “dIS” and the TORC

controller will revert back to the unmodified calibration. All of the changes will be permanently lost.

Painless Performance Limited Warranty and Return Policy

Chassis harnesses and fuel injection harnesses 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.