



APEX PDM

Quick Install Guide

Apex 24

Apex 16

Introduction

The Apex Power Distribution Module (PDM) combines state-of-the-art components with an innovative visual designer to ensure a intuitive, easy-to-access experience for both experienced tuners and hobbyists alike. This 'smart fuse box' allows for reliable, accurate control of the entire vehicle, and extensive Inputs and Outputs means never running out of channels whether the vehicle is a stripped-out race car or an IVA Compliant road car.

Status LEDs, Datalogging, and an intuitive, visual, software layout allows for rapid, accurate diagnostics in any situation. In addition, 2-way CANbus not only allows for the PDM to be controlled via a Keypad but also allows all the information from your Engine Control Unit (ECU) to be used in the PDM's algorithms. This flexibility allows for limitless control of your vehicle's systems.



- Apex PDM
- USB-C Cable
- USB-C Dust Cap
- M5 Cap Head Mounting Bolts
- Quick start Guide
- Pinout Sheet
- Keyring
- Sticker
- Plug and Pins or Wiring Harness

What's in the box?

MOTORSPORT ELECTRONICS			
Outputs	Apex-16	Apex-24	
15A Outputs	12	16	
7A Outputs	4	8	
Inputs			
Analog/Digital Inputs	16	16	
Accessory Input	✓	✓	
12v Input	✓	✓	
Communications			
USB-C	✓	✓	
2-Way CANbus	✓	✓	
Dual CANbus	✓	✓	
DataLogging			
PC Datalogging	✓	✓	
Onboard Datalogging	✓	✓	
Features			
190A Battery Connection	M6 or Redlok Compatible	M6 or Redlok Compatible	
Status LED	✓	✓	
Output Diagnostic LEDs	✓	✓	
Billet Aluminium Case	✓	✓	
Full Time UK Support	✓	✓	

Legend

1. Power LED
2. Status LEDs
3. USB-C Connector
4. Battery Connection
5. Connector A (26 Pins)
6. Connector B (34 Pins)
7. M5 Mounting Holes

Mounting Torques

Mounting Bolts Max:
4Nm / 4 ftlbs

Battery Connection Max:
4Nm / 3 ftlbs

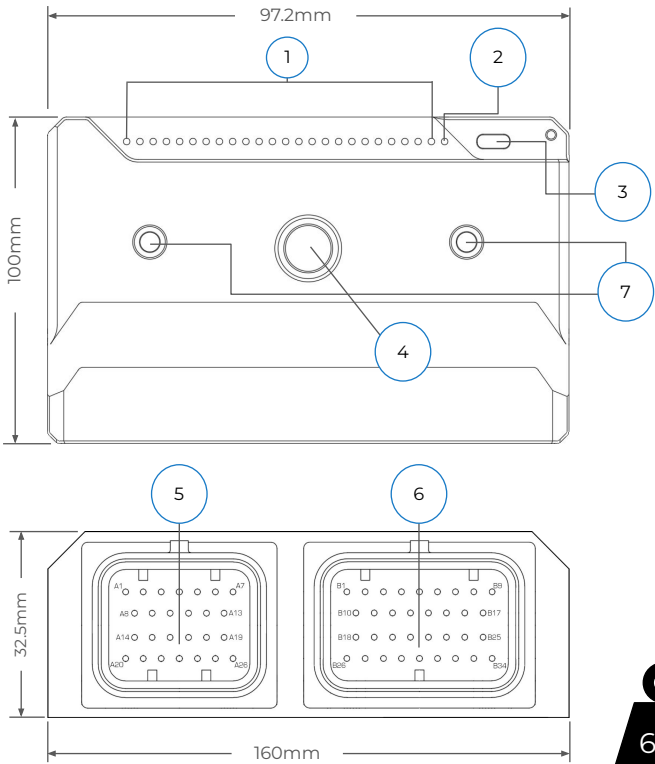
Part Numbers

Harness Connector A:
1473416-1

Harness Connector B:
4-1437290-1

Terminals: 3-1447221-3

Schematic and Mounting



LED Status Decoder

Status LED

- OFF (Unlit) - Device not powered
- Blue Pulsing - Device Powered
- Red - System Error; either one or more outputs have tripped or there is an internal error state

Power Output LEDs

- OFF (Unlit) - Output not in use
- Blue - Output assigned but is currently not in use
- Green - Output currently in use and operational
- Red - Fault

All 25 LEDs will do a sweep on Connection in White. This is useful for diagnosing possible LED issues.

Connection to the Apex PDM couldn't be simpler with a single USB-C cable able to provide the power required to connect the PDM to a computer for configuration.

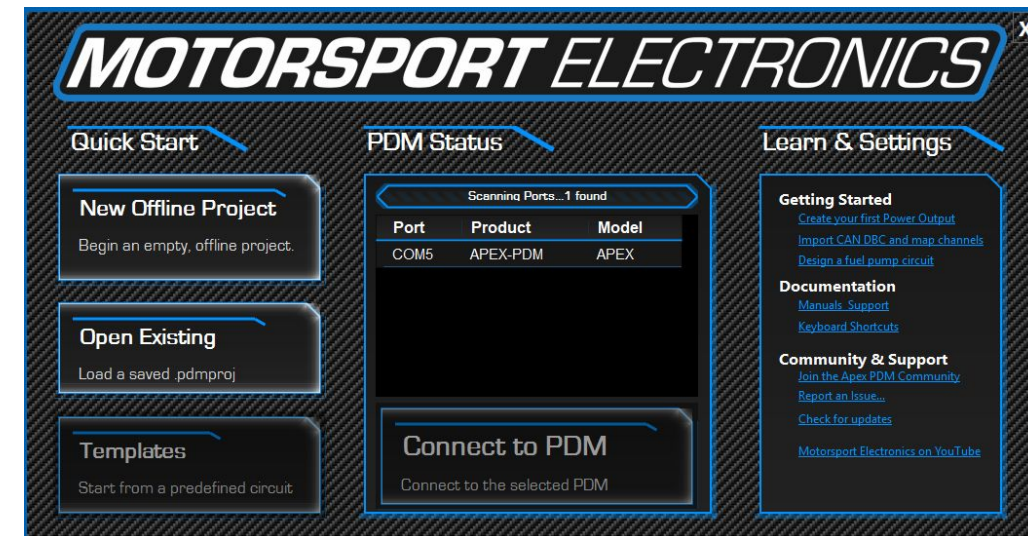
Installing Apex PDM Software

1. Navigate to motorsport-electronics.co.uk/support
2. Click on the button that says 'PDM Configuration'
3. Select 'Click here to download'
4. Follow installation instructions on screen
5. Find the PDM Icon on your Desktop or navigate to the software using the Start Menu
6. This should then show the Project Hub (below) where you can select how you would like to configure your PDM

Connecting to the PDM

1. Insert USB-C
2. The PDM will show in Project Hub
3. Click on PDM in Device list
4. Click "Connect to PDM"

Note: The PDM will be powered via the USB-C it does require external power

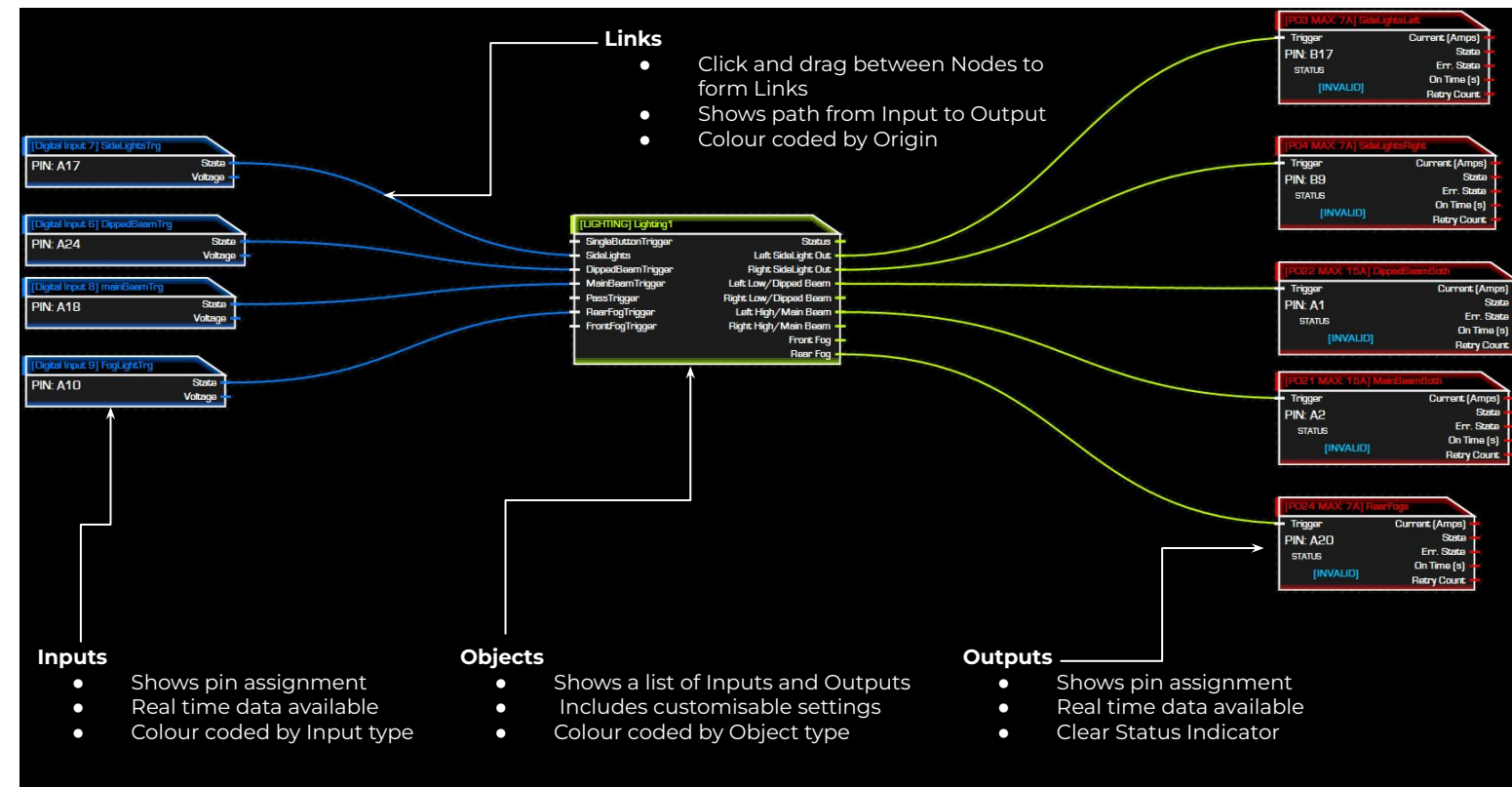
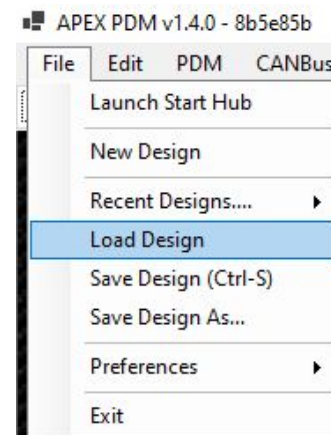


Load Basefile

Once the PDM Software has been opened you will be able to visualise the current Configuration.

To install an IVA Compliant basefile:

1. Click 'File'
2. Click 'Load Design'
3. This should open a dialog box in the 'Examples' folder
4. Double-click the 'RoadGoingBasic' file to open it
5. If the System prompts you to Save the current configuration click 'No'

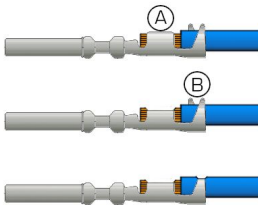


Wiring Guide

Proper wiring is essential for safety and functionality. To help we've made this guide on how to crimp wires, seat and unseat them from the connectors and on proper wire gauges to use for each channel type.

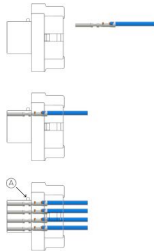
How to Crimp Wire

- Insert crimp Tab A into slot 2.0L
- Insert wire into back of crimp so the conductor will be crimped by Tab A and the insulator is in Tab B
- Crimp Tab A
- Insert Tab B into slot 4.0 and crimp
- Insert Tab B into slot 2.5 and crimp



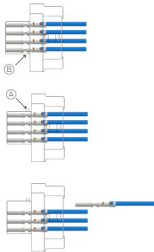
How to seat Crimps in the Connectors

- Insert crimped wire into the back of the connector
- Make sure wire is pushed all the way to the front of connector
- Once you have inserted all your wires into one of the connectors click down Tab A to lock in place



How to unseat Crimps from the Connectors

- There is a small tab at Position B
- Push this with small screwdriver until Tab A fully extends
 - Note: This should be done no more than 10 times total
- Pull the wire from the connector
 - Note: This should not be done more than 3 times in any one location



Recommended Wire Sizes

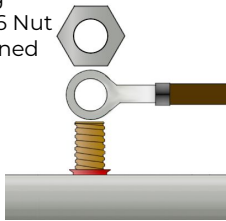
Channel Type	Wire Size (AWG)	Wire Size (mm^2)
M6 Power Lug	4	21
15A Power Output	16-18	1
Accessory Input	16-18	1
12v Ignition Input	16-18	1
Grounds	16-18	1
Sensor Grounds	20	0.5
5v References	20	0.5
CANBus	20	0.5
7A Power Output	20	0.5
Inputs	20	0.5

Wiring Tools

- We recommend the following tools:
- Hozan P-706 Crimping Tool
 - Ideal 45-121 Wire Strippers

Power Lug

- The Power Lug should be connected to the main battery using 21mm wire
- Terminate the 21mm wire with a ring terminal or Radlok connector
- Place onto Power Lug
- If securing with an M6 Nut ensure it is not tightened beyond the specified torque



12v Ignition Input

- The 12v Ignition Input should be connected to the ignition switch or key barrel using 0.5mm wire
- This will turn on the PDM allowing the operation of connected devices

Accessory Input

- The Accessory Input can connected to the battery to keep devices alive which are legally required to work while the Ignition is off
- Use 1mm wire for this Input

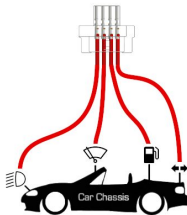
Grounds

- The Main Ground (B18) wire should be connected to the clean, bare metal, chassis using 1mm wire
- Make sure to employ a "Star Point Grounding" technique
- Sensor Grounds should be used for sensors only. These should not be connected to any other ground



Power Outputs

- Power Outputs each have a rating. Multiple can be combined to give more available current
- Power Outputs will give 12v to devices such as headlights, wipers, indicators etc
- These devices then should be grounded locally to the chassis
- 2x Power Outputs are dedicated Wiper outputs
- Horns must be connected to 15A Flyback Protected Outputs to avoid damage to the PDM
- Status LEDs help check the state of these outputs



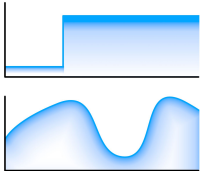
CANbus

- Connect 0.5mm wires to CAN High and CAN Low outputs
- Twist wires together
- Set the software selectable resistor inside the PDM
- Make sure to put a 120ohm resistor in the circuit at one of the other CANBus devices (e.g. ECU, Dash)



Inputs

- Inputs can accept both digital and analog signals
- They can be used to wire in switches, stalks or buttons
- They can also accept sensor signals
- 0.5mm wire should be used for these connections



Typical Wiring Diagrams

Providing Power

To ensure correct powering of the Apex PDM, it must be powered directly from the Battery to the central lug and via an Ignition Switch or Key Barrel into the connector. The PDM should also be grounded directly to the battery.

The battery provides power for devices attached to the PDM with the Ignition Live (from the Ignition Switch / Key Barrel) providing a signal to the PDM to turn on.

Power for an ECU should be provided via a Power Output from the PDM. The ECU should then be grounded to the chassis. The Engine harnesses provided with Motorsport Electronics Wire-in ECUs have a Chassis Ground for this purpose.

If the install includes a CANBus keypad then this needs to be powered via the Ignition. Do not power this via the PDM. A keypad should be grounded locally to the chassis.

15A Power Outputs

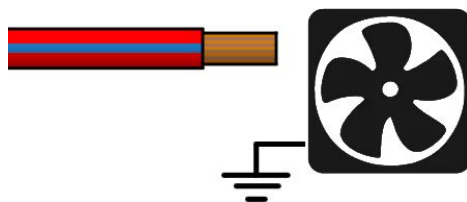
The Apex PDM features Power Outputs capable of providing 15A to devices or sending up to 15A to ground.

These outputs can be configured to output a PWM signal allowing for precise control of high load devices such as fans and pumps. Alternatively, they can be left in an On/Off state to control circuits such as ignition or injection circuits.

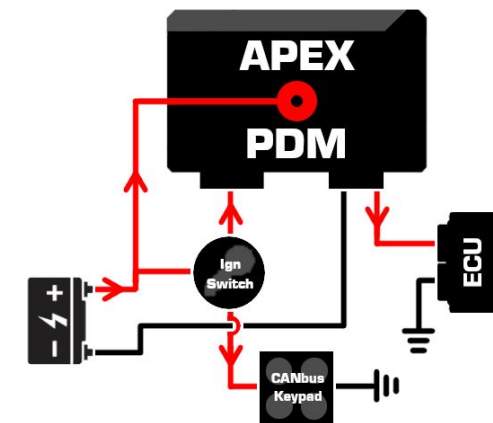
Configurable automatic overcurrent protection and retry settings give complete control over each power output individually to ensure maximum safety. With Status LEDs on the outside of the PDM allowing for quick and effective diagnosis.

In addition, all the power outputs have flyback protection allowing them to be used for devices such as horns or high-power solenoids. This additional layer of protection ensures hardware failures are never a concern.

Example 15A Power Output Connection



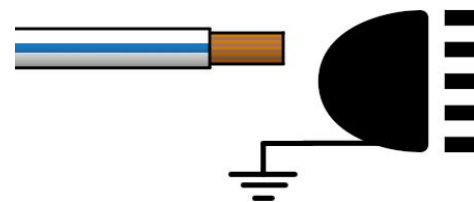
Any of the power outputs may be combined to increase the maximum available power for any one device



7A Power Outputs

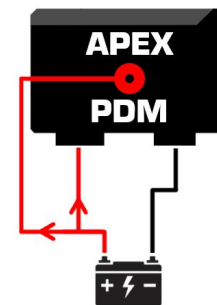
Full PWM control and settable Fuse currents ensure the same level of control as safety are available on all the Apex's outputs. Perfect for devices such as wipers, ECUs and lights, these outputs are the backbone of any build and are included in the status LEDs.

Example 7A Power Output Connection



Accessory Input

The Apex PDM can also be connected to the battery via the Accessory Input. This is not essential for operation however, it allows devices to be configured in the software to stay powered even when the ignition is turned off.



Inputs

The Apex PDM accepts Inputs from all manner of sensors, stalks, rotary position, push, and toggle switches. Options for filtering and pull-up resistors allow for complete control of input signals.

Analog Inputs are used for variable 0-5v signals and include a transfer function to allow for immediate conversion from a voltage to a meaningful parameter such as temperature. Pull-ups should be selected for temperature inputs.

2-pin sensors (e.g coolant) will require a Sensor Ground connection alongside the signal wire which will be wired to the Input. 3-pin sensors will have a 5v Reference wire alongside the signal and sensor ground.

Digital Inputs are used for switches and stalks and can be configured to trigger at certain voltages. There are also settings to activate only while the switch is closed, toggle or even increment settings.

Frequency Inputs allow users to input cyclical signals and detect rising and falling edges for effective input of wheel speed, RPM or fuel flow sensors. Most of these are 3-wire sensors and require the same wiring as a typical 3-wire sensor however, sometimes a Power Output supplying 12v is required rather than a 5v Reference.

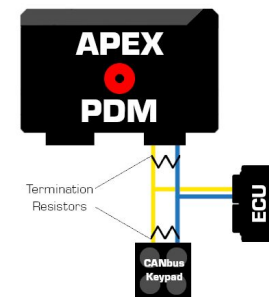
Communications

The Apex PDM can communicate with other devices via CANBus. CAN wires should be twisted together and have 2 termination resistors between the CAN High and CAN Low wires. One of these can be selected in the PDM software and the other can be configured on many ECUs, Keypads and Digital Dashes.

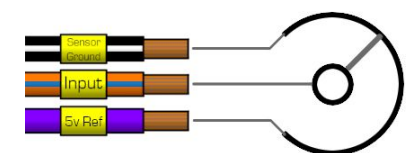
Any additional devices you want to communicate with should then be spliced into this wiring between the two resistors. Additional devices do not require a termination resistor.

In the diagram on the right, the PDM and the Keypad both have internal termination resistors selected. The ECU is spliced into the network and therefore doesn't require a resistor.

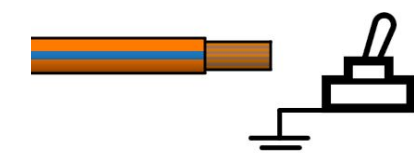
Typical Wiring Diagrams



Example Analog Input Wiring



Example Digital Input Wiring



Configuration Software

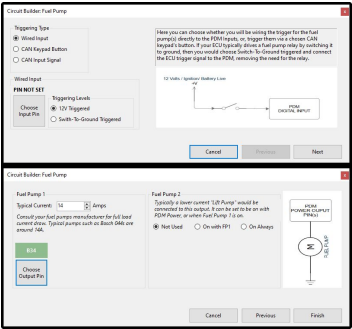
The Apex PDM uses a Visual Designer for its configuration. This is an intuitive way of designing circuits that allows for a graphical representation of circuits within the vehicle rather than a list of abstract connections. Unique features like Circuit Builders, live data visualisation and, a graphic pin selector combine for a configuration experience that is both accessible and customisable.

When configuration of the PDM is complete, a set-up sheet can be generated from inside the software to allow users to build their desired harness.

Circuit Builders

These wizards allow for intuitive, step-by-step, creation of circuits and modules.

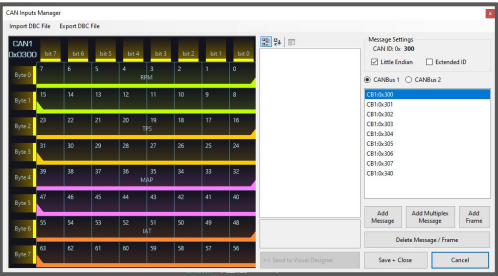
All of these settings are then built as a circuit so each element can be later customised without the need to rerun the wizard.



Custom CANbus

CANbus files can be loaded in from any source, including OEM .dbc files. These can be customised on import to allow users to only select the variables they require.

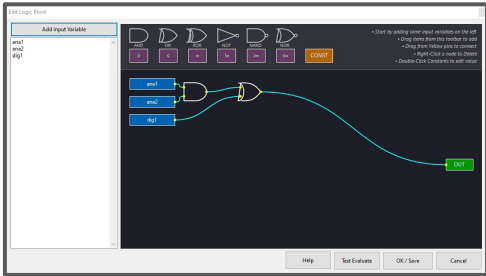
Users can also create custom CAN messages which can then be exported to a .dbc file for importing into devices such as digital dashboards.



Logic Blocks

The Visual Designer allows users to create custom logic both in a basic form using singular logic gates but also using Logic Blocks.

Logic Blocks allow users to contain complex logic into one simple object on the screen. This adds a layer of customisation without needlessly adding complexity to the graphical representation of the system.

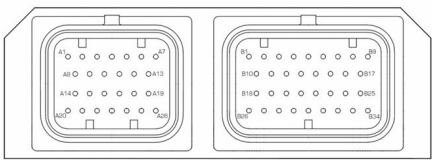


Configuration Software

Setup Sheet

Once a configuration has been finalised, the Apex Calibration Software has a built-in Set-up Generator.

This generates a print-ready document including all the used pins, their functions and recommended wire gauges depending on the usage. This can then be used to wire-up a harness for the Apex PDM.



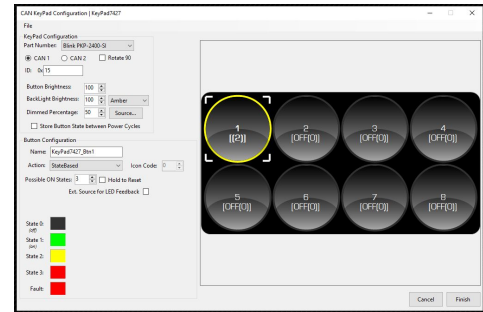
System Infrastructure (CAN / Power / GND)			
Pins	Function	Con	Description
B15, B16, B24, B32	5V OUT	B	5V Sensor Supply
A21	ACC 12V	A	Accessory 12V Trigger Input
B30	CAN1 HI	B	CAN BUS 1 HIGH
B29	CAN1 LOW	B	CAN BUS 1 LOW
B28	CAN2 HI	B	CAN BUS 2 HIGH
B27	CAN2 LOW	B	CAN BUS 2 LOW
B33	IGN SW	B	12V Ignition Switch Input
B18	Main Ground	B	Main Ground
A3, A22	NC	A	Not Connected
B11, B12, B13, B14, B19, B20, B26	S.GND	B	Sensor Ground Return / Sensor Ground

Keypads

Keypads can be configured inside the Software's Keypad Configurator.

This includes layouts for many popular Keypads and a visual state decoder so users can assign colours to each possible state that keypad button can have.

Keypad settings like brightness, backlight colour and dimming can also be controlled from this configurator.



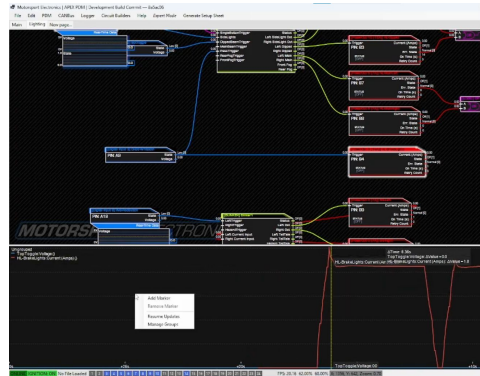
Configuration Software

Real Time Data

The Software includes both Real-Time readouts for specific outputs and a full Data Logger.

Opening the contextual read out on a specific Output or Input will give information for that specific channel. Alternatively, you can add it to the main Logger to view multiple sources simultaneously.

There is also the option to log to perform diagnostic logs both to the PC or to the PDM itself.



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