CORE ECU

INSTALLATION GUIDE

27 August 2024

REVISION HISTORY

Date	Revisions
August 2024	Initial Release
August 27, 2024	Updates to automatic transmission wiring

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INTRODUCTION

Thank you for purchasing HP Tuners CORE ECU.

All of our hardware, firmware, and software designs undergo rigorous testing. All products are individually tested before they ship to ensure you receive a working product. Please read all the associated documentation to get the most out of your Electronic Control Unit (ECU).

Your purchase and use of the HP Tuners CORE ECU is subject to the HP Tuners General Terms and Conditions, which can be found at **https://www.hp-tuners.com/terms-of-use/**.

REGISTRATION AND VERIFICATION

The CORE ECU is designed for use in exempt vehicles such as pre-emissions motor vehicles and documented competition vehicles that are exclusively for track use and not driven on public roads.

Before using this product, you must register your CORE ECU and verify your use of the product. See *ECU Installation* (Page 10) for instructions.

Failure to follow these steps or failure to comply with HP Tuners' Compliance Statement will void the warranty of this product.

SAFETY INFORMATION

At HP Tuners, safety is our top priority. We are dedicated to ensuring that our Electronic Control Units (ECUs) meet the highest standards of safety and reliability. Our team works diligently to design and manufacture ECUs that adhere to the most stringent safety protocols. We employ rigorous quality control measures at every stage of production, from firmware, software, design, and testing, to guarantee that our ECUs perform flawlessly and safely.

Additionally, we stay up-to-date with the latest industry safety regulations and standards to ensure that our products consistently meet or exceed all requirements.

CAUTION:

- Do not overcharge the battery or reverse the polarity of the battery or any charging unit.
- Always disconnect the CORE ECU from the electrical system whenever doing any welding on the vehicle by unplugging the wiring harness connector from the ECU.
- Always disconnect the battery when doing electrical work on your vehicle. Avoid sparks, open flames or use of electrical devices near flammable substances. Do not run the engine with a battery charger connected as this could damage the ECU and other electrical equipment.
- Ensure there is no wiring left un-insulated. Un-insulated wiring can cause sparks, short circuits and in some cases fire. Before attempting to run the engine ensure there are no leaks in the fuel system.
- Ensure all fuel system components and wiring should be mounted away from heat sources, shielded if necessary and well ventilated.
- Always be vigilant and adhere to all workshop safety precautions when working on any vehicle to ensure a safe working environment.

LIMITED WARRANTY

HP Tuners warrants to the original purchaser of an HP Tuners CORE ECU that the product will be free from defects in materials or workmanship in the manufacturing process for a period of twelve months from the date of registration. The twelve month limited warranty will apply to any CORE ECU purchased and registered through HP Tuners. During the applicable warranty period, we will, repair or replace (in our sole discretion) any ECU found by HP Tuners (in our sole discretion) to contain defective materials or workmanship, at no cost to you. HP tuners will also warrant any CORE harness to the original purchaser of an HP Tuners CORE harness for twelve months from the date of purchase. During the twelve month warranty period, we will, repair or replace (in our sole discretion) any CORE harness found by HP Tuners (in our sole discretion) to contain defective materials or workmanship, at no cost to you.

To file a warranty claim you must submit a ticket to our support team through the **HP Tuners website** or by emailing **Support@hptuners.com**. When submitting a warranty claim we will need the ECUs serial number, which can be found on the bottom of the ECU. When submitting a warranty claim for any of the CORE harnesses, we will need a Proof of Purchase (original invoice and/or order number) and serial number.

This limited warranty will not apply to any problems with a CORE ECU and CORE harness that, in HP Tuners' determination, is a result of conditions, malfunctions or damage unrelated to defects in material or workmanship in the manufacturing process, including failure to comply with HP Tuners' Compliance Statement. This limited warranty is not transferable and does not apply to any ECU and harness not properly installed or properly used by the purchaser. The above warranty is the full extent of the warranty available for the CORE ECU and CORE harnesses. HP Tuners specifically disclaims all other warranties, express or implied, including all warranties of fitness for a particular purpose or warranties of merchantability.

LIMITATION OF LIABILITY

IN NO EVENT WILL HP TUNERS, ITS AFFILIATES, SUPPLIERS, LICENSORS, EMPLOYEES, OR AGENTS BE LIABLE FOR ANY INCIDENTAL, DIRECT, INDIRECT, PUNITIVE, ACTUAL, CONSEQUENTIAL, GENERAL, SPECIAL, EXEMPLARY, OR OTHER DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, THOSE RESULTING FROM LOST PROFITS, LOST DATA OR BUSINESS INTERRUPTION) ARISING OUT OF THE USE OF A CORE ECU PRODUCT, WHETHER BASED ON WARRANTY, CONTRACT, TORT OR ANY OTHER LEGAL THEORY AND WHETHER OR NOT HP TUNERS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

CORE DIMENSIONS

Below outlines the dimensions in millimeters (mm) for the CORE ECU.

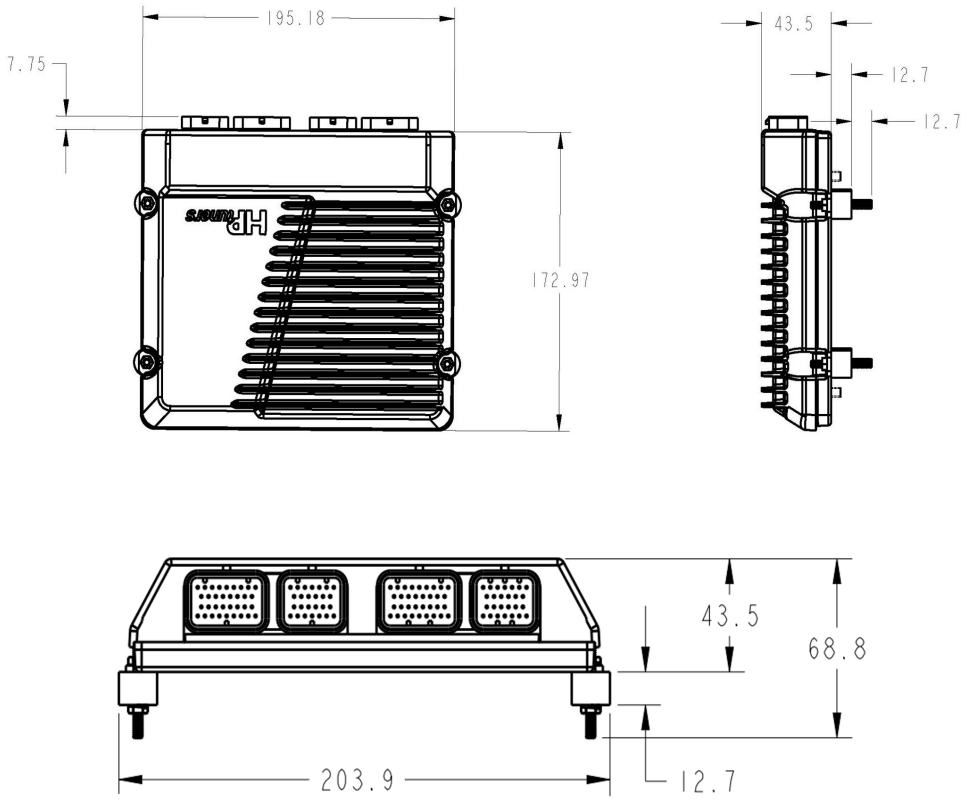


Figure 1. CORE Dimensions

NOTE: Mounting hole size is 5.0 mm.

ECU INSTALLATION

The following steps outline the recommended procedures for installing the CORE ECU for your LS motor.

OPTIONAL TOOLS

- Crimper
- Wire loom
- Heat shrink
- Wire cutters
- Zip ties
- Various wrenches, ratchet, metric & standard sockets, screwdrivers, and ratchet extensions
- Heat gun

REMOVAL OF OLD ECU

1. Disconnect and remove the vehicles battery.
2. Remove your current ECU.
3. Remove your current ECU's harness (if necessary).
4. Remove any ECU mounting brackets (if necessary).

INSTALLATION OF CORE

1. Identify your preferred location for mounting the ECU and clean any debris from that location.
   - Ensure the ECU is not mounted near any obstruction or any other critical engine components.
   - Ensure the ECU and harness is mounted away from any moving components, excessive heat, and vibration.
   - If possible, mount the CORE ECU where the OE ECU was located.
2. Use a 5 mm drill bit to create the four mounting holes (If applicable).

3. Mount the ECU, use the supplied 4 lock washers and 4 nuts to mount the ECU.
4. Torque the 4 nuts to 1.4 N· m.
5. Feed the harness through the firewall (if applicable).
   - Ensure that the harness wiring is at least six inches away from major heat sources. This distance helps prevent wire insulation from melting or degrading due to excessive heat.
   - If you must route wires closer to hot spots, consider using heatproof shielding to protect them. This shielding provides an additional layer of insulation and prevents direct exposure to extreme temperatures.
6. Connect all sensor.

> **NOTE:** The Gen III Drive-By-Cable Harness is designed with the camshaft sensor located towards the rear of the engine. Many early LS2 24x engines may have the camshaft sensor mounted towards the front of the engine, in the event the camshaft is mounted towards the front of the engine, the camshaft sensor will have to be extended.

7. Connect all four connectors (A-D) into the ECU.
   - Connector ports A-D are rated to be disconnected and reconnected 25 times. Users may experience errors if reconnected past the alluded number of times. See *CORE Connectors* (Page 17)
   - On both the Gen III Drive-By-Cable & Gen IV Drive-By-Wire Harness always ground the black 2 ring terminal wire to the chassis, engine block, or cylinder head. If necessary, both 2 ring terminals can be grounded together at the same suitable ground point.
8. Reconnect the vehicles battery.
9. Download and install VCM live.

   VCM LIVE MINIMUM REQUIREMENTS:

   - OS: Windows 10
   - CPU: Intel Core i3-63000 3.8GHz Quad-Core Processor
   - RAM: 8GB

10. Open VCM Live.
11. In the menu bar, select **Tune > Open Tune**.
12. Browse to **Documents > HP Tuners > VCM Live > Tunes** and select the base tune that you wish to use with the new ECU.
13. Connect your laptop to CORE with an Ethernet cable (not included) to the female Ethernet pigtail on the harness.

> **NOTE:** Be sure to use a USB to Ethernet adapter when connecting to CORE.

14. Key-on, engine-off.
15. Click the  icon in VCM Live's toolbar.
16. Complete the activation registration process by filling out the information in the Activation Acknowledgment window. See Figure 2.

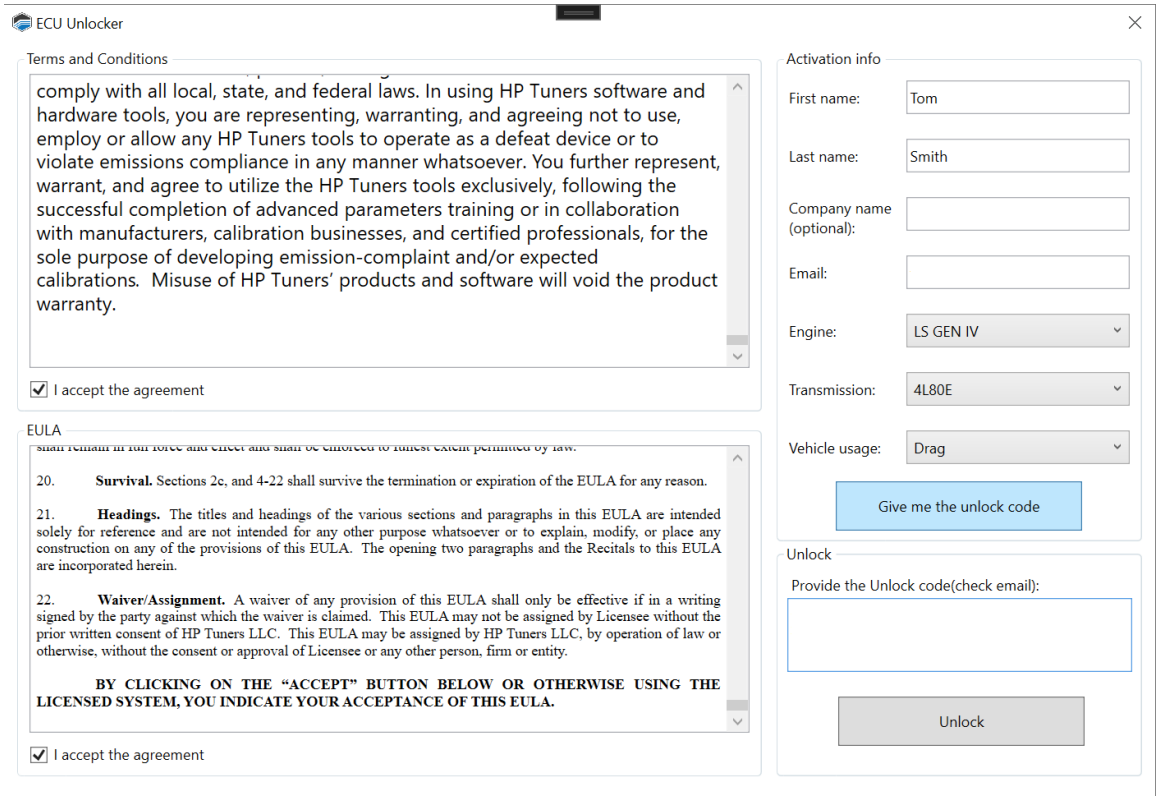


Figure 2. Activation Acknowledgment Window

> **NOTE:** Once you receive the unlock code and enter the code into VCM live, your twelve month warranty begins.

17. Create or open a Screen Layout (refer to the VCM Live User Guide).

PRE-START SETUP WIZARD

Once CORE is installed, and VCM Live and your tune file have been downloaded successfully, we recommend following the below steps before making any modifications to your LS engine. The below setup wizard can quickly configure many of the ECU's parameters based on the sensor hardware being used in the engine/vehicle.

1. With VCM live open, key-on, engine-off check for any pre-existing DTC's and resolve any issues reported before moving forward.
2. Ensure to resolve any mechanical issues with the vehicle before moving forward.
3. Once all DTC's and mechanical issues are resolved, open the Setup Wizard by selecting **Tune > Setup Wizard** in VCM Live's menu bar.

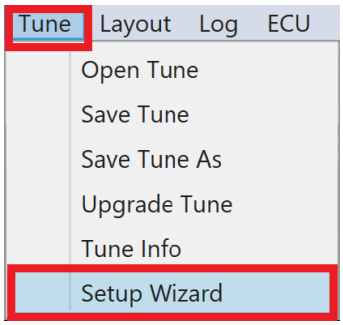


Figure 3. Opening the Setup Wizard

4. Select each of the below applicable sensors and ensure to select the corresponding sensor part number being used for your specific setup.

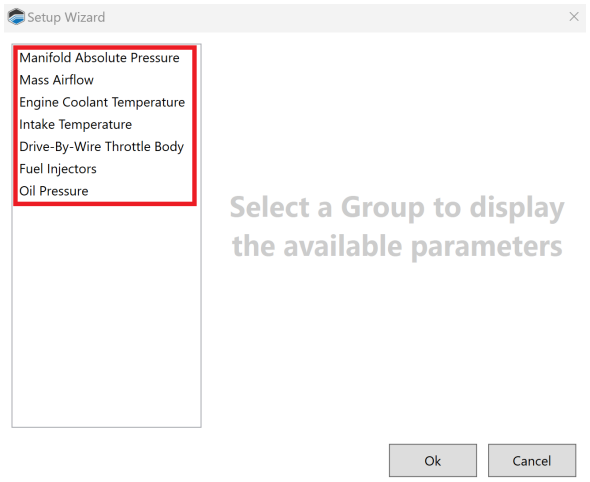


Figure 4. Wizard Sensor Setup

5. After each sensor part number is selected, a list of parameters will appear.

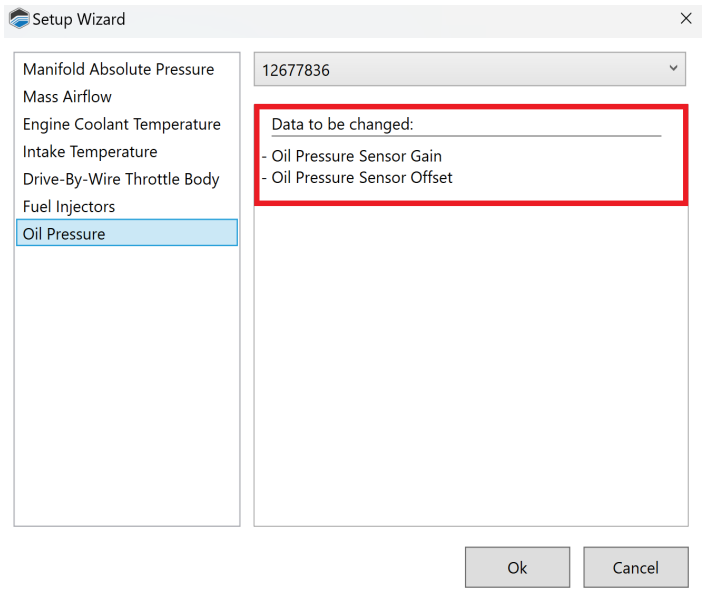


Figure 5. Wizard Parameter Checklist

6. Ensure these parameters are reporting a working value within VCM live by adding Measurement & Characteristic lists.

> **NOTE:** Refer to the VCM Live User Guide to add Measurement & characteristic lists.

> **NOTE:** For full description of these and all parameters, refer to the CORE Parameter Guide.

> **NOTE:** If there is no value present in any of the above sensors, further diagnosis is needed, and no tuning modifications should be made until there is an accurate value/reading present for all the above sensors.

7. Ensure fuel pump is being primed.
8. When you are finished with configuring all sensors, click **OK**.
9. If live tuning is enabled, VCM Live will send these updates to the ECU immediately. If live tuning is NOT enabled, click  to write the update tune to the vehicle.
10. Once all sensors have had their corresponding part numbers selected within the Setup Wizard and all sensors show a working value within VCM live, modifications can be made to your vehicle.

> **NOTE:** The setup wizard will not remember your settings the next time you open it. This is to prevent accidentally programming a second vehicle with the wrong settings.

CORE CONNECTORS

CORE has four connectors on the bottom end of the ECU (Figure 6). Each connector head has 34 or 26 contacts with four rows, combined 120 contacts total with all four connectors.

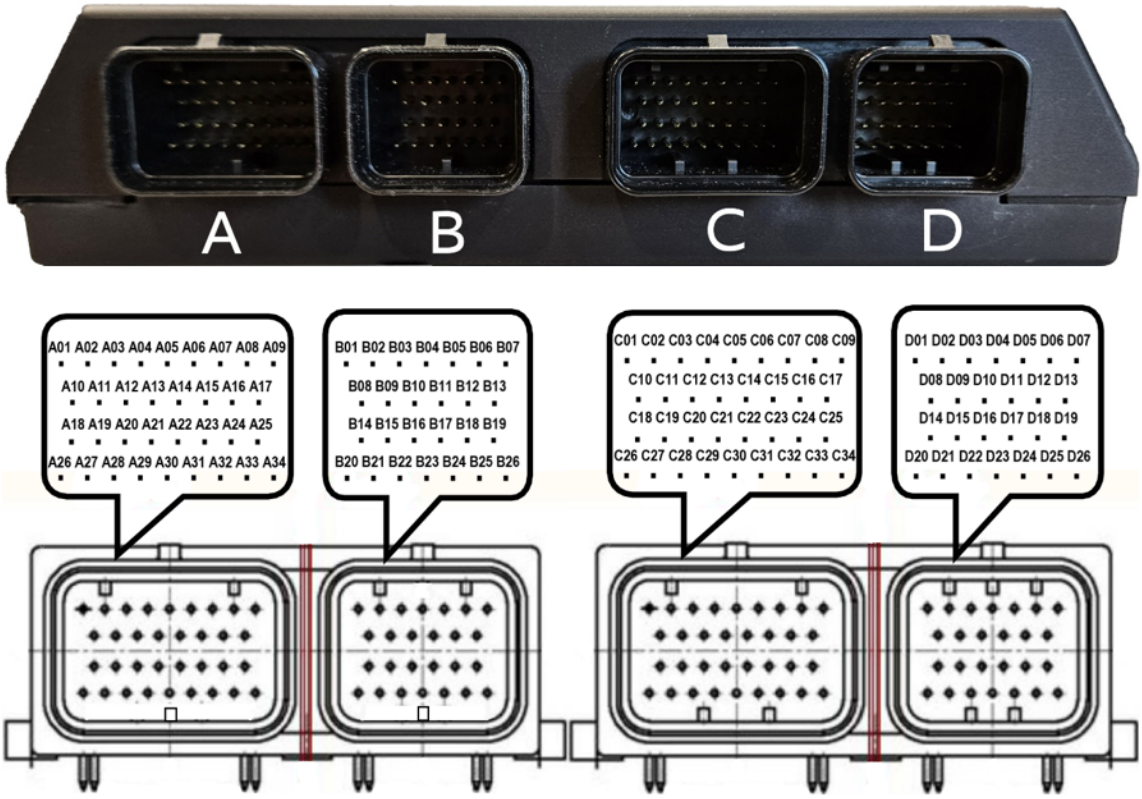


Figure 6. CORE Connectors (Connector side view with ECU facing upwards)

PINOUTS

The pins on connectors A-D can be grouped into functional groups. In this document, each group is represented by a color code.

Category	Color Code
Power	Light Brown
Triggers	Light Pink
Input	Light Green
Output	Light Red
Can	Light Purple
HPT Net	Light Orange
Ethernet	Yellow
Ground	Light Blue
VSS (speed inputs)	Tan
Lambda	Turquoise
Auto Transmission (4L60e & 4L80e)	Pink

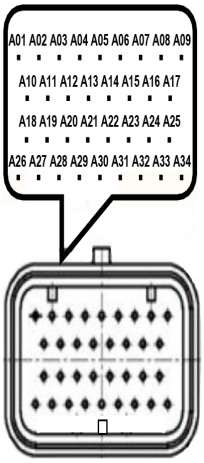
Table 1. Pinout Color Codes

NOTE: All analog inputs are configurable and can be used as a digital signal up to 5 volts.

NOTE: Table 16 outlines the pinout description when using the 4L60e & 4L80e harness, utilize Table 36 when using 4L60e & 4L80e harness as well.

NOTE: When NOT using the 4L60e & 4L80e harness those I/O types default to INPUT, OUTPUT, and VSS.

CONNECTOR A PINOUT



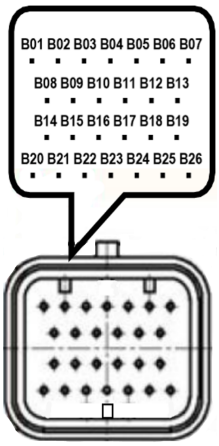
Pin	Description	Max Current (A)	I/O Type	Comment
A1	Throttle Body 1 switched +12V source (10A fuse #1)	10	Power I/P	10A fused 12V switched power input SWITCHED THROTTLE BODY 1 VOLTAGE
A2	2A low side driver output 1	2	O/P	Low side driver control (connect load to switched ignition supply)
A3	Injection Output 1 - (Cylinder / Primary Injector 1)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A4	Injection Output 2 - (Cylinder 8 & Primary Injector 2)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A5	Injection Output 3 - (Cylinder 7 & Primary Injector 3)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A6	Injection Output 4 - (Cylinder 2 & Primary Injector 4)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A7	Injection Output 5 - (Cylinder 6 & Primary Injector 5)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A8	2A low side driver output 1	2	O/P	Low side driver control (connect load to

Pin	Description	Max Current (A)	I/O Type	Comment
				switched ignition supply)
A9	Throttle Body 2 switched +12V source (10A fuse #2)	10	Power I/P	10A fused 12V switched power input SWITCHED THROTTLE BODY 2 VOLTAGE
A10	Throttle Body 1P	10	O/P	H-Bridge output high side control
A11	Idle air control coil 1N	6	O/P	Idle air coil 1 low side control
A12	Ignition output 2 - (Cylinder 8)	1	O/P	TTL levels (active low) (Smart coils only)
A13	Igntion output 4 - (Cylinder 2)	1	O/P	TTL levels (active low) (Smart coils only)
A14	Ignition output 6 (Cylinder 5)	1	O/P	TTL levels (active low) (Smart coils only)
A15	Ignition output 8 (Cylinder 3)	1	O/P	TTL levels (active low) (Smart coils only)
A16	Idle air control coil 2N	6	O/P	Idle air coil 2 low side control
A17	Throttle Body 2N	10	O/P	H-Bridge output low side control
A18	Throttle Body 1N	10	O/P	H-Bridge output low side control
A19	Ignition output 1 (Cylinder 1)	1	O/P	TTL levels (active low) (Smart coils only)
A20	Ignition output 3 (Cylinder 7)	1	O/P	TTL levels (active low) (Smart coils only)
A21	Ignition output 5 (Cylinder 6)	1	O/P	TTL levels (active low) (Smart coils only)
A22	Ignition output 7 (Cylinder 4)	1	O/P	TTL levels (active low) (Smart coils only)
A23	Speed input 1		I/P	Digital hall effect sensor - VR sensor
A24	Speed input 2		I/P	Digital hall effect sensor - VR sensor
A25	Throttle Body 2P	10	O/P	H-Bridge output high side control
A26	ECU GROUND / BATTERY NEGATIVE	20	Supply Groud	ECU GROUND
A27	Idle air control coil 1P	6	O/P	Idle air coil 1 high side control
A28	2A low side driver output 6	2	O/P	Low side driver control (connect load to switched ignition supply)
A29	2A low side driver output 7	2	O/P	Low side driver control (connect load to switched ignition supply)
A30	Injection output 8 (Cylinder 3 &	6	O/P	High impedance injector low side control

Pin	Description	Max Current (A)	I/O Type	Comment
	Primary Injector 8)			(supply injector from switched ignition supply)
A31	Injection output 8 (Cylinder 4 & Primary Injector 7)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A32	Injection output 8 (Cylinder 5 & Primary Injector 6)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A33	Idle air control coil 2P	6	O/P	Idle air coil 2 high side control
A34	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND

Table 2. Connector A Pinout Description

CONNECTOR B PINOUT

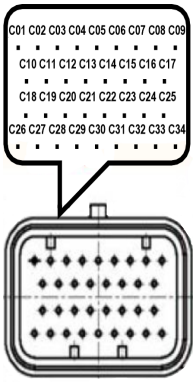


Pin	Description	Max Current (A)	I/O Type	Comment
B1	Injection output 10 (Secondary Injector 2)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B2	Injection output 11 (Secondary Injector 3)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B3	Injection output 12 (Secondary Injector 4)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B4	Injection output 13 (Secondary Injector 5)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B5	Injection output 14 (Secondary Injector 6)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B6	Injection output 15 (Secondary Injector 7)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B7	Injection output 16 (Secondary Injector 8)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B8	Crankshaft position		I/P	Digital hall effect sensor - VR sensor
B9	Speed input 3		I/P	Digital hall effect sensor - VR sensor
B10	Camshaft position 1		I/P	Digital hall effect sensor - VR sensor

Pin	Description	Max Current (A)	I/O Type	Comment
B11	Camshaft position 2		I/P	Digital hall effect sensor - VR sensor
B12	Camshaft position 3		I/P	Digital hall effect sensor - VR sensor
B13	Camshaft position 4		I/P	Digital hall effect sensor - VR sensor
B14	Injection output 9 (Secondary Injector 1)	6	O/P	High Impedence injector low side control (supply injector from switched igntion supply)
B15	Frequency/digital input 1		I/P	TTL frequency measurement, TTL active low input
B16	Frequency/digital input 2		I/P	TTL frequency measurement, TTL active low input
B17	Frequency/digital input 3		I/P	TTL frequency measurement, TTL active low input
B18	Frequency/digital input 4		I/P	TTL frequency measurement, TTL active low input
B19	2A low side driver output 12	3	O/P	Low side driver control (connect load to switched igntion supply)
B20	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
B21	Speed input 4		I/P	Digital hall effect sensor - VR sensor
B22	2A low side driver output 4	2	O/P	Low side driver control (connect load to switched igntion supply)
B23	2A low side driver output 3	2	O/P	Low side driver control (connect load to switched igntion supply)
B24	2A low side driver output 5	2	O/P	Low side driver control (connect load to switched igntion supply)
B25	2A low side driver output 11	2	O/P	Low side driver control (connect load to switched igntion supply)
B26	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND

Table 3. Connector B Pinout Description

CONNECTOR C PINOUT



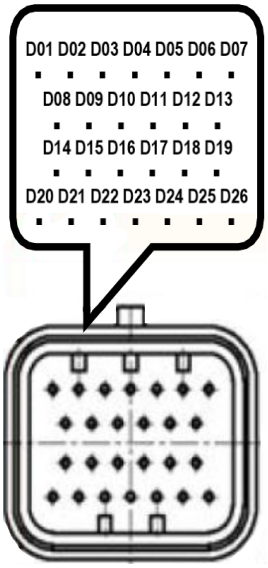
Pin	Description	Max Current (A)	I/O Type	Comment
C1	Switched ignition voltage +12V source (10A fuse #3)	10	Power I/P	10A fued 12V power input SWITCHED IGNITION VOLTAGE
C2	2A low side driver output 10	2	O/P	Low side driver control (connect load to switched ignition supply)
C3	2A low side driver output 9	2	O/P	Low side driver control (connect load to switched ignition supply)
C4	2A low side driver output 1	5	O/P	High side driver control (connect load to engine ground)
C5	2A low side driver output 2	5	O/P	High side driver control (connect load to engine ground)
C6	2A low side driver output 3	5	O/P	High side driver control (connect load to engine ground)
C7	2A low side driver output 4	5	O/P	High side driver control (connect load to engine ground)
C8	2A low side driver output 14	2	O/P	Low side driver control (connect load to switched ignition supply)
C9	2A low side driver output 13	2	O/P	Low side driver control (connect load to switched ignition supply)
C10	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND

Pin	Description	Max Current (A)	I/O Type	Comment
C11	General purpose analog input 2		I/P	General purpose analog input 0-5V
C12	General purpose analog input 4		I/P	General purpose analog input 0-5V
C13	LAMBDA IP1 (Pump current APF/IP)		I/P	LAMBDA IP1 (Pump current APF/IP)
C14	LAMBDA VM1 (Virtual ground IPN/VM)		I/P	LAMBDA VM1 (Virtual ground IPN/VM)
C15	LAMBDA IP2 (Pump current APE/IP		I/P	LAMBDA IP2 (Pump current APE/IP
C16	LAMBDA VM2 (Virtual ground IPN/VM)		I/P	LAMBDA VM2 (Virtual ground IPN/VM)
C17	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
C18	Lambda heater low side driver output 1 (Heater voltage H-/Uh-)	2	O/P	Lambda heater low side driver control (connect "Heater voltage H+ / Uh+" to switched ignition supply)
C19	General purpose analog input 5		I/P	General purpose analog input 0-5V
C20	General purpose analog input 6		I/P	General purpose analog input 0-5V
C21	LAMBDA UN2 (Nenst voltage UN /RE)			LAMBDA UN2 (Nenst voltage UN /RE)
C22	LAMBDA IA2 (Trim resistor RT/RE)			LLAMBDA IA2 (Trim resistor RT/RE)
C23	LAMBDA UN1 (Nenst voltage UN /RE)			LAMBDA UN1 (Nenst voltage UN /RE)
C24	LAMBDA IA1 (Trim resistor RT/RE)			LAMBDA IA1 (Trim resistor RT/RE)
C25	General purpose analog input 3		I/P	General purpose analog input 0-5V
C26	Lambda heater low side driver output 1 (Heater	2	O/P	Lambda heater low side driver control (connect "Heater voltage H+ / Uh+" to

Pin	Description	Max Current (A)	I/O Type	Comment
	voltage H-/Uh-)			switched ignition supply)
C27	2A low side driver output 8	2	O/P	Low side driver control (connect load to switched ignition supply)
C28	General purpose analog input 7		I/P	General purpose analog input 0-5V
C29	General purpose analog input 8		I/P	General purpose analog input 0-5V
C30	General purpose analog input 9		I/P	General purpose analog input 0-5V
C31	General purpose analog input 10		I/P	General purpose analog input 0-5V
C32	General purpose analog input 11		I/P	General purpose analog input 0-5V
C33	General purpose analog input 12		I/P	General purpose analog input 0-5V
C34	NTC temperature input 5		I/P	NTC termperature input

Table 4. Connector C Pinout Description

CONNECTOR D PINOUT



Pin	Description	Max Current (A)	I/O Type	Comment
D1	Engine knock input 1		I/P	Engine knock sensor input 1
D2	Sensor ground / ANALOG GROUND		Supply Ground	Sensor ground
D3	Sensor1 +5V Power	1	Power O/P	Sensor1 +5V reference supply voltage (5Vdc, 200ma)
D4	Sensor ground / DIGITAL GROUND		Supply Ground	Sensor ground
D5	Sensor2 +5V Power	1	Power O/P	Sensor2 +5V reference supply voltage (5Vdc, 200ma)
D6	HPTnet CAN_N		Differential I/O	CAN_C_N Unshielded twisted pair with CAN_C_P (impedance matched to 120 ohm recommended)
D7	BATTERY VOLTAGE +12V source (10A fuse #4)	10	Power I/P	10A fused 12V power input BATTERY VOLTAGE

Pin	Description	Max Current (A)	I/O Type	Comment
D8	Engine knock input 2		I/P	
D9	NTC temperature input 1		I/P	NTC temperature input
D10	NTC temperature input 2		I/P	NTC temperature input
D11	NTC temperature input 3		I/P	NTC temperature input
D12	HPTnet CAN_P		Differential I/O	CAN_C_P Unshielded twisted pair with CAN_C_N (impedance matched to 120 ohm recommended)
D13	HPTnet +12V Power	3	Power O/P	HPTnet +12V reference supply voltage (12Vdc, 2.6A)
D14	NTC temperature input 4		I/P	NTC temperature input
D15	Ethernet Tx_N		Differential I/O	ETHERNET_TX_N, 10/100 Ethernet, Ushielded twsited pair with ETHERNET_ TX_P (CAT5 recommended)
D16	Ethernet Rx_N		Differential I/O	ETHERNET_RX_N, 10/100 Ethernet, Ushielded twsited pair with ETHERNET_ RX_P (CAT5 recommended)
D17	CAN_A_N		Differential I/O	CAN_A_N Unshielded twisted pair with CAN_A_P (impedance matched to 120 ohm recommended)
D18	CAN_B_N		Differential I/O	CAN_B_N Unshielded twisted pair with CAN_B_P (impedance matched to 120 ohm recommended)
D19	HPTnet Ground	3	Power O/P	HPTnet ground reference

Pin	Description	Max Current (A)	I/O Type	Comment
D20	General purpose analog input 1		I/P	General purpose analog input 0-5V
D21	LIN BUs (for future use)		I/O	LIN Bus
D22	Ethernet Tx_P		Differential I/O	ETHERNET_TX_P, 10/100 Ethernet, Ushielded twsited pair with ETHERNET_ TX_N (CAT5 recommended)
D23	Ethernet Rx_P		Differential I/O	ETHERNET_RX_P, 10/100 Ethernet, Ushielded twsited pair with ETHERNET_ RX_N (CAT5 recommended)
D24	CAN_A_P		Differential I/O	CAN_A_P Unshielded twisted pair with CAN_A_N (impedance matched to 120 ohm recommended)
D25	CAN_B_P		Differential I/O	CAN_B_P Unshielded twisted pair with CAN_B_N (impedance matched to 120 ohm recommended)
D26	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND

Table 5. Connector D Pinout Description

CAN

Pin	Description	Max Current (A)	I/O Type	Comment
D17	CAN_A_N		Differential I/O	CAN_A_N Unshielded twisted pair with CAN_A_P (impedance matched to 120 ohm recommended)
D18	CAN_B_N		Differential I/O	CAN_B_N Unshielded twisted pair with CAN_B_P (impedance matched to 120 ohm recommended)
D24	CAN_A_P		Differential I/O	CAN_A_P Unshielded twisted pair with CAN_A_N (impedance matched to 120 ohm recommended)
D25	CAN_B_P		Differential I/O	CAN_B_P Unshielded twisted pair with CAN_B_N (impedance matched to 120 ohm recommended)

Table 6. CAN I/O Pinout Description

ETHERNET

Pin	Description	Max Current (A)	I/O Type	Comment
D15	Ethernet Tx_N		Differential I/O	10/100 Ethernet, Unshielded twisted pair with ETHERNET_TX_P (CAT5 recommended)
D16	Ethernet Rx_N		Differential I/O	10/100 Ethernet, Unshielded twisted pair with ETHERNET_RX_P (CAT5 recommended)
D22	Ethernet Tx_P		Differential I/O	10/100 Ethernet, Unshielded twisted pair with ETHERNET_TX_N (CAT5 recommended)
D23	Ethernet RX_P		Differential I/O	10/100 Ethernet, Unshielded twisted pair with ETHERNET_RX_N (CAT5 recommended)

Table 7. Ethernet I/O Pinout Description

GROUND

Pin	Description	Max Current (A)	I/O Type	Comment
A26	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
A34	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
B20	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
B26	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
C10	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
C17	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND
D2	Sensor ground / ANALOG GROUND		Supply Ground	SENSOR GROUND
D4	Sensor ground / DIGITAL GROUND		Supply Ground	SENSOR GROUND
D26	ECU GROUND / BATTERY NEGATIVE	20	Supply Ground	ECU GROUND

Table 8. Ground I/O Pinout Descritpion

HPTNET

Pin	Description	Max Current (A)	I/O Type	Comment
D6	HPTnet CAN_N		Differential I/O	Unshielded twisted pair with CAN_P (impedance matched to 120 ohm recommended)
D12	HPTnet CAN_P		Differential I/O	Unshielded twisted pair with CAN_N (impedance matched to 120 ohm recommended)
D13	HPTnet +12V Power	3	Power O/P	HPTnet +12V reference supply voltage (12Vdc, 2.6A)
D19	HPTnet Ground	3	Power O/P	HPTnet ground reference

Table 9. HPTNET I/O Pinout Description

INPUT

Pin	Description	Max Current (A)	I/O Type	Comment
B15	Frequency / Digital Input 1		I/P	TTL frequncy measurement, TTL active low input
B16	Frequency / Digital Input 2		I/P	TTL frequncy measurement, TTL active low input
B17	Frequency / Digital Input 3		I/P	TTL frequncy measurement, TTL active low input
B18	Frequency / Digital Input 4		I/P	TTL frequncy measurement, TTL active low input
C11	General purpose analog input 2		I/P	General purpose analog input 0-5V
C12	General purpose analog input 4		I/P	General purpose analog input 0-5V
C19	General purpose analog input 5		I/P	General purpose analog input 0-5V
C20	General purpose analog input 6		I/P	General purpose analog input 0-5V
C25	General purpose analog input 3		I/P	General purpose analog input 0-5V
C28	General purpose analog input 7		I/P	General purpose analog input 0-5V
C29	General purpose analog input 8		I/P	General purpose analog input 0-5V
C30	General purpose analog input 9		I/P	General purpose analog input 0-5V
C31	General purpose analog input 10		I/P	General purpose analog input 0-5V
C32	General purpose analog input 11		I/P	General purpose analog input 0-5V
C33	General purpose analog input 12		I/P	General purpose analog input 0-5V
C34	NTC termperature input 5		I/P	NTC tempeature input

Pin	Description	Max Current (A)	I/O Type	Comment
D1	Engine knock input 1		I/P	Engine knock sensor input 1
D8	Engine knock input 2		I/P	Engine knock sensor input 2
D9	NTC temperature input 1		I/P	NTC temperature input
D10	NTC temperature input 2		I/P	NTC temperature input
D11	NTC temperature input 3		I/P	NTC temperature input
D14	NTC temperature input 4		I/P	NTC temperature input
D20	General purpose analog input 1		I/P	General purpose analog input 0-5V
D21	LIN Bus (for guture use)		I/O	LIN Bus

Table 10. Input I/O Pinout Description

LAMBDA

Pin	Description	Max Current (A)	I/O Type	Comment
C13	LAMDA IP1 (Pump current APE / IP)		I/P	LAMDA IP1 (Pump current APE / IP)
C14	LAMBDA VM1 (Virtual ground IPN / VM)		I/P	LAMBDA VM1 (Virtual ground IPN / VM)
C15	LAMBDA IP2 (Pump current APE /IP)		I/P	LAMBDA IP2 (Pump current APE /IP)
C16	LAMBDA VM2 (Virtual ground IPN / VM)		I/P	LAMBDA VM2 (Virtual ground IPN / VM)
C18	Lambda heater low side driver output 1 (Heater voltage H- / Uh-)	2	O/P	Lambda heater low side driver control (connect "Heater voltage H+ / Uh+" to switched ignition supply)
C21	LAMBDA UN2 (Nernst voltage UN / RE)			LAMBDA UN2 (Nernst voltage UN / RE)
C22	LAMBDA IA2 (Trim resistor RT / IA)			LAMBDA IA2 (Trim resistor RT / IA)
C23	LAMBDA UN1 (Nernst voltage			LAMBDA UN1 (Nernst voltage UN / RE)

Pin	Description	Max Current (A)	I/O Type	Comment
	UN / RE)			
C24	LAMBDA IA1 (Trim resistor RT / IA)			LAMBDA IA1 (Trim resistor RT / IA)
C26	Lambda heater low side driver output 2 (Heater voltage H- / Uh-)	2	O/P	Lambda heater low side driver control (connect "Heater voltage H+ / Uh+" to switched ignition supply)

Table 11. Lambda I/O Pinout Description

OUTPUTS

Pin	Description	Max Current (A)	I?O Type	Comment
A2	2A low side driver output 1	2	O/P	Low side driver control (connect load to switched ignition supply)
A3	Injection output 1 (Cylinder / Primary Injector 1)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A4	Injection output 2 (Cylinder 8 & Primary Injector 2)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A5	Injection output 3 (Cylinder 7 & Primary Injector 3)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A6	Injection output 4 (Cylinder 2 & Primary Injector 4)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A7	Injection output 5 (Cylinder 6 & Primary Injector 5)	6	O/P	High impedance injector low side control (supply injector from switched ignition supply)
A8	2A low side driver output 2	2	O/P	Low side driver control (connect load to switched ignition supply)
A10	Throttle Body 1P	10	O/P	H-Brdige output high side control

Pin	Description	Max Current (A)	I?O Type	Comment
A11	Idle air contorl coil 1N	6	O/P	Idle air coil 1 low side control
A12	Ignition output 2 (Cylinder 8)	1	O/P	TTL levels (active low) (Smart coils only)
A13	Ignition output 4 (Cylinder 2)	1	O/P	TTL levels (active low) (Smart coils only)
A14	Ignition output 6 (Cylinder 5)	1	O/P	TTL levels (active low) (Smart coils only)
A15	Ignition output 8 (Cylinder 3)	1	O/P	TTL levels (active low) (Smart coils only)
A16	Idle air control coil 2N	6	O/P	Idle air coil 2 low side control
A17	Throttle Body 2N	10	O/P	H-Bridge output low side control
A18	THrottle Body 1N	10	O/P	H-Bridge output low side control
A19	Ignition output 1 (Cylinder 1)	1	O/P	TTL levels (active low) (Smart coils only)
A20	Ignition output 3 (Cylinder 7)	1	O/P	TTL levels (active low) (Smart coils only)
A21	Ignition output 5 (Cylinder 6)	1	O/P	TTL levels (active low) (Smart coils only)
A22	Ignition output 3 (Cylinder 4)	1	O/P	TTL levels (active low) (Smart coils only)
A25	Throttle Body 2P	10	O/P	H-Bridge output high side control
A27	Idle air control coil 1P	6	O/P	Idle air control 1 high side control
A28	2A low side driver output 6	2	O/P	Low side driver control (connect load to switched igntiion supply)
A29	2A low side driver output 7	2	O/P	Low side driver control (connect load to switched igntiion supply)
A30	Injection output 8 (Cylinder 3 & Primary Inector 8)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
A31	Injection output 7 (Cylinder 4 & Primary	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)

Pin	Description	Max Current (A)	I?O Type	Comment
	Inector 7)			
A32	Injection output 6 (Cylinder 5 & Primary Inector 6)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
A33	Idle air control coil 2P	6	O/P	Idle air coil 2 high side control
B1	Injection output 10 (Secondary Injector 2)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B2	Injection output 11 (Secondary Injector 3)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B3	Injection output 12 (Secondary Injector 4)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B4	Injection output 13 (Secondary Injector 5)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B5	Injection output 14 (Secondary Injector 6)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B6	Injection output 15 (Secondary Injector 7)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B7	Injection output 16 (Secondary Injector 8)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B14	Injection output 9 (Secondary Injector 1)	6	O/P	High impedance injector low side control (supply injector fromm switched ignition supply)
B19	2A low side driver output 12	3	O/P	Low side driver control (connect load to switched igntion supply)
B22	2A low side driver output 4	2	O/P	Low side driver control (connect load to switched igntion supply)
B23	2A low side driver output 3	2	O/P	Low side driver control (connect load to switched igntion supply)
B24	2A low side driver output 5	2	O/P	Low side driver control (connect load to switched igntion supply)
B25	2A low side driver output 11	2	O/P	Low side driver control (connect load to switched igntion supply)
C2	2A low side driver	2	O/P	Low side driver control (connect load to switched

Pin	Description	Max Current (A)	I?O Type	Comment
	output 10			igntion supply)
C3	2A low side driver output 9	2	O/P	Low side driver control (connect load to switched igntion supply)
C4	5A low side driver output 1	5	O/P	HIgh side driver control (connect load to engine ground)
C5	5A low side driver output 2	5	O/P	HIgh side driver control (connect load to engine ground)
C6	5A low side driver output 3	5	O/P	HIgh side driver control (connect load to engine ground)
C7	5A low side driver output 4	5	O/P	HIgh side driver control (connect load to engine ground)
C8	2A low side driver output 14	2	O/P	Low side driver control (connect load to switched igntion supply)
C9	2A low side driver output 13	2	O/P	Low side driver control (connect load to switched igntion supply)
C27	2A low side driver output 8	2	O/P	Low side driver control (connect load to switched igntion supply)

Table 12. Output I/O Pinout Description

POWER

Pin	Description	Max Current (A)	I/O Type	Comment
A1	Throttle Body1 switched +12V source (10A fuse #1)	10	Power I/P	10A fused 12V switched power input SWITCHED THROTTLE BODY1 VOLTAGE
A9	Throttle Body2 switched +12V source (10A fuse #2)	10	Power I/P	10A fused 12V switched power input SWITCHED THROTTLE BODY2 VOLTAGE
C1	SWITCHED IGNITION VOLTAGE +12V source (10A fuse #3)	10	Power I/P	10A fused 12V power input SWITCHED IGNITION VOLTAGE
D3	Sensor1 +5 Power	1	Power O/P	Sensor1 +5 reference supply voltage (5Vdc, 200mA)
D5	Sensor2 +5 Power	1	Power O/P	Sensor2 +5 reference supply voltage (5Vdc, 200mA)
D7	BATTERY VOLTAGE +12V source (10A fuse #4)	10	Power I/P	10A fused 12V power input BATTERY VOLTAGE

Table 13. Power I/O Pinout Description

TRIGGER

Pin	Description	Max Current (A)	I/O Type	Comment
B8	Crankshaft position		I/P	Digital hall effect sensor - VR sensor
B10	Camshaft position 1		I/P	Digital hall effect sensor - VR sensor
B11	Camshaft position 2		I/P	Digital hall effect sensor - VR sensor
B12	Camshaft position 3		I/P	Digital hall effect sensor - VR sensor
B13	Camshaft position 4		I/P	Digital hall effect sensor - VR sensor

Table 14. Trigger I/O Pinout Description

VSS

Pin	Description	Max Current (A)	I/O Type	Comment
A23	Speed input 1		I/P	Digital hall effect sensor - VR sensor
A24	Speed input 2		I/P	Digital hall effect sensor - VR sensor
B9	Speed input 3		I/P	Digital hall effect sensor - VR sensor
B21	Speed input 4		I/P	Digital hall effect sensor - VR sensor

Table 15. VSS I/O Pinout Description

AUTO TRANSMISSION

Pin	Color	Comment
1	LT GRN	ECU A2 - 2A LOW SIDE DRIVER OUTPUT 1
2	YEL/BLK	ECU A2 - 2A LOW SIDE DRIVER OUTPUT 2
3	RED/BLK	ECU C5 - 5A LOW SIDE DRIVER OUTPUT 2
4	YEL	ECU C34 - NTC TEMPERATURE INPUT 5
5	PINK/BLK	ECU C30 - GENERAL PURPOSE ANALOG INPUT 9
6	RED	ECU C32 - GENERAL PURPOSE ANALOG INPUT 11
7	DK BLU	ECU C31 - GENERAL PURPOSE ANALOG INPUT 10
8	WHT	ECU A29 - 2A LOW SIDE DRIVER OUTPUT 7
9	TAN/BLK	ECU B22 - 2A LOW SIDE DRIVER OUTPUT 4
10	BRN	ECU B23 - 2A LOW SIDE DRIVER OUTPUT 3
11	PNK	12V IGNITION
12	BLK/WHT	ANALOG GROUND
13	PPL/WHT	ECU A24 - SPEED INPUT 2
14	DK GRN	ECU C33 - GENERAL PURPOSE ANALOG INPUT 12
15	LT BLU	ECU 5V REFERENCE 2
16	DK BLU/RED	ECU B9 - SPEED INPUT 3
17	PPL/BLK	ECU B21 - SPEED INPUT 4

Pin	Color	Comment
18	LT BLU/PPL	ECU B16 - FREQUENCY/DIGITAL INPUT 2
19	LT BLU/YEL	ECU B17 - FREQUENCY/DIGITAL INPUT 3
20	BLK	BATTERY NEGATIVE

Table 16. Auto Transmission I/O Pinout Description

MAIN POWER

The ECU's main power is through connector pin D7 on connector D, with a max current of 10 amps. The main power for the ignition switch is found at pin C1 on connector C and the main power for the throttle body can be found at pin A1 on connector A. Both the ignition and throttle body have a max current of 10 amps.

SENSORS & CONNECTORS

Below outlines each sensor and connector location, along with common sensor/-connector part numbers supported with the CORE harnesses, as well as the Drive-By-Cable (DBC) and Drive-By-Wire (DBW) connector wire colors.

CRANKSHAFT POSITION SENSOR

The crankshaft position sensor on most Gen III & IV LS engines can be found on the lower right-hand side of the engine block above the starter.

Generation	OEM	ACDelco
Gen III	12560228	213-354
Gen IV	12585546	N?A

Table 17. Crankshaft Supported Sensor Table

Figure 7. Crankshaft Position Sensor DBC & DBW Connector View

CAMSHAFT POSITION SENSOR

The camshaft position sensor on most Gen III LS engines can be found on the rear valley of the block behind the intake manifold.

The camshaft position sensor on most Gen IV LS engines can be found on the front of the engine on the front timing cover. Some may have an extension cable.

Generation	OEM	ACDelco
Gen III	12561211	213-363
Gen IV	N/A	213-3826

Table 18. Camshaft Supported Sensor Table

Figure 8. Camshaft Position Sensor DBC Connector View

Figure 9. Camshaft Position Sensor DBW Connector View

THROTTLE POSITION SENSOR (TPS)

The throttle position sensor on most Gen III & IV LS engines can be found towards the front of the engine on the throttle/butterfly shaft assembly, which is only applicable to the Gen III Drive-By-Cable harness.

Generation	OEM	ACDelco
Gen III	17123852	213-912
Gen IV	N/A	N/A

Table 19. TPS Supported Sensor Table

Figure 10. Throttle Position Sensor DBC Connector View

ACCELERATOR PEDAL POSITION SENSOR

The accelerator pedal position sensor is located on the left side of the accelerator foot pedal, which is only applicable to the Gen IV Drive-By-Wire harness.

Generation	OEM	ACDeleco
Gen III	N/A	N/A
Gen IV	Varies by Application	Varies by Application

Table 20. APP Supported Sensor Table

Figure 11. Accelerator Pedal Position Sensor DBW Connector View

MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

The MAP sensor on most Gen III & Gen IV LS engines can be found on top of the intake manifold.

Generation	OEM	ACDelco
Gen III	19418810	12614970
Gen IV	12591290 12644228	213-4434

Table 21. MAP Supported Sensor Table

Figure 12. Manifold Absolute Pressure Sensor DBC Connector View

Figure 13. Manifold Absolute Pressure Sensor DBW Connector View

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

The coolant temperature sensor on most Gen III & IV LS engines can be found on the driver side bank 1 cylinder head.

Generation	OEM	ACDeleco
Gen III	15326388	213-953
Gen IV	15326388	213-953

Table 22. ECT Supported Sensor Table

Figure 14. Engine Coolant Temperature Sensor DBC & DBW Connector View

INTAKE AIR TEMPERATURE (IAT) SENSOR

The IAT sensor on most Gen III LS engines is located on the intake pipe separate and not incorporated into the MAF sensor.

The IAT sensor on most Gen IV LS engines is located on the intake pipe that is usually incorporated into the MAF.

> **NOTE:** Both the Terminated Gen III Drive-By-Cable & Gen IV Drive-By-Wire harnesses will have a 5 wire MAF that integrates with the IAT. Customers will have to purchase an adapter harness from EFI and/or BP to split the 2 wire IAT sensor.

Generation	OEM	ACDelco
Gen III	12160244 (N/A with 5 wire MAF)	213-243 (N/A with 5 wire MAF)
Gen IV	12160244	213-243

Table 23. IAT Supported Sensor Table

OIL PRESSURE SENSOR

The oil pressure sensor on most Gen III & IV LS engines can be found towards the back on the engine, above the flywheel housing.

Generation	OEM
Gen III	12677836
Gen IV	12673134

Table 24. Oil Pressure Supported Sensor Table

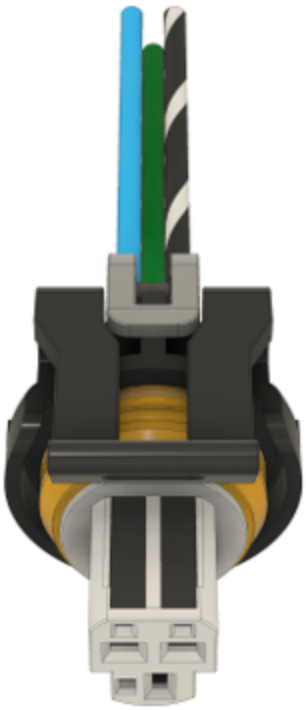


Figure 15. Oil Pressure Sensor DBC Connector View

Figure 16. Oil Pressure Sensor DBW Connector View

LAMBDA SENSOR (OXYGEN SENSOR)

Both upstream lambda sensors can be found after the exhaust manifold flanges and before the catalytic converter on each bank.

Generation	BOSCH
Gen III	17025
Gen IV	17025

Table 25. Lambda Supported Sensor Table

Figure 17. Lambda 1 Sensor DBC & DBW Connector View

Figure 18. Lambda 2 Sensor DBC & DBW Connector View

KNOCK SENSOR

Both knock sensors on most Gen III LS engines can be found under the valley and uses an extension harness with one connector.

Both knock sensors on most Gen IV LS engines can be found on the lower sides of the engine block in front of the starter motor or near the motor mounts and uses a separate connector for each knock sensor.

Generation	OEM	ACDelco
Gen III	12673134	213-3521
Gen IV	N/A	213-1576

Table 26. Knock Supported Sensor Table

Figure 19. Knock Sensor DBC Connector View

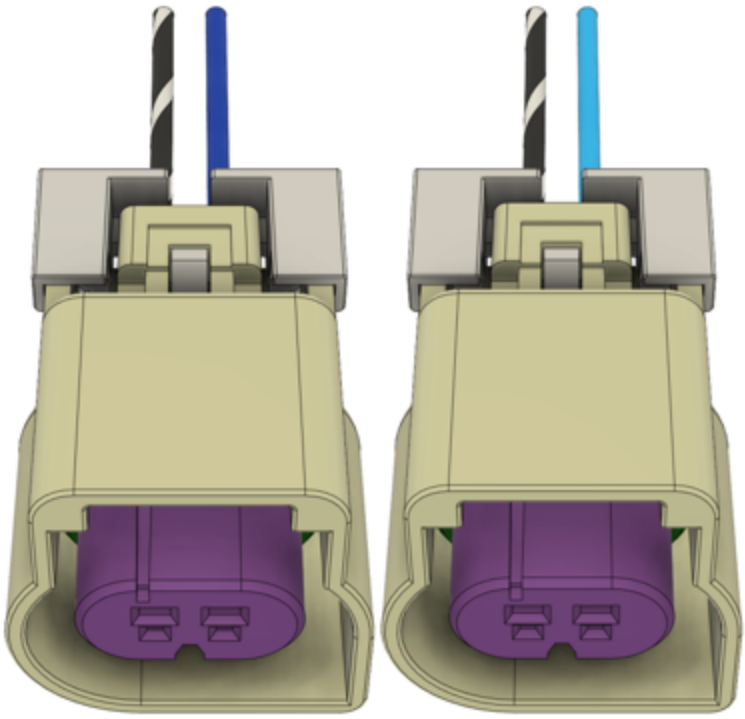


Figure 20. Knock Sensor 1 & 2 DBW Connector View

MASS AIR FLOW (MAF) SENSOR

The MAF sensor on most Gen III & IV LS engines can be located on the intake tube.

> **NOTE:** Both the Terminated Gen III Drive-By-Cable & Gen IV Drive-By-Wire harnesses will have a 5 wire MAF that integrates with the IAT. Customers will have to purchase an adapter harness from EFI to split the 3 wire MAF sensor.

Generation	OEM	ACDelco
Gen III	25179711 (3 wire MAF, IAT Required)	213-364 (3 wire MAF, IAT Required)
	25168491 (5 wire MAF, applicable for LS1, LS2, & LS6)	213-4657 (5 wire MAF, applicable for LS1, LS2, & LS6)
Gen IV	15865791	213-4222

Table 27. MAF Supported Sensor Table

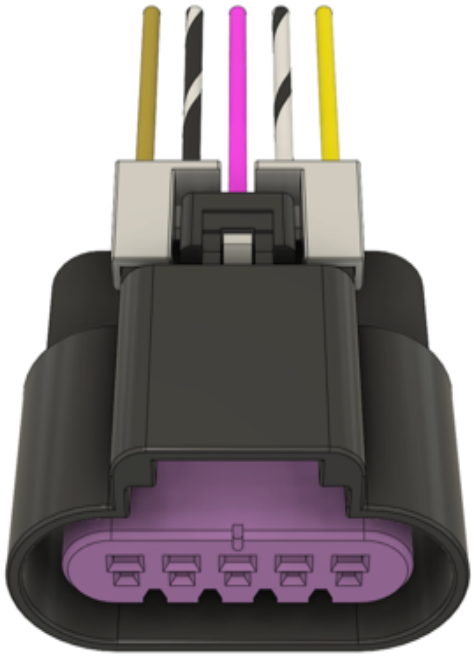


Figure 21. Mass Air Flow DBC & DBW Connector View

FUEL INJECTORS

The fuel injectors are located on top of the intake manifold on both the left and right banks.

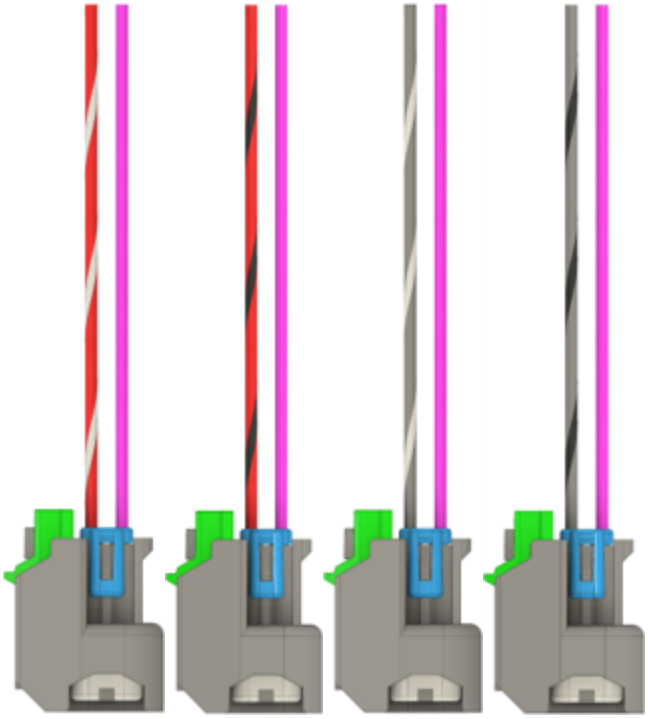


Figure 22. Fuel Injectors 1-4 DBC & DBW Connector View

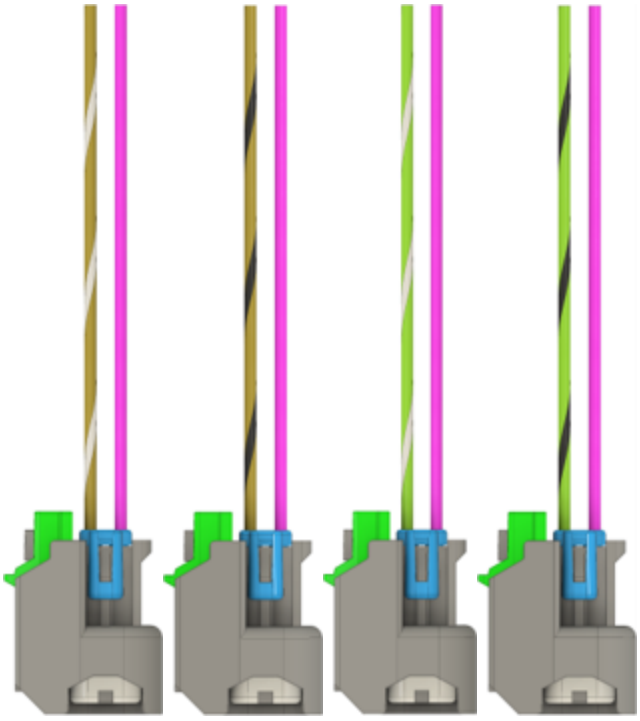


Figure 23. Fuel Injectors 5-8 DBC & DBW Connector View

IGNITION COILS

The ignition coils are located on both the left and right valve covers with a total of two connections, one for each bank.

Generation	OEM	ACDelco
Gen III	Varies by Application	Varies by Application
Gen IV	Varies by Application	Varies by Application

Table 28. Ignition Coil Supported Table

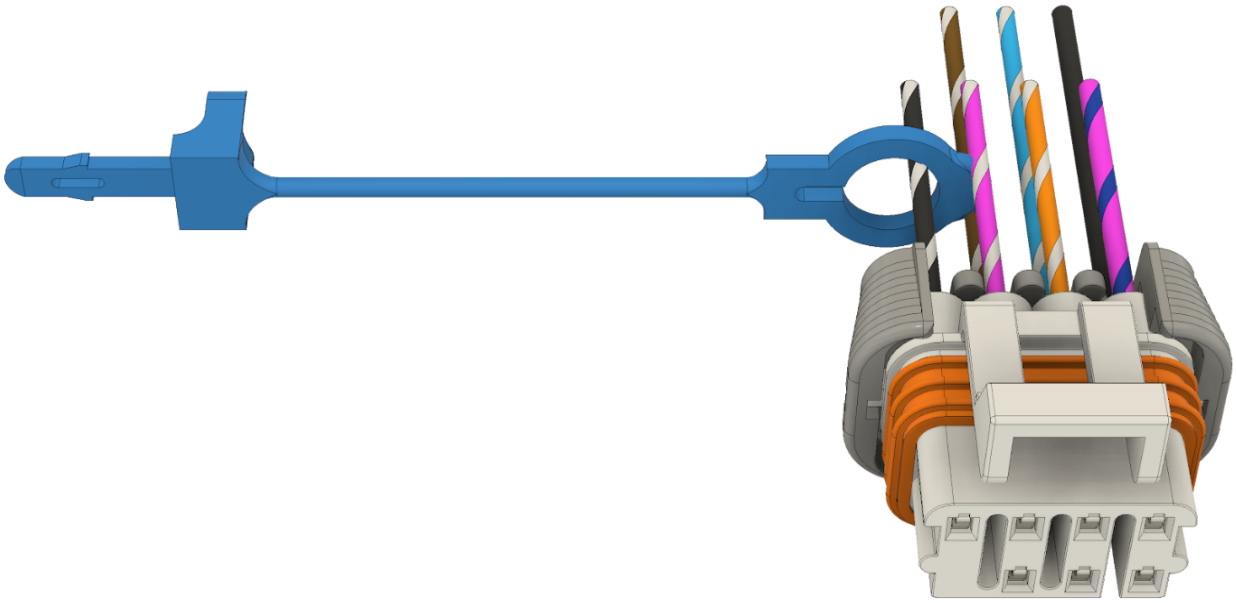


Figure 24. Ignition Coil Bank 1 DBC & DBW Connector View

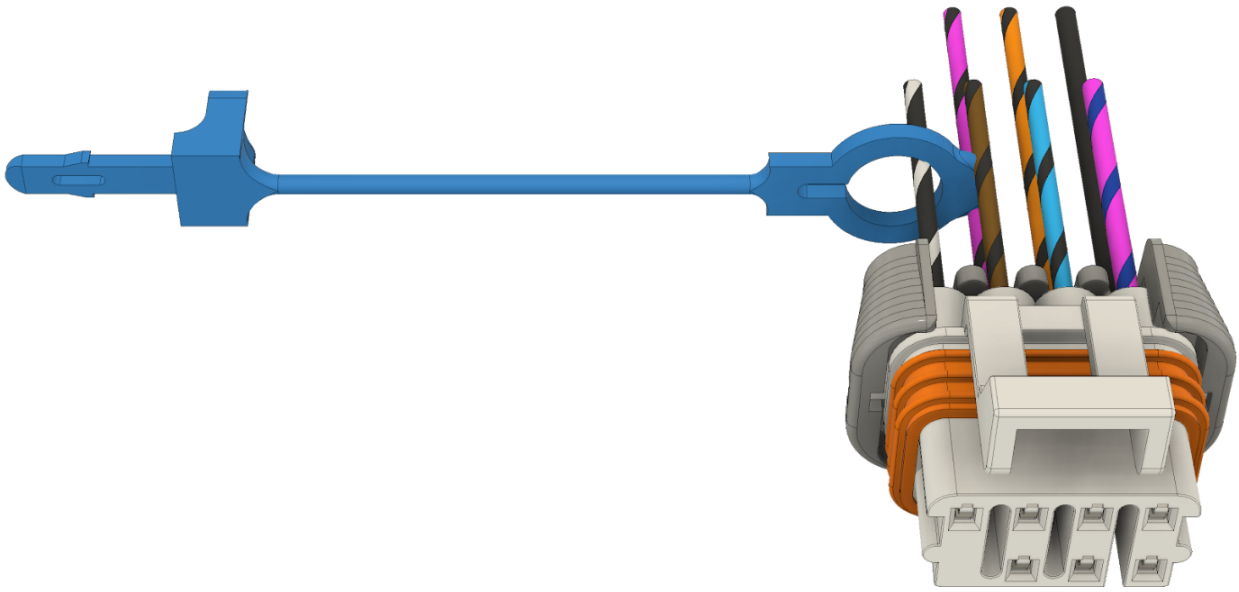


Figure 25. Ignition Coil Bank 2 DBC & DBW Connector View

NOTE: First dozen DBC & DBW harnesses will NOT have the blue trace on the 12v ignition wire, this does not affect the functionality of either harness.

BAROMETRIC PRESSURE SENSOR

The barometric pressure sensor is often located on the fire wall on the right-hand side of the A/C blower motor when it's a standalone sensor. When it's not a standalone unit, the MAP and barometric pressure sensor are the same sensor.

Generation	OEM
Gen III	30-2130-15
Gen IV	30-2130-15

Table 29. Barometric Pressure Supported Sensor Table

Figure 26. Barometric Pressure Sensor DBC & DBW Connector View

VEHICLE SPEED SENSOR

The vehicle speed sensor is often on the driver near side of the transmission.

Figure 27. Vehicle Speed Sensor DBC & DBW Connector View

ALTERNATOR CONNECTOR

The alternator connector is located ont he back side of the alternator.

Generation	OEM	ACDelco
Gen III	Any 4 Cavity Connector	Any 4 Cavity Connector
Gen IV	Any 4 Cavity Connector	Any 4 Cavity Connector

Table 30. Alternator Supported Connector Table

Figure 28. Alternator DBC & DBW Connector View

THROTTLE BODY CONNECTOR

The throttle body connector is located on the throttle body itself. The below table specifies the recommended part numbers for the gen III harness, any throttle body can be used with the gen III harness, if the same style IAC and TPS sensor are used along with the throttle body.

Generation	OEM
Gen III	TPS: 17123852 IAC: 17113598
Gen IV	12570790

Table 31. Throttle Body Supported Connector Table

Figure 29. Throttle Body Connector DBW Connector View

IDLE AIR CONTROL VALVE

The idle air control valve is located directly above the right-hand side of the intake manifold or often on the throttle body.

Generation	OEM	ACDelco
Gen III	17113391	217-1806
Gen IV	N/A	N/A

Table 32. Idle Air Control Supported Valve Table

Figure 30. Idle Air Control Valve DBC Connector View

CAN CONNECTORS

The CAN connectors are located by the fuse box, close to the ECU side of the harness.

Generation	DT Connector
Gen III	AT04-4P TPA-AW4P Terminal - AT60-202-16141
Gen IV	AT04-4P TPA-AW4P Terminal - AT60-202-16141

Table 33. CAN Supported Connector Table

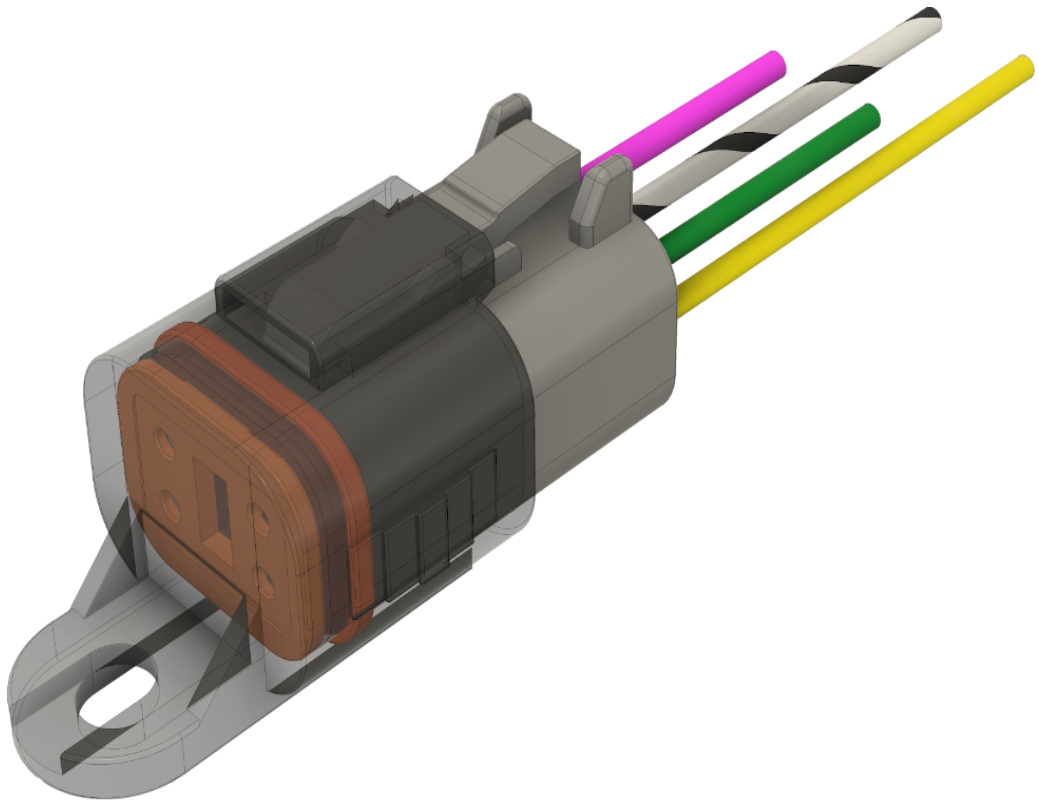


Figure 31. CAN BUS 1 (Deutsch) DBC & DBW Connector View

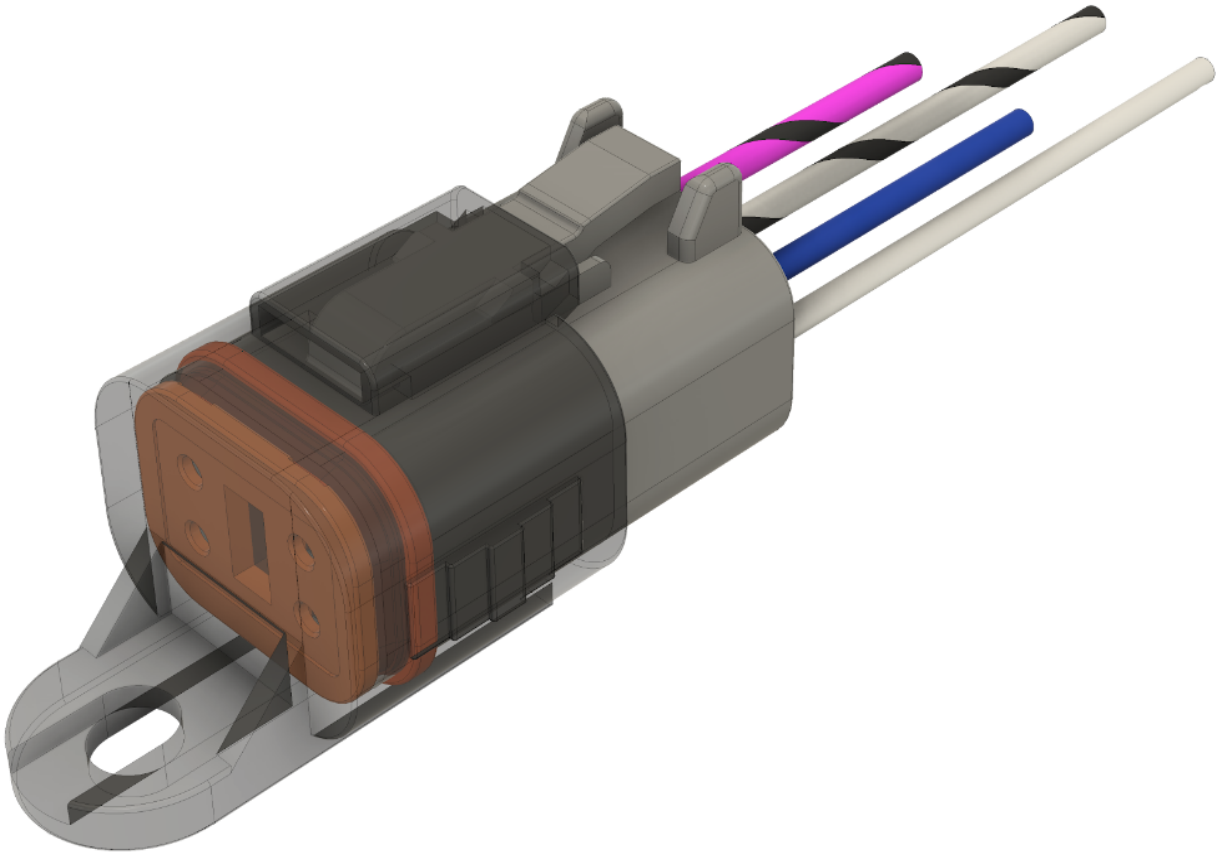


Figure 32. CAN BUS 2 (Deutsch) DBC & DBW Connector View

I/O CONNECTOR

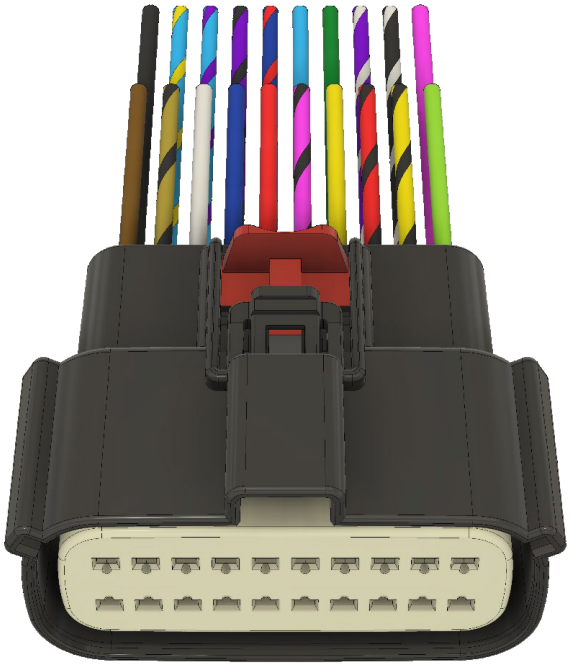


Figure 33. I/O (Molex) DBC & DBW Connector View

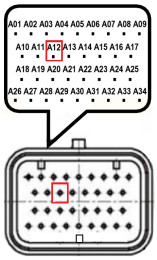
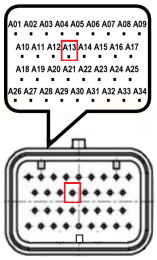
Figure 34. I/O (Molex) Pin 1-20 Connector View

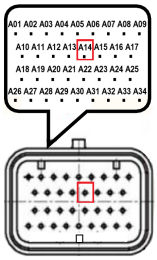
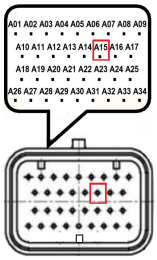
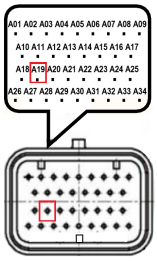
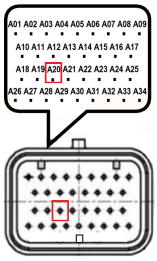
IGNITION & INJECTION WIRING

The suggested ignition and injection wiring can be found in the below order. Users may configure the firing order in the "Cylinder Firing Order" table within VCM Live but the pinout wiring below is how the pre-terminated harnesses are wired.

CAUTION: The values are configurable in VCM Live, however, the method of wiring must be wired as defined in Table 34 & 35. Failure to do so will result in incorrect ignition and injection events.

IGNITION WIRING

Pin #	Harness Output	Description	Pin "A" Location
A12	Ignition Coil Cylinder 8	Ignition Output 2	
A13	Ignition Coil Cylinder 2	Ignition Output 4	

Pin #	Harness Output	Description	Pin "A" Location
A14	Ignition Coil Cylinder 5	Ignition Output 6	
A15	Ignition Coil Cylinder 3	Ignition Output 8	
A19	Ignition Coil Cylinder 1	Ignition Output 1	
A20	Ignition Coil Cylinder 7	Ignition Output 3	

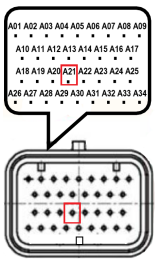
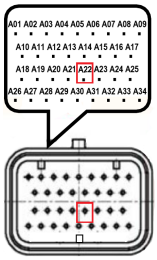
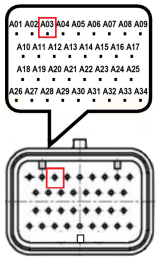
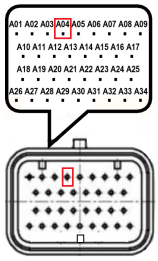
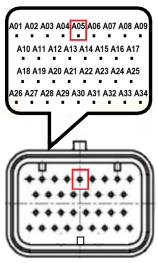
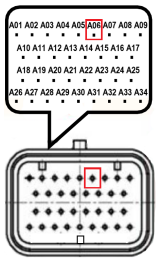
Pin #	Harness Output	Description	Pin "A" Location
A21	Ignition Coil Cylinder 6	Ignition Output 5	
A22	Ignition Coil Cylinder 4	Ignition Output 7	

Table 34. Ignition Wiring Table

INJECTION WIRING

Pin #	Harness Output	Description	Pin "A" Location
A3	Fuel Injector Cylinder 1	Injection Output 1	
A4	Fuel Injector Cylinder 8	Injection Output 2	
A5	Fuel Injector Cylinder 7	Injection Output 3	
A6	Fuel Injector Cylinder 2	Injection Output 4	

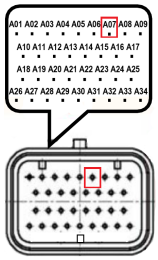
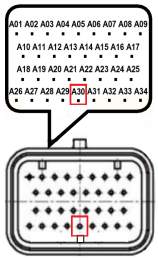
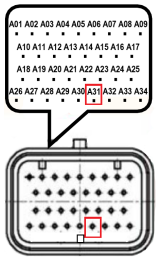
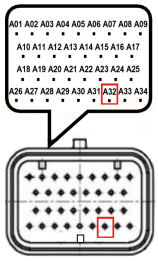
Pin #	Harness Output	Description	Pin "A" Location
A7	Fuel Injector Cylinder 6	Injection Output 5	
A30	Fuel Injector Cylinder 3	Injection Output 8	
A31	Fuel Injector Cylinder 4	Injection Output 7	
A32	Fuel Injector Cylinder 5	Injection Output 6	

Table 35. Injection Wiring Table

DUAL INJECTION CONFIGURATION

There are 16 injectors on the CORE ECU. Eight injectors are used for primary injection, eight are used for secondary. The secondary injectors are mated to the primary injectors and will match the firing order of the primary. They must be connected to the same cylinder.

The following injectors must be paired together when using dual injection:

Pair	Primary Injector	Secondary Injector
#1	Injection Output 1	Injection Output 9
#2	Injection Output 2	Injection Output 10
#3	Injection Output 3	Injection Output 11
#4	Injection Output 4	Injection Output 12
#5	Injection Output 5	Injection Output 13
#6	Injection Output 6	Injection Output 14
#7	Injection Output 7	Injection Output 15
#8	Injection Output 8	Injection Output 16

The firing order can be configured by using the "Cylinder Firing Order" characteristic in VCM Live (Refer to the VCM Live User Guide to add a characteristic list), however, the pairs of injectors are non-configurable.

NITROUS SYSTEM WIRING

Below outlines the recommended procedures to wire a nitrous oxide system that is controlled by the CORE ECU.

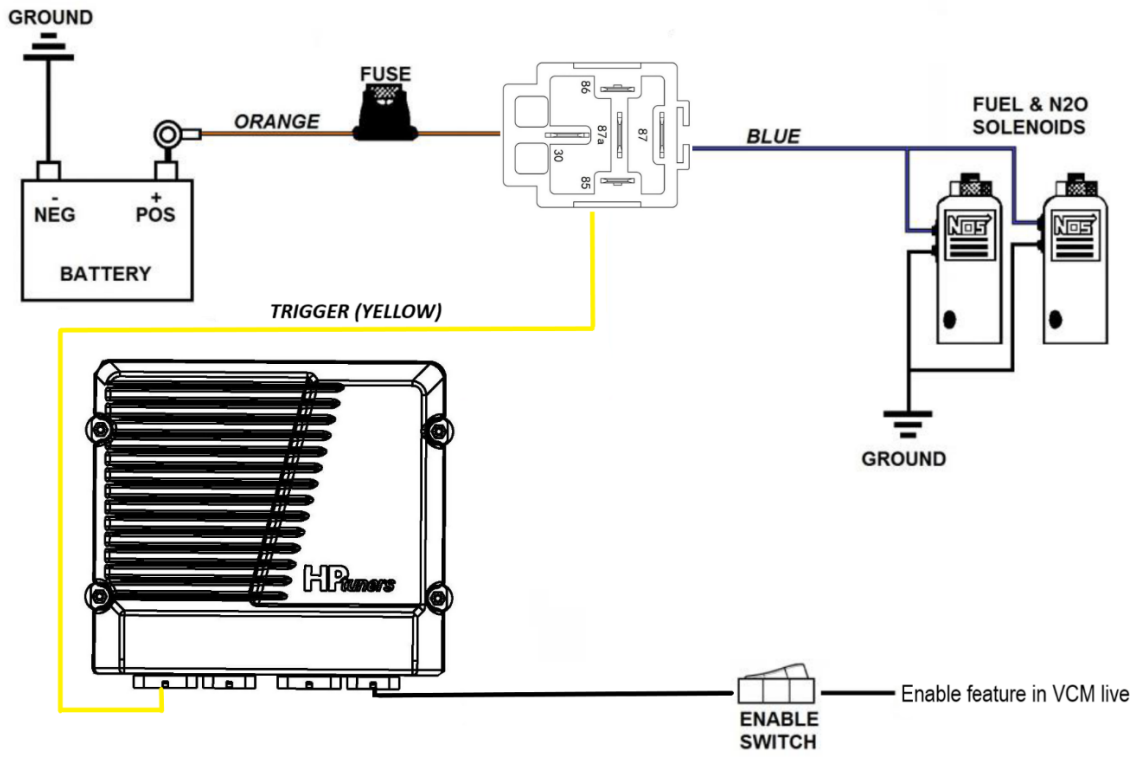


Figure 35. Single Stage Nitrous Wiring

REQUIRED WIRING

An enable/arming input of a ground is required. When enabled, this feature must be configured/enabled in VCM live and the primary activation is TPS and engine speed which are active inputs in the ECU.

GENERAL PURPOSE OUTPUTS

CORE's general purpose outputs can be used as an input or output and are all controlled by VCM live. Low side drivers are ground triggers and high side drivers are

all 12-volt power triggers, which will be driving a relay and not any high amperage devices.

> **NOTE:** Never have the ECU directly power a nitrous oxide solenoid. All nitrous solenoids require more than a 2A rating for the ECU output.

> **NOTE:** When nitrous is enabled as a feature, no fuel cuts will be allowed.

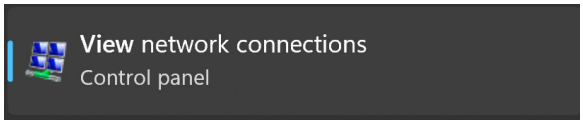
ETHERNET CONFIGURATION

When purchasing the CORE ECU an optional harness can be purchased to connect to the ECU, that harness will have a 2-meter Ethernet branch cable that allows routing of the Ethernet connector into the vehicles cabin. The Ethernet connector will allow a standard Ethernet cable to plug into the harness.

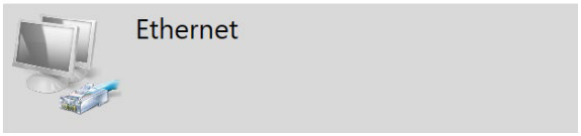
Using Ethernet to connect to CORE allows a plug-and-play feature to begin tuning immediately. If issues arise, the below step-based instructions outline common corrective Ethernet actions.

> **NOTE:** If you are using a previously used Ethernet adapter, which has had an IP address setup previously and/or are having issues connecting in general, please follow the below steps:

1. Connect your Ethernet adapter to your computer and ensure your Ethernet is connected to CORE.
2. In your search taskbar, search and select **View network connections**.

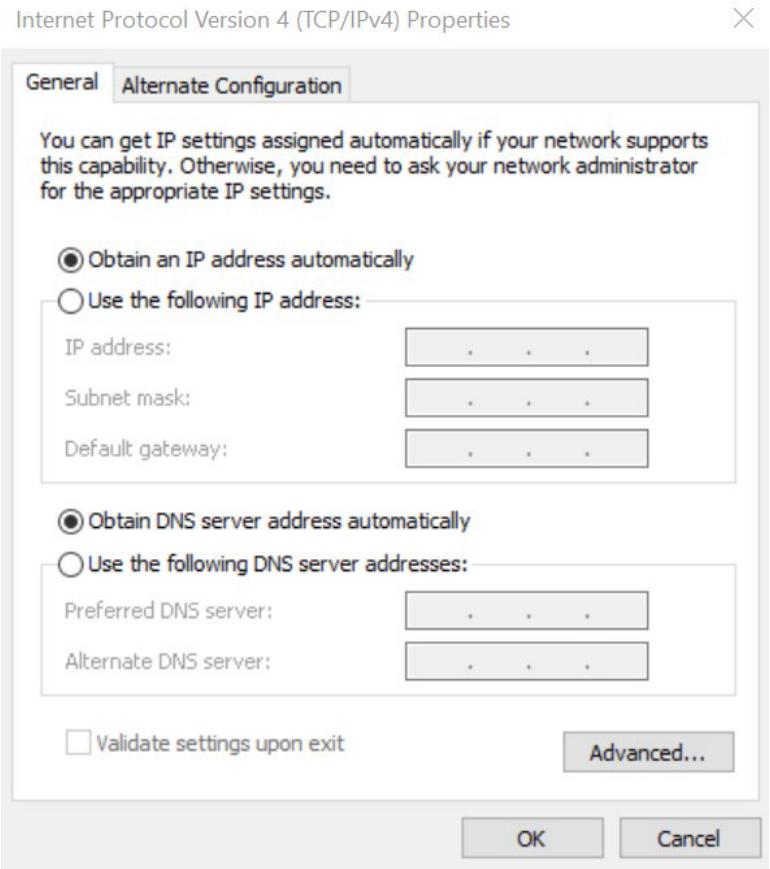


3. Right click on the Ethernet cable you just plugged in.



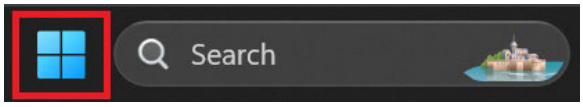
4. Double click **Internet Protocol Version 4 (TCP/IPV4)**.

5. Ensure the information matches the settings below.

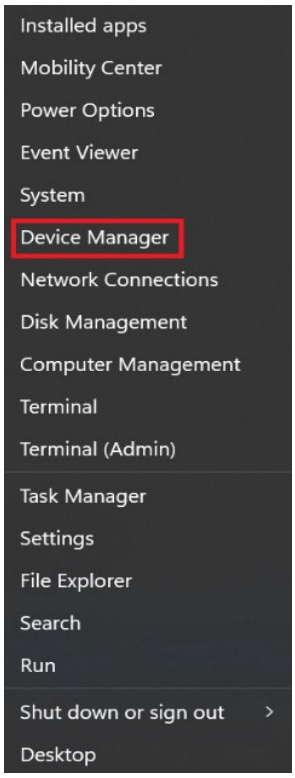


If issues are still present, follow the below steps to reset your network adapter.

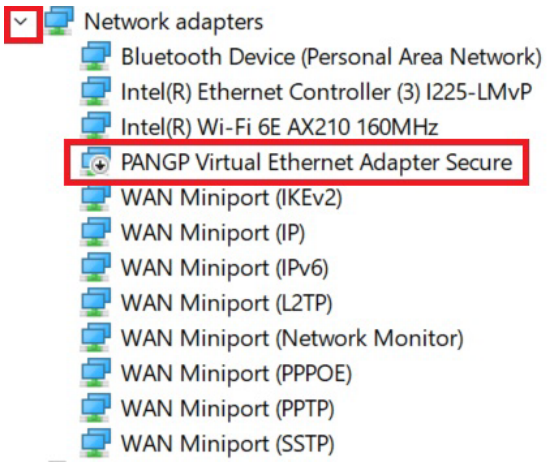
1. Right click on the Windows Logo.



2. Select **Device Manager**.

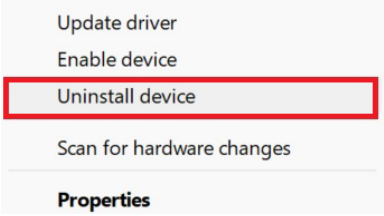


3. Click on the drop-down arrow on the left-hand side of the "Network Adapter", Then right click on the network adapter to reinstall.



> **NOTE:** The exact name of the network adapter will vary from computer to computer.

4. Click **Uninstall device**.



> **NOTE:** If a checkbox appears to also delete the driver software, leave this box UNCHECKED.

5. Select **OK**.
6. Restart your computer. The adapter will be reinstalled on startup and the adapter will be reset.

WIRING HARNESS

This section outlines the available harnesses for CORE.

TERMINATED GEN III DRIVE-BY-CABLE LSX CORE ECU HARNESS

On this harness the knock sensors are located in the valley. The MAP sensor and Cam sensor are located on the back of the engine. EV1 and EV6 connectors can be purchased with this harness to allow usage of the OEM connector style Gen III LS application.

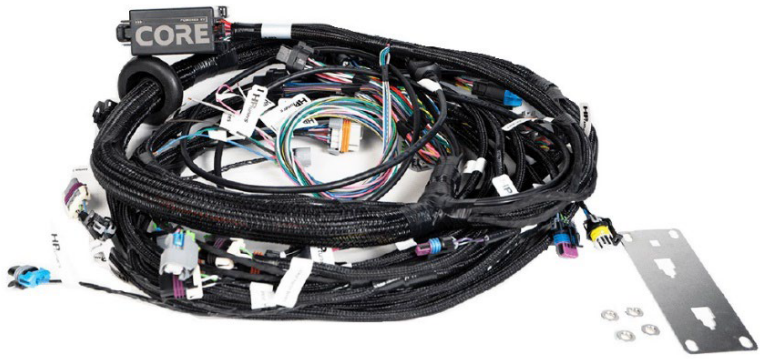


Figure 36. Drive-By-Cable Harness Assembly

NOTE: The EV6 injector is standard on the Gen III Drive-By-Cable harness.

NOTE: The Gen III Drive-By-Cable harness is wired for 2 Bosch 4.9 LSU (Laser Sensor Unit) sensors.

NOTE: Can 1 and Can 2 come pre-terminated with DT (Deutsch) connector for easy use with aftermarket products.

NOTE: 20 pin I/O expansion connector is standard for the Gen III Drive-By-Cable harness. It can be paired with either additional I/O flying lead harness or 4L60e/4L80e expansion harness for direct plug in and play to the 4L60e and 4L80e transmission setups.

TERMINATED GEN IV DRIVE-BY-WIRE LSX CORE ECU HARNESS

This harness has an electronically controlled throttle body, along with an accelerating pedal feeding a signal to the ECU to control the electronic throttle. On the Gen IV Drive-By-Wire harness the MAP and Cam sensor are both located on the front of the engine. The knock sensors are located on the sides of the engine, which is different from the Gen III Drive-By-Cable harness.

Figure 37. Drive-By-Wire Harness Assembly

NOTE: The EV6 injector is standard on the Gen IV Drive-By-Wire harness.

NOTE: The Gen IV Drive-By-Wire harness MAP sensors wiring is long enough to go to either front or rear of the intake manifold.

NOTE: The Gen IV Drive-By-Wire harness is wired for 2 Bosch 4.9 LSU (Laser Sensor Unit) sensors.

NOTE: Can 1 and Can 2 come pre-terminated with DT (Deutsch) connector for easy use with aftermarket products.

NOTE: 20 pin I/O expansion connector is standard for the Gen III Drive-By-Cable harness. It can be paired with either additional I/O flying lead harness or 4L60e/4L80e expansion harness for direct plug in and play to the 4L60e and 4L80e transmission setups.

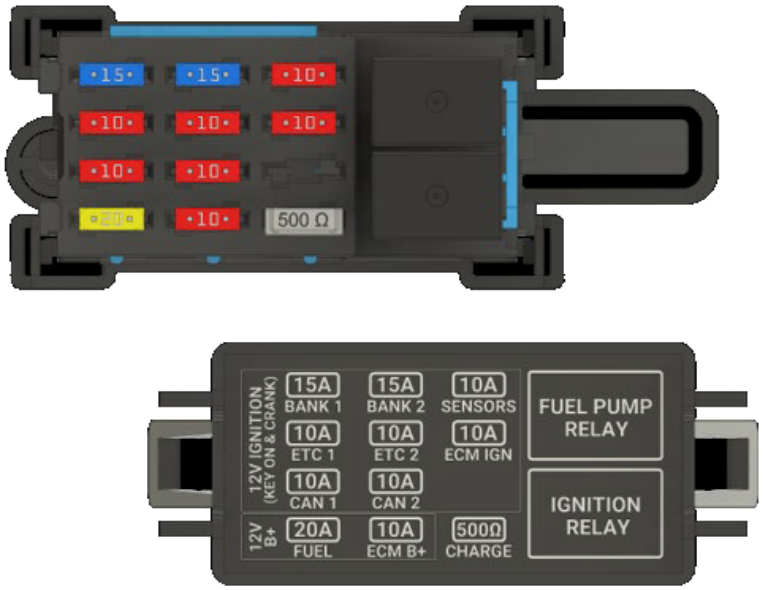


Figure 38. Fuse & Relay DBC & DBW Center Assembly

UNETERMINATED 15’ FLYING LEAD CORE ECU HARNESS

This harness comes with the four ECU connectors along with the 15 ft sections of wiring already pinned for the ECU connector. This kit provides cavity plugs for the cavities not being used.

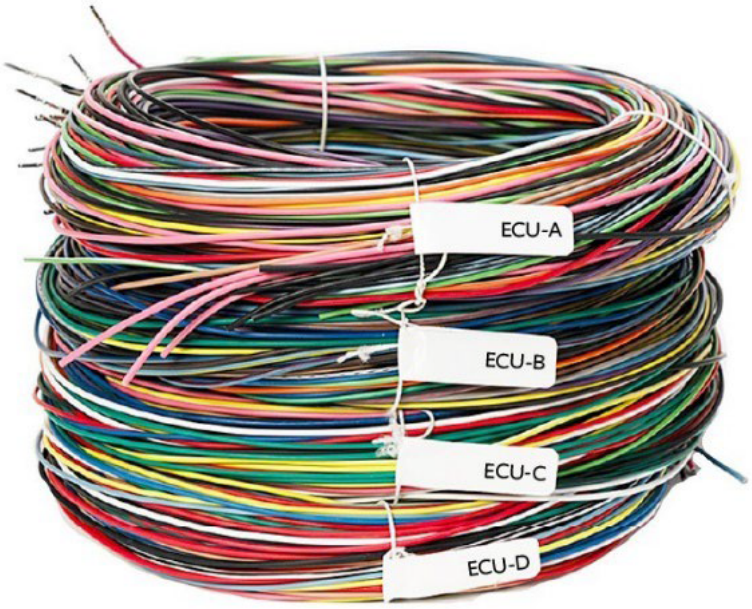


Figure 39. Flying Lead Harness Assembly

4L60E/4L80E TRANSMISSION CONTROL CORE ECU SUB HARNESS

This is a single plug-in solution harness for the 4L60e & 4L80e transmission. Below outlines the 4L60e & 4L80e harness pinouts and I/O type.

Figure 40. 4L60e & 4L80e Harness Assembly

Pin	Color	Comments
1	LT GRN	4L60E CAVITY A - 1-2 SHIFT SOLENOID VALVE CONTROL
		4L80E CAVITY A - 1-2 SHIFT SOLENOID VALVE CONTROL
2	YEL/BLK	4L60E CAVITY B - 2-3 SHIFT SOLENOID VALVE CONTROL
		4L80E CAVITY B - 2-3 SHIFT SOLENOID VALVE CONTROL
3	RED/BLK	4L60E CAVITY C - PRESSURE CONTROL SOLENOID VALVE HIGH CONTROL
		4L80E CAVITY C - PRESSURE CONTROL SOLENOID VALVE HIGH CONTROL
4	YEL	4L60E CAVITY L - TRANS FLUID TEMPERATURE SENSOR SIGNAL
		4L80E CAVITY L - TRANS FLUID TEMPERATURE SENSOR SIGNAL
5	PNK/BLK	4L60E CAVITY N - TRANS RANGE SWITCH SIGNAL A
		4L80E CAVITY N - TRANS RANGE SWITCH SIGNAL A
6	RED	4L60E CAVITY P - TRANS RANGE SWITCH SIGNAL C
		4L80E CAVITY P - TRANS RANGE SWITCH SIGNAL C
7	DK BL	4L60E CAVITY R - TRANS RANGE SWITCH SIGNAL B
		4L80E CAVITY R - TRANS RANGE SWITCH SIGNAL B

Pin	Color	Comments
8	WHT	4L60E CAVITY S - 3-2 SHIFT SOLENOID VALVE CONTROL
		4L80E CAVITY S - TCC PWM SOLENOID VALVE CONTROL
9	TAN/BLK	4L60E CAVITY T - TCC SOLENOID VALVE CONTROL
		4L80E - NOT USED
10	BRN	4L60E CAVITY U - TCC PWM SOLENOID VALVE CONTROL
		4L80E - NOT USED
11	PNK	4L60E CAVITY E - 12V IGNITION
		4L80E CAVITY E - 12V IGNITION
12	BLK/WHT	4L60E CAVITY D - PRESSURE CONTROL SOLENOID VALVE LOW REFERENCE 4L60E CAVITY M - TRANS FLUID TEMP SENSOR LOW REFERENCE
		4L80E CAVITY D - PRESSURE CONTROL SOLENOID VALVE LOW REFERENCE 4L80E CAVITY M - TRANS FLUID TEMP SENSOR LOW REFERENCE ISS CAVITY B - INPUT SHAFT SPEED SENSOR LOW
13	PPL/WHT	4L80E - NOT USED
		ISS CAVITY A - INPUT SHAFT SPEED SENSOR SIGNAL
14	DK GRN	LOOSE - POSSIBLY TO BE USED FOR 0-5V LINE PRESSURE SENSOR
15	LT BLU	LOOSE - ECU 5V REFERENCE 2
16	DK BLU/RED	LOOSE - SPEED INPUT 3
17	PPL/BLK	LOOSE - SPEED INPUT 4
18	LT BLU/PPL	LOOSE - FREQUENCY/DIGITAL INPUT 2
19	LT BLU/YEL	LOOSE - FREQUENCY/DIGITAL INPUT 3
20	BLK	LOOSE - BATTERY NEGATIVE

Table 36. 4L60e & 4L80e Harness I/O Pinout Description

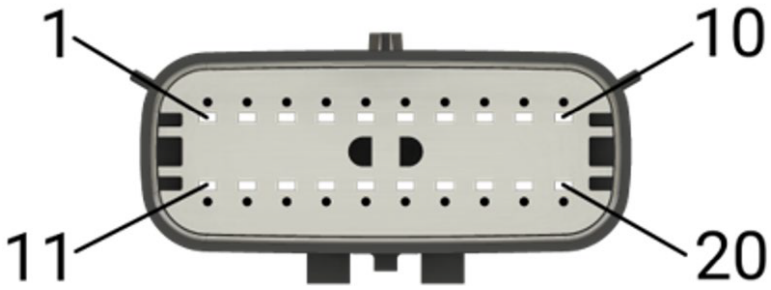


Figure 41. 4L60e & 4L80e Pin 1-20 Connector View

5FT CORE ECU I/O SUB HARNESS

This sub harness allows users the ability to utilize additional I/O when not utilizing the 4L60e/4L80e sub harness.

Figure 42. 5ft I/O Harness Assembly