D2A   TPS Signal Converter (V4.5) and Scaler(Analog or SENT protocol)

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Common Uses

In D to A mode the **D2A** can be used to decode a GM LT digital SENT protocol throttle position sensor signal and convert it to the corresponding dual 0-5V analog signals. The signals can be re-scaled and/or inverted as needed.

In A to D mode **D2A** can be used to convert a pair of analog throttle position sensor signals to a digital signal. The signals can be re-scaled and/or inverted as needed.

In A to A mode the **D2A** can be used to change the ranges and/or directions of analog TPS signals.

Installation

The **D2A** should be mounted where it will not be exposed to high temperatures.

Download and install the D2A PC app from http://torquerush.com/downloads.html

Connection to a PC for Programming/Logging/Firmware Updates

Remove the back cover from the D2A to access the USB connector. Connect with the supplied USB cable.

Wiring Connections:

Pink -- 5V out to throttle body

Black – ground/low ref from throttle position sensor wiring of ECU/TAC Module

Yellow– ground to engine

* Light Green – digital(J2716 SENT) signal from throttle position sensor

* White – SENT digital TPS signal out

Dark Green – TPS1 0-5V output signal

Purple – TPS2 0-5V output signal

Grey and Orange wires – analog inputs from throttle body for A to D and A to A modes

Red – 12V supply. *must be constant fused(2 amp) 12V for many vehicles. Tick "Constant 12V" when programming the device.

Blue – 5V sense/Device wakeup - connects to 5V throttle reference from ECU/TAC module for systems using a constant 12V supply. (must be the Blue/Black wire for 2003-2007 GM trucks and Holden LS1 cars)

Twisted 3 wire pigtail - CAN bus connections – Yellow - CAN H, Brown - CAN L, Black – Ground (capability to read specific bus data, finding CAN messages of interest, etc., connection not currently required)

* These 2 wires may be folded back inside the wire loom. If using the D2A for a digital TPS application, the required wire may be swapped in the connector housing with one of the other wires that is not being used.

Mode

A to A is used if you simply want to re-scale, flip, etc. an analog signal

D to A GM is used to convert the digital(SENT) signal from newer 5 wire GM LT throttle bodies to the corresponding analog signals. No scaling is required if you only need to output the analog versions of the two encoded signals. Simply set the D2A in D to A mode. Otherwise, scale as required for your application.

A to D GM converts the 2 signals from an analog output throttle body to GM digital (SENT) signal compatible with newer ECUs that use the SENT protocol.

D to A Ford s used to convert the digital(SENT) signal from newer 5 wire Ford throttle bodies to the corresponding analog signals. No scaling is required if you only need to output the analog versions of the two encoded signals. Simply set the D2A in D to A Ford mode. Otherwise, scale as required for your application.

Scaling can be applied to all modes.

The D2A should be re-booted after changes to the mode. Remove, then reconnect power from the device (including USB power).

Scaling the Outputs

The output signals can be re-scaled to simulate those of any 0-5V TPS signal throttle body. The signals can be scaled to move in the same or opposite directions(rising/falling). Each signal can have its own maximum, minimum and slope.

Method 1 - using the preset values if applicable to the application:

1. With the unit and vehicle powered up, key on/engine off, connect the USB cable between the **D2A** and your PC with the **D2A** app running on it. You should see "12V" in the upper right corner of the D2A app.

2. Under "Select Emulation" select the vehicle/ECU type in which the **D2A** has been installed.

3. If available under "Connected TB Type," select the new throttle body type you are using.

4. Click "Program Device" to program the values into the device.

Method 2(most accurate) – recording the actual output ranges of the throttle bodies:

1. With the unit and vehicle powered up, key on/engine off, connect the USB cable between the **D2A** and your PC with the **D2A** app running on it. You should see "12V" in the upper right corner of the D2A app.

2. Disable all existing scaling by clicking the "Undo" button.

3. Under "Enter New Ranges" (Closed/Open) set the maximum and minimum sensor output values for the throttle body you wish to emulate. Typical values for some known applications are available from the "Select Emulation" drop down list. Otherwise, these should have been obtained in a similar manner as used for the new throttle body in step 4, by moving the blade of the original throttle body by hand to full closed and full open. These values cannot be obtained by using the pedal to actuate the throttle body.

4. Under "Connected TB Type" select "Record Direct from TB".

5. If applicable, tick the appropriate check box(es) to program special features for the vehicle or input type.

6. Click "Record" to capture the peak and minimum values for the digital throttle or analog throttle body by moving the blade by hand to the full closed and full open stops. (**Push it in both directions from its neutral position where the springs hold it).

**For the above mentioned Ford throttle bodies, you should move the blade slowly and smoothly as the D2A app also needs to capture data between the full open/full closed positions. Take 10 -15 seconds to move the blade from full closed to full open.

7. Click "Stop" then click the "Program" button to apply the new settings.

8. Remove the USB cable and de-power, then re-power, the device to allow it to re-boot. You can simply unplug it if it is powered by constant 12V.

Use Existing

Tick this checkbox if you <u>only</u> wish to update the output(emulation) ranges from the **D2A**. Previously programmed input ranges recorded from the replacement throttle body will not be overwritten. You will not need to record them again. Select "Custom" under "Select Emulation" and enter the desired values in the TPS1/TPS2/ Closed/Open text boxes. Then click "Program".

Swap Analog Inputs

When using the preset values from the drop down list for connected throttle body types, depending on your input wiring, and if that throttle body type does not have identical ranges for both sensors, you may need to swap the ranges(Range = Peak - Min) that were populated for TPS1 and TPS2. The "Swap" button will swap the TPS1 values with the TPS2 values each time you click on it. This feature is not used when manually recording the ranges from the new throttle body.

Analog Sampling Rate

It is not likely that the default value of 10 kHz needs to be changed, but if needed for a particular application, the input sampling rate in A to A or A to D modes can be fine tuned.

Other PC App Buttons

Top Toolbar

"Update" will open the Firmware Update window.

"Find Device" will reset the connection to the D2A without closing and re-opening the app if there was a connection issue.

"DTC" will allow you to view or clear the stored fault record. The button will have a green background if there are no stored faults when the D2A is connected to the PC or when a Settings Report is requested. It will be red if the fault record is not empty.

"Settings" will retrieve the current settings of the D2A.

"Help" opens this document.

"Program" transfers the new input/output data to the D2A.

"Undo" clears all customized settings from the device. Output values will mirror the associated input values.

Chart Toolbar

Clicking the "Outputs" or "Inputs" buttons will toggle between which data is shown in the chart. Other than Ford digital, before any custom programming has been applied to the D2A, or after an "Undo", inputs and outputs will be identical. Ford digital outputs a counter value rather than a TPS2 value. This will be shown when "Inputs" is selected.

"Live" will stream data from the D2A to the app without recording the data.

"Record" will stream data with the option to save it to a log file.

"Stop" will end data recording or playback of a log file.

"Save" will open a save to file dialog for the current recording.

"Play" will re-play the current recording or live view session. Or select a previously recorded log file for playback by clicking the drop down arrow.

"Pause" allows you to pause and resume playback at any point and resume. Click "Stop" rather than "Resume" if you wish to end playback.

"Reset Chart" will clear all current data.The min/max slider control allows you to adjust the playback speed before or during playback.

"Send to TRP" will send either device settings or a selected log file to TRP support if requested.

DIP Switch Settings

A1 – off if switch installed
A2 – off if switch installed

0-5V Dual Voltage Outputs on Dark Green and Purple wires
B1 – ON
B2 - OFF
C1 - ON
C2 - OFF

D1 – CAN Bus termination resistor enable
D2 – Not used

Firmware Updates

Download and install the current version of the **D2A** PC app from http://torquerush.com/downloads.html
If available, firmware updates may be installed to the **D2A** by one of the following procedures.
*You must use the current version of the PC app to access all functions of the current firmware.
Click the "Update" button at the left end of the top tool bar.

Method 1 – Auto Update is available in current PC app versions. Your PC must be connected to the internet. Click the "Auto Update" button in the top tool bar.

Method 2 - Manual Update:
1. Download and save the latest firmware file from http://torquerush.com/downloads.html
   TRPD2A_V1.trp for V1 units, TRPD2A_V2.trp for V2 units, or TRPD2A_V3.trp for V3 units.
2. Click the "Manual Update" button.
4. Disconnect the **D2A** from vehicle power. Remove the cover from the **D2A** enclosure and connect it to your PC using an appropriate USB cable.
5. Browse to and select the the appropriate ".trp" firmware file.
6. Click "Update Module Firmware".

LED Status Indicator (Firmware version 150+)

When the device is running, the LED will be flashing at a fast rate. The LED should not be flashing when the ignition is off. Fault codes flash at a slower rate.

Blink fault codes:

Single Blink

1 single blink = D to A mode- loss of input signal

2 single blinks = A to D mode- loss of input signal(s)

3 single blinks = A to A mode- loss of input signal(s)

4 single blinks = A to D or A to A mode- TPS values outside of normal range

5 single blinks = D to A mode- digital throttle body reports a fault with one of the 2 sensors
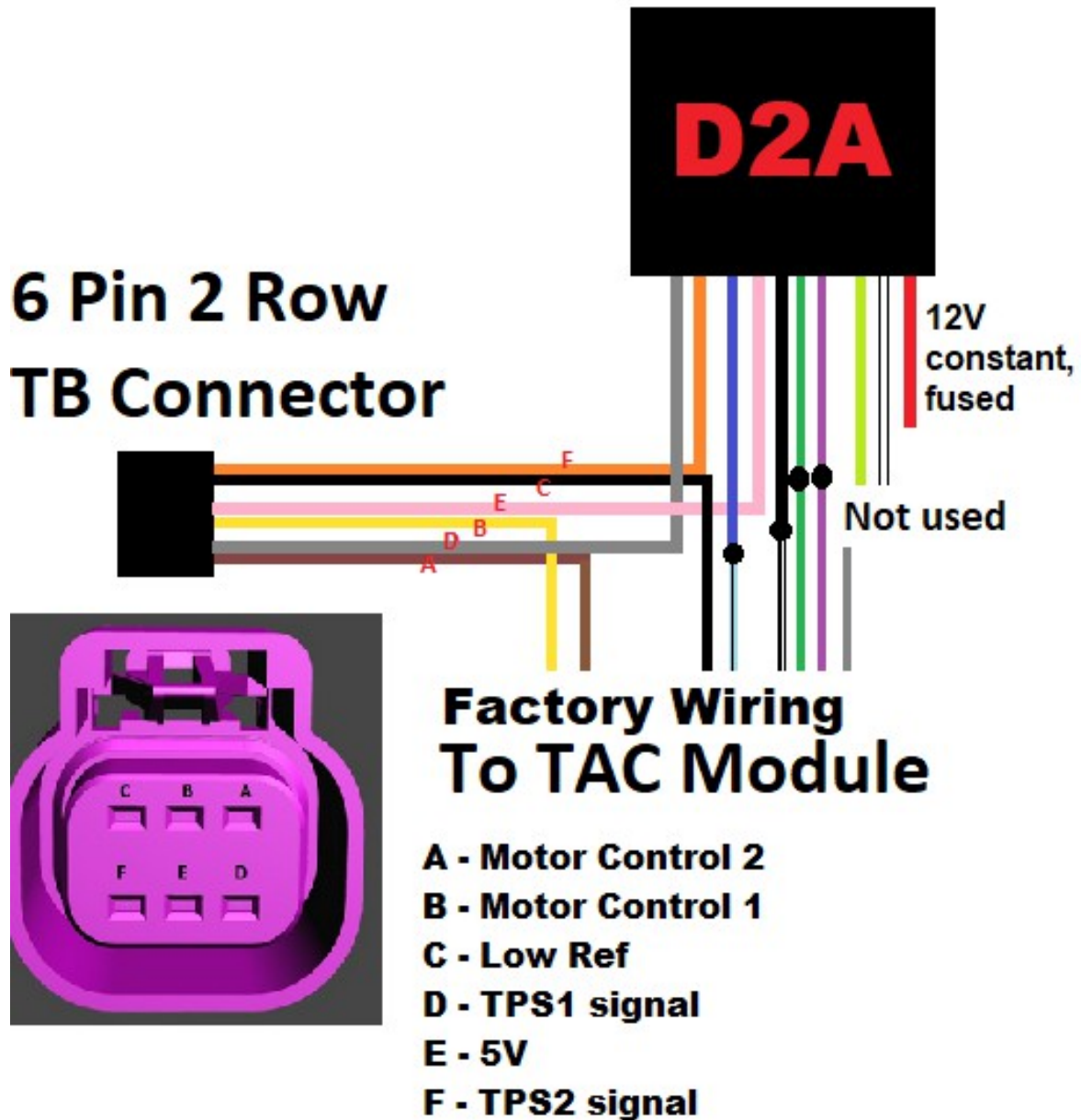
6+ single blinks = Processor fault

Double blinks (Ford 4+2 wire type throttle bodies)

1 double blink = TPS1 input(grey wire) outside of learned range

2 double blinks = TPS2 input(orange wire) outside of learned range

3 - 6 double blinks = Disagreement between TPS1 and TPS2 inputs base on the learned ranges.

*If in a fault state, correct the source of the error, de-power, then re-power the device to reboot it.
 This includes removing USB power.

# 2001-2002 GM Full Size V8 Truck Wiring

D2A to 2001-2002 GM Truck

D2A

6 Pin 2 Row TB Connector

12V constant, fused

Not used

Factory Wiring To TAC Module

A - Motor Control 2
B - Motor Control 1
C - Low Ref
D - TPS1 signal
E - 5V
F - TPS2 signal

2003-2007 GM Full Size V8 Truck Wiring

D2A to 2003 - 2007 GM Truck /Holden LS1

Analog to Analog(re-scale) Mode

D2A

6 Pin 2 Row
TB Connector

Not used

12V Constant
(fused) e.g. PCM B circuit

Not used

16 8   2,3,9,10,1,11
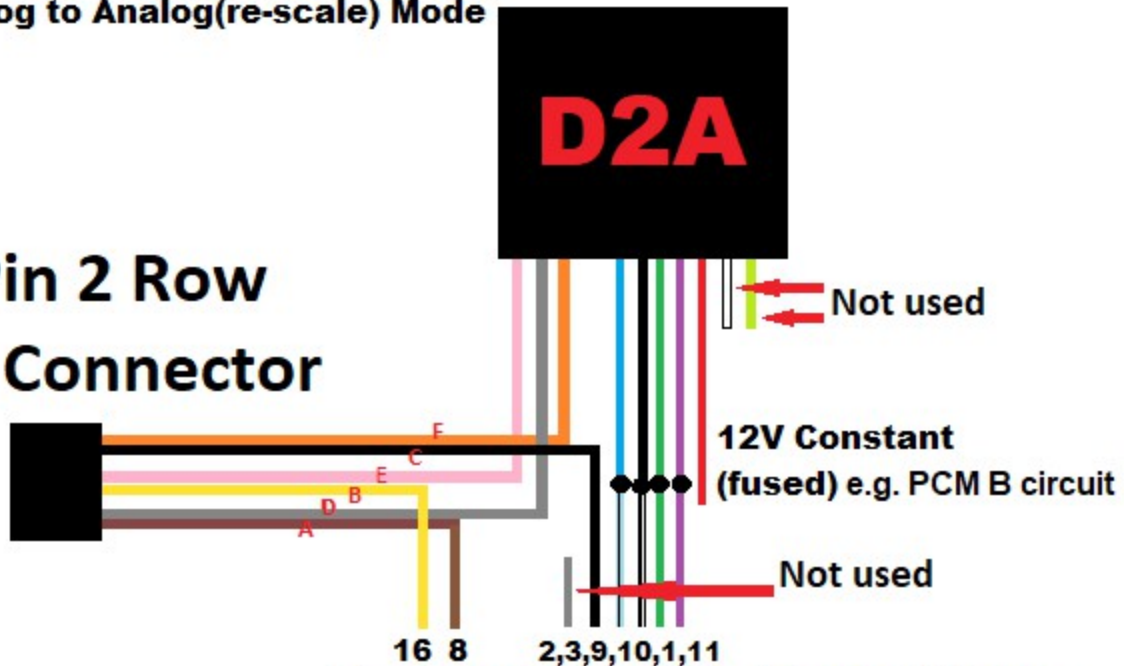
Factory throttle Body Wiring
From TAC Module C1

A - Motor Control 2
B - Motor Control 1
C - Low Ref
D - TPS1 signal
E - 5V
F - TPS2 signal

LS1, LS6 North American Car Wiring

D2A to LS6

Analog to Analog(re-scale) Mode

D2A

6 Pin 2 Row
TB Connector

F
C
E
B
D
A

12V constant fused

3,2,10,1,11

16 8
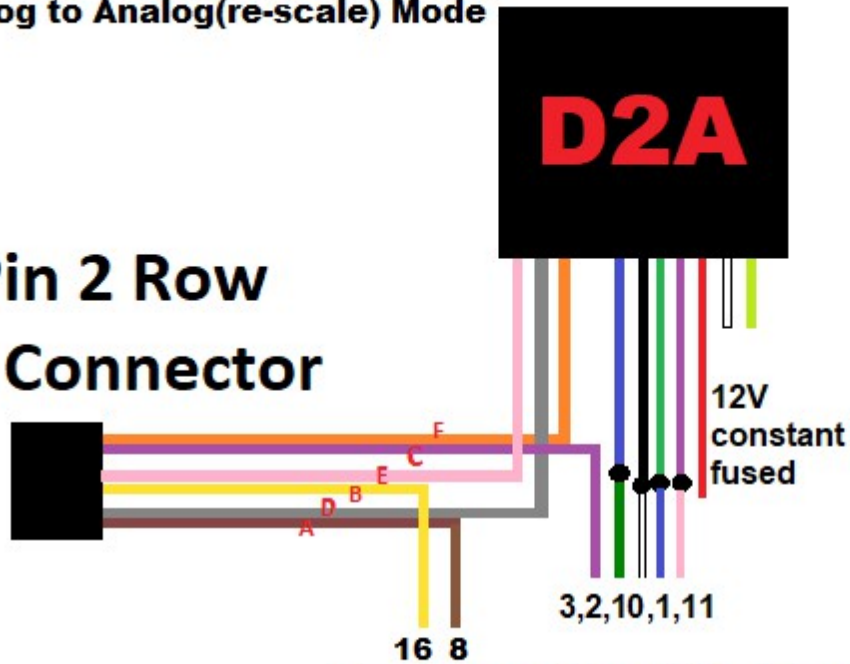
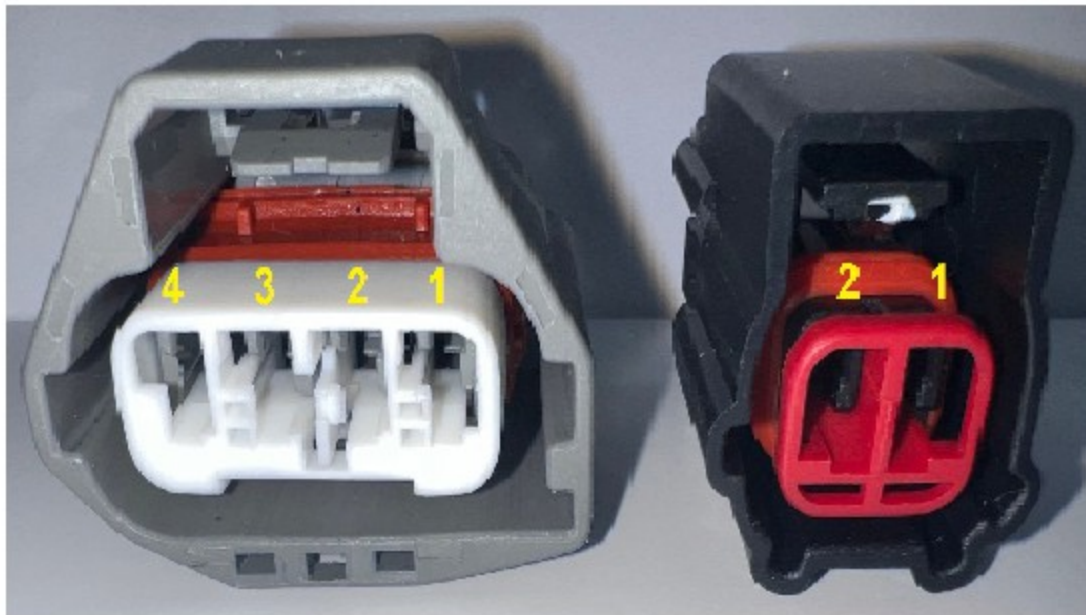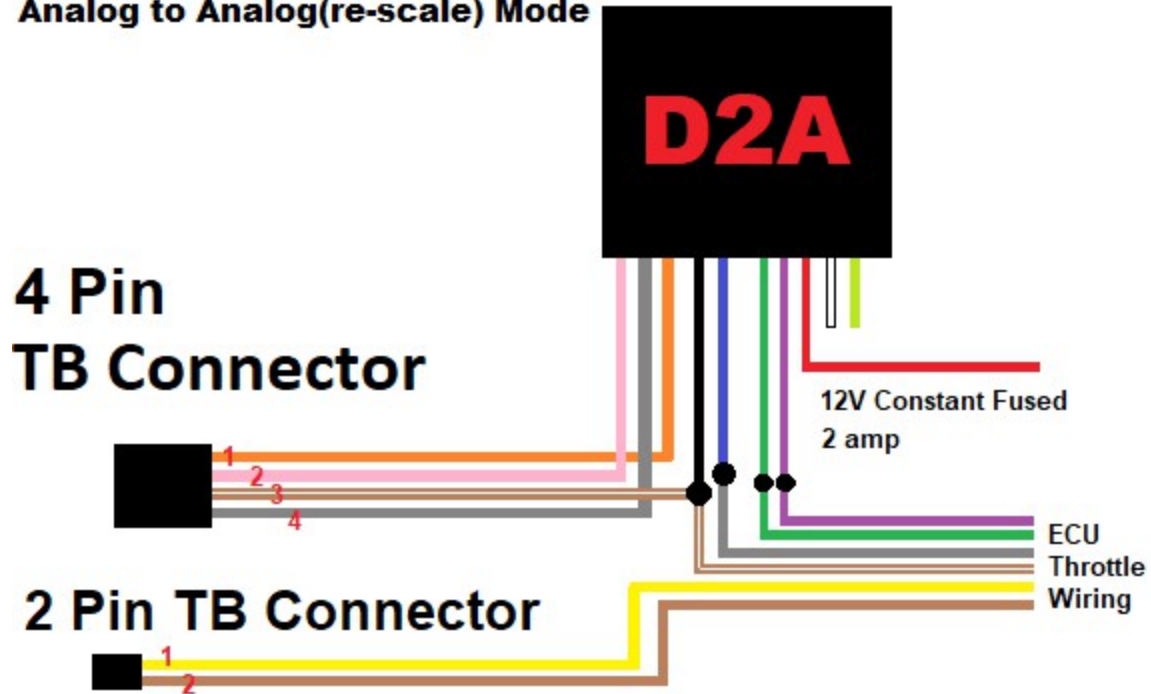## Factory throttle Body Wiring
From TAC Module 16 Way Connector

A - Motor Control 2
B - Motor Control 1
C - Low Ref
D - TPS1 signal
E - 5V
F - TPS2 signal

Ford 4 + 2 Throttle Systems

D2A to LS2 with Ford 4 + 2 Throttle Body
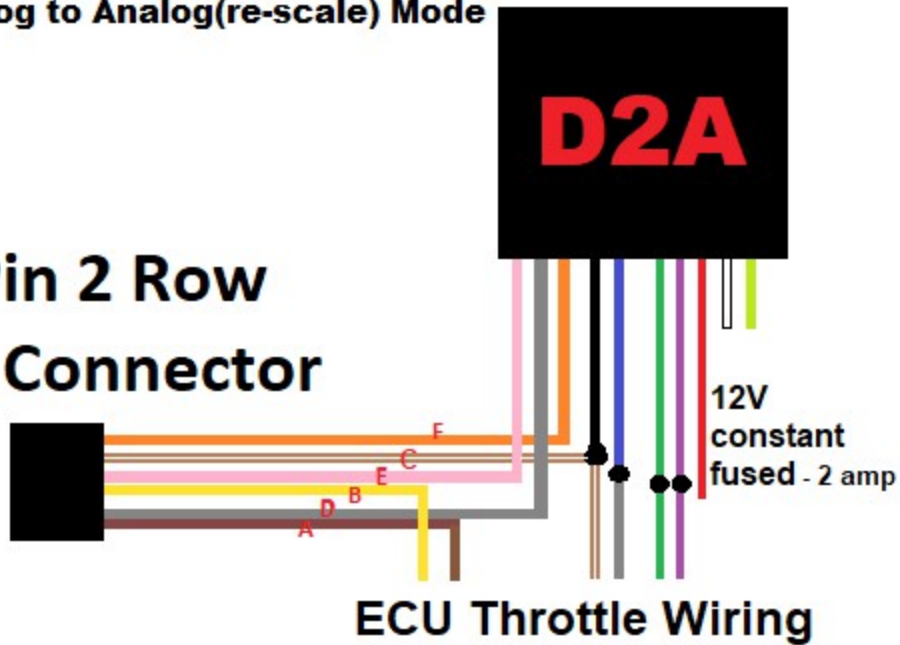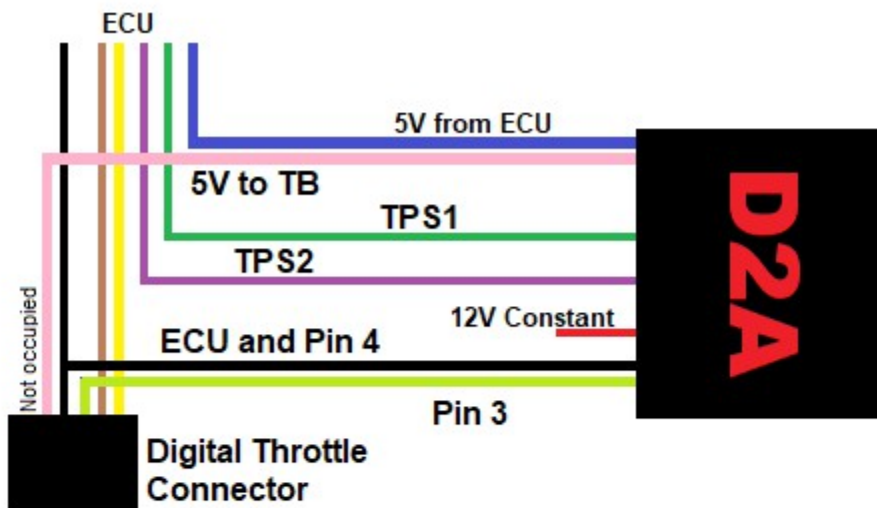### Analog to Analog(re-scale) Mode

D2A

4 Pin TB Connector

1
2
3
4

2 Pin TB Connector

1
2

12V Constant Fused 2 amp

ECU
Throttle
Wiring

4 3 2 1

2 1

D2A to LS2, L76

Analog to Analog(re-scale) Mode

D2A

6 Pin 2 Row
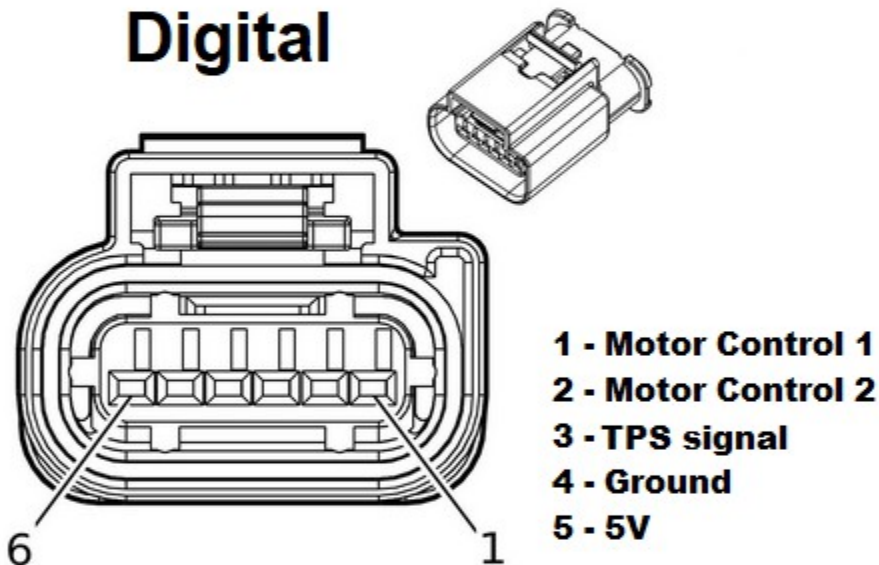
TB Connector

12V
constant
fused - 2 amp

ECU Throttle Wiring

A - Motor Control 2
B - Motor Control 1
C - Low Ref
D - TPS1 signal
E - 5V
F - TPS2 signal

Ford Digital to Analog

ECU

5V from ECU

5V to TB

TPS1

TPS2

12V Constant

ECU and Pin 4

Pin 3

D2A

Not occupied

Digital Throttle
Connector

Digital

1 - Motor Control 1
2 - Motor Control 2
3 - TPS signal
4 - Ground
5 - 5V

6

1

Analog

1 - Motor Control 1
2 - Motor Control 2
3 - TPS2
4 - Ground
5 - 5V
6 - TPS1

6

1
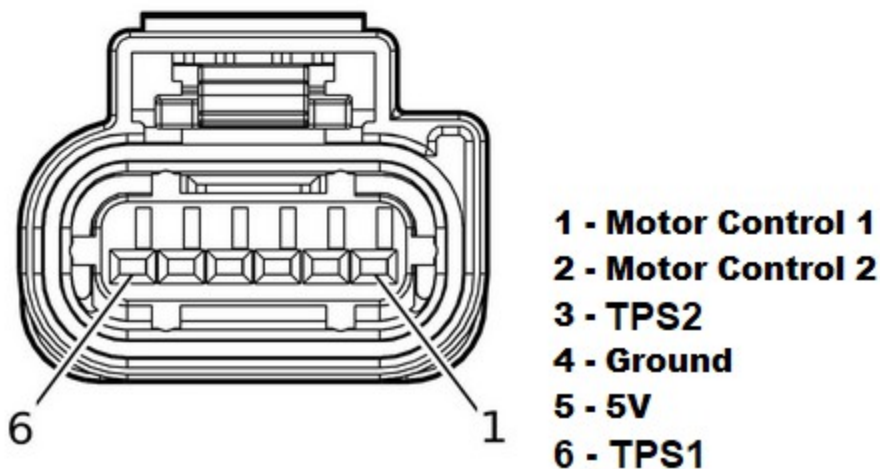
GM LT Digital Throttle Signal Decode

LT Decode
(Digital to Analog)
Option 1

To ECU

Not occupied

Wake up

TPS1 Out

TPS2 Out

12V Switched

4

3

D2A

Throttle
Connector

1 - Motor Control 1
2 - Motor Control 2
3 - TPS signal
4 - Ground
5 - 5V

6   1
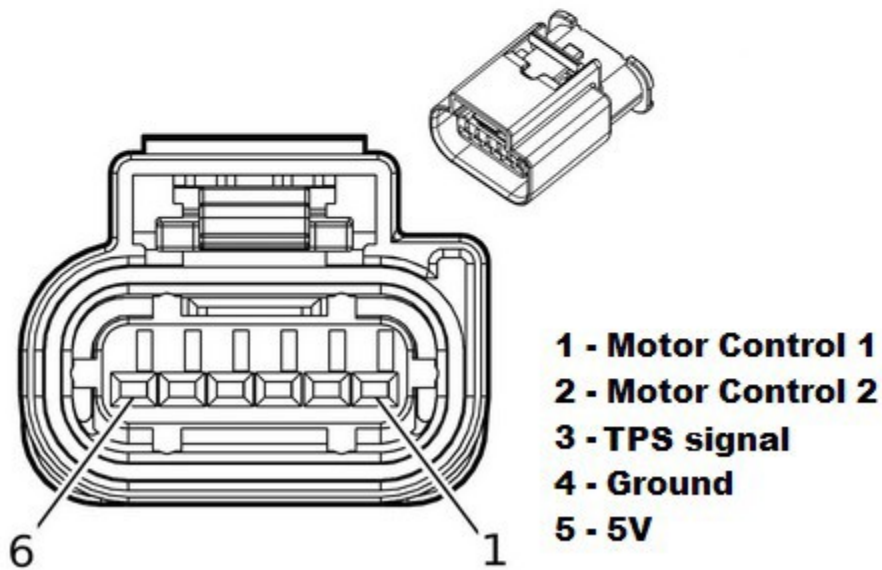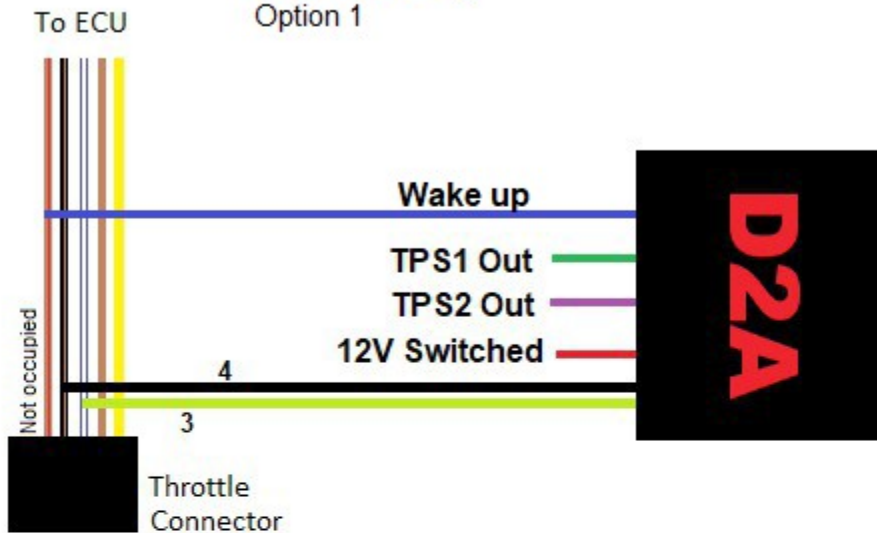
LT Decode Option 2
(Digital to Analog)

To ECU

Not occupied

Wake up

5V

TPS1 Out

TPS2 Out

12V Switched

D2A

4

3

Throttle
Connector

1 - Motor Control 1
2 - Motor Control 2
3 - TPS signal
4 - Ground
5 - 5V

6

1