Haltech

NEXUS S3 NEXUS S2

QUICK START GUIDE

The Nexus S3/S2 ECUs stand at the forefront of engine management systems, featuring cutting-edge technology and innovative features. Designed for the next generation of automotive enthusiasts and professionals, these state-of-the-art ECUs seamlessly combine powerful engine control with a range of additional functionalities, making them versatile and comprehensive solutions for everything from everyday driving to high-performance racing.

The Nexus S3/S2 ECUs are fully compatible with a myriad of Haltech devices, streamlining the configuration of engine parameters and additional functionalities, all programmable using a single piece of software.

Experience high-speed USB and Wi-Fi connectivity, allowing for seamless communication between the ECU and your tuning device. The Nexus S3/S2 ECUs are revolutionary engine management systems that transcend conventional boundaries, offering a comprehensive solution for performance tuning and control. With their advanced features, user-friendly interface, and seamless connectivity, they redefine the standard for engine management systems in the automotive industry.

Scan this QR code to access more information about the Nexus S3/S2 ECUs.

What's in the box?

- Nexus S3 or S2 ECU
- USB-C Cable
- USB-C Dust Cap
- Mounting Bolts

HT-182200

HT-030009

HT-030011

HT-039065

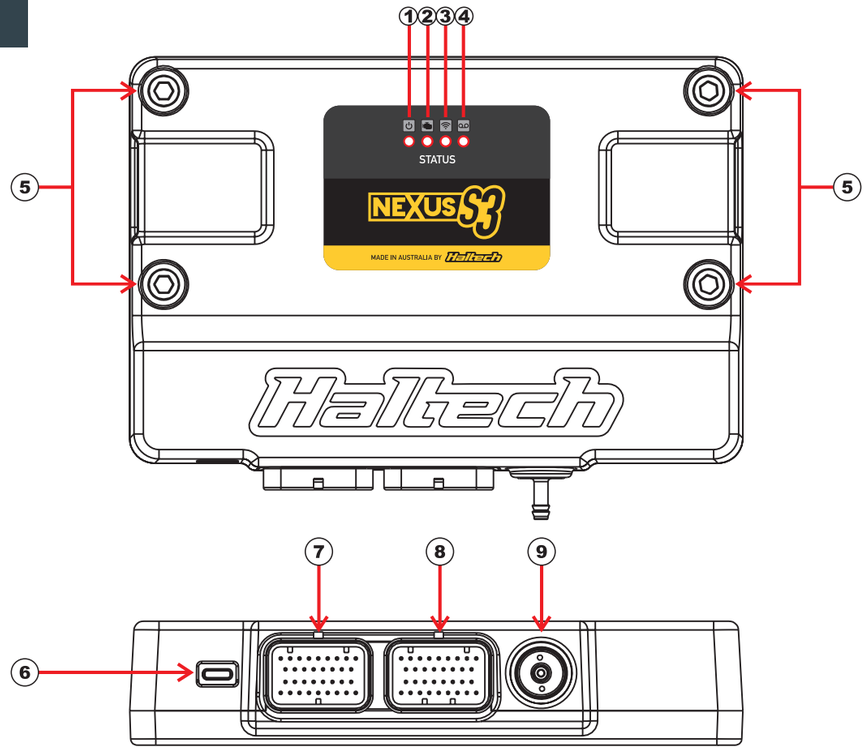
HT-010746

HT-010747

Optional accessories (sold separately)

- HT-030009 - AMP 34-pin Key 1 plug and pins set
- HT-030011 - AMP 34-pin Key 2 plug and pins set
- HT-182200 - Nexus S3/S2 Universal Wiring Harness 2.5m (8')
- HT-010746 - Bosch LSU 4.9 Wideband Hardware Pack - includes sensor, adaptor harness, and weld-in bung
- HT-010747 - NTK Wideband Hardware Pack - includes sensor, adaptor harness and weld-in bung
- HT-039065 - Tube Mount Kit - 31.75mm (1.25")
- HT-039067 - Tube Mount Kit - 41.275mm (1.625")
- Plug and play adapter kits for various applications

1 Power LED
2 DTC LED
3 Wi-Fi LED
4 Datalog LED
5 Mounting Holes
6 USB-C Port (Comms)
7 Connector A (AMP 34 pin Keyway 1)
8 Connector C (AMP 34 pin Keyway 2)
9 Onboard MAP sensor (4 BAR)



LED	COLOR	CONDITION
Power	Green	Normal operation (on main power or low power mode)
	Blue	Connect to unit and install firmware
	Red	Hardware fault
DTC	None	DTCs not present
	Yellow	A DTC is present (of any kind, past/present/not severe/severe)
Wi-Fi	None	Wi-Fi is disabled
	Green solid	Wi-Fi is enabled
	Green flashing	Wi-Fi is enabled and connected to NSP
Datalog	None	Unit is not logging
	Yellow flashing	Unit is logging, unit is not looping or not full
	Yellow	Unit is logging, unit is looping or full

NEXUS S3/S2 SPECIFICATIONS

FEATURES	
Drive-By-Wire Throttle Support	2
Flex Fuel	YES
Closed Loop O2 Control	Dual Bank
Knock Control	Dual
Variable Cam Control	Up to 4
Long Term Learning	Up to 4D
Data Logging	Laptop + Onboard
Anti-Lag Rotational Idle	YES
Launch Control	YES
Traction Control	YES
Tuning Table Resolution	32 x 32 x 8 4D
Engine Protection	Multi Level

FEATURES continued	
CAN Networks	2
Nitrous Control Stage	6
Boost Control	4D Closed Loop
CO2 Control	YES
Intake Air Bleed Control	YES
Flat Shift Control	Advanced
Shock Travel & Ride Height	YES
Trans Brake	YES
Race Timer	YES
Advanced Torque Management	YES
On-board Wideband	Single Channel LSU 4.9 / NTK

OUTPUTS	
Ignition	Nexus S3: 8 | Nexus S2: 4
Injector (peak and hold)	Nexus S3: 8 | Nexus S2: 4
Digital Pulsed Outputs (DPO)	6
Engine Control Relay (ECR) output	1
Half Bridge Outputs (HBO)	4

INPUTS	
Onboard MAP sensor (4 bar)	1
Analog Voltage Inputs (AVI)	11
Differential Engine Position Inputs	2 (Trigger and Home)
Synchronised Pulsed Inputs (SPI)	6
Knock Inputs	2
Universal Wideband Controllers (NTK/LSU 4.9)	1
Ignition Switch Input	1

OTHER	
4 Channel Oscilloscope	50kSa/s per channel, 2ms/Div limit, optional external trigger
5V Sensor Supply	1
8V Sensor Supply	1
Sensor Ground	1

COMMUNICATIONS	
CAN Bus Networks 1000, 500 or 250 kbit/s	2
High Speed USB 2.0 (USB-C interface) 480 Mbit/s connection	1
Power up over USB	Datalogging, settings and firmware upgrade available
Wi-Fi (internal antenna)	900 kB/s datalog extraction. Hardware lockout for security

DATA LOGGING	
Location	Onboard
Storage	128MB
Max sampling frequency	1kHz
Maximum channels per log	300

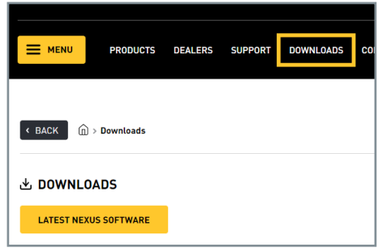
DIMENSIONS	
Enclosure	196.0 x 130.0 x 39.6 mm (7.7 x 5.2 x 1.6 in)
Overall (Including connector protrusion)	196.0 x 138.5 x 39.6 mm (7.7 x 5.5 x 1.6 in)
Weight	0.75 kg (1.65 lbs)
Operating Temperature (ambient)	-40 to 85°C (-40 to 185°F)

ELECTRICAL	
Power Supply (across power terminals)	8 to 22V
No output static current draw	< 1A
Low Power Mode (USB)	4 to 5.5V
Static current draw from USB port	< 500mA

Installing the NSP software

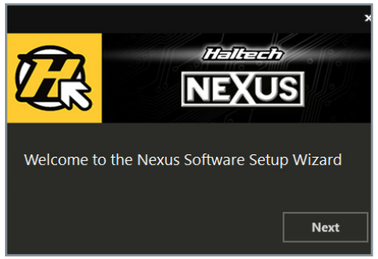
Haltech NSP (Nexus Software Programmer) is the software used for tuning and programming the Nexus S3/S2 ECUs. Follow these steps to install the Haltech NSP software:

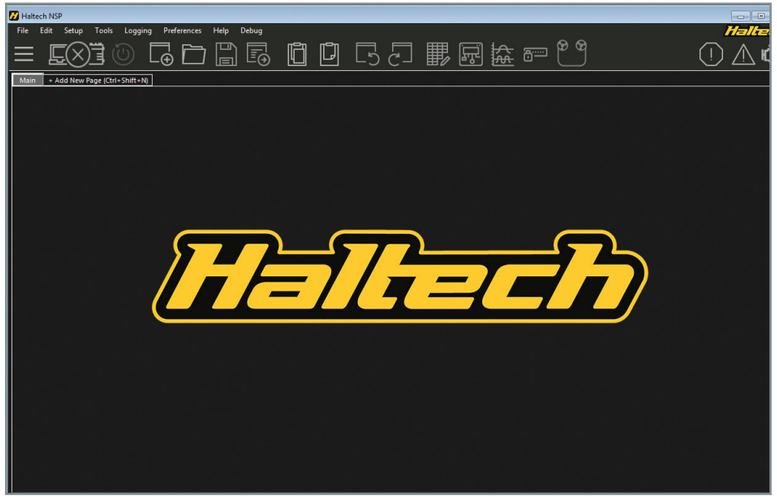
1. Download the NSP installer - Go to the Haltech website (www.haltech.com), navigate to the 'Downloads' section, and click on the download link.



2. Run the installer file - Once the download is complete, locate the downloaded file (usually in the 'Downloads' folder of your computer) and double-click on the file to run the Nexus Software Setup Wizard.

3. Launch Haltech NSP - Once the installation is complete, you can launch the Haltech NSP software from the Windows 'Start' menu or using the desktop shortcut that was created.

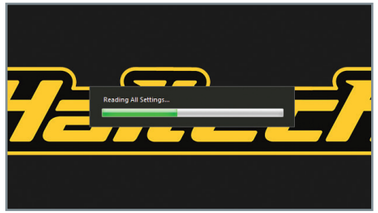




Going online with the ECU

With the NSP software open, connect the supplied Haltech USB cable between your laptop and the USB-C port on the front of the Nexus S3/S2 ECU.

The USB connection will let the NSP software automatically recognize the ECU and activate the unit in low power mode. This allows you to either upload a basemap or create a new one before installing the ECU into the vehicle. In low power mode, the ECU's inputs and outputs are disabled, ensuring you to safely configure your vehicle setup prior to installing the unit and powering it up.



Setting up Wi-Fi communications

Wi-Fi communication is another method for connecting the Nexus S3 or S2 ECU to your laptop, serving as an alternative to a USB connection once the Wi-Fi module is enabled.

To set up your Wi-Fi connection follow these steps:

1. Open NSP and connect your Nexus S3/S2 ECU using the provided USB-C cable.

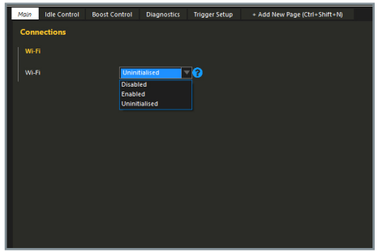
2. Click on 'Connections' in the navigation tree and enable the Wi-Fi module.

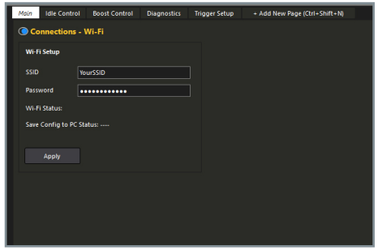
3. Under 'Connections', select 'Wi-Fi' to set up your SSID and password. Note that your SSID must be at least 1 character long, and your password at least 8 characters.

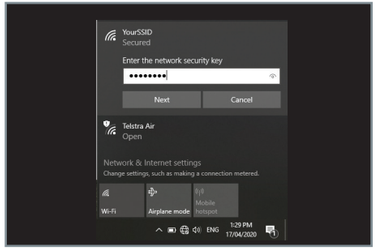
4. Click 'Apply'.

5. Power up the ECU using main power (ignition switch on), then go to your computer's Network settings. Connect to your Nexus S3/S2 ECU by selecting your chosen SSID and entering your password.

NOTE: The Wi-Fi antenna is internal on the Nexus S3/S2 ECU. The unit must be powered by the main power source for Wi-Fi communication. Up to two computers can connect to the ECU via Wi-Fi, and one via USB-C, at any given time. When the Wi-Fi module is disabled, it is completely inactive and held in an OFF state.





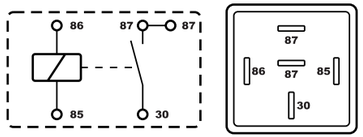


Power, Ground, and ECR Switching

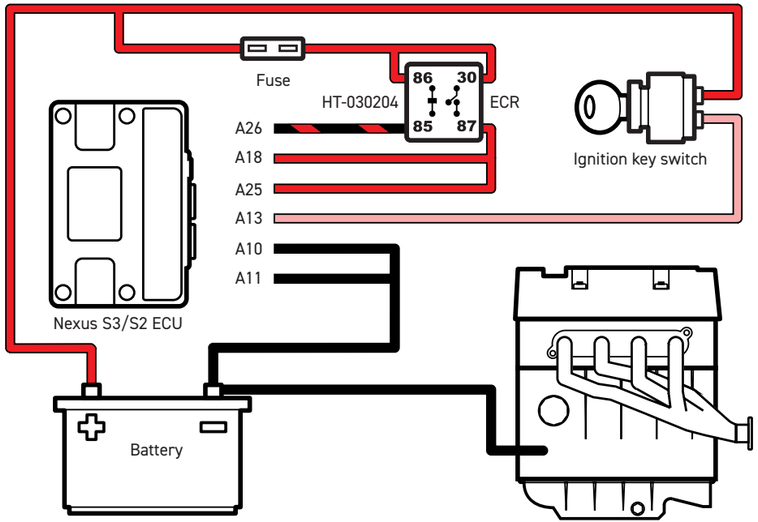
Powering the Nexus S3/S2 ECU must be done through the use of an Engine Control Relay (ECR). The unit requires an ECR-switched +12V power connection to both pins A18 and A25, along with a direct battery ground connection to both pins A10 and A11 for the ECU to function correctly.

Switching the ECR on or off can be controlled by the Nexus S3/S2 ECU as well. This is achieved by connecting the Ignition switch input (Pin A13) to the Ignition key switch and utilizing the ECR output from the ECU to trigger the ECR with a ground signal. An example diagram is provided to illustrate this typical setup.

NOTE: When wiring up the Ignition switch signal, it is crucial that the signal remains active in the Ignition On and Start positions. This ensures the ECU stays powered on while the engine is cranking, preventing start-up issues that could strain engine components.



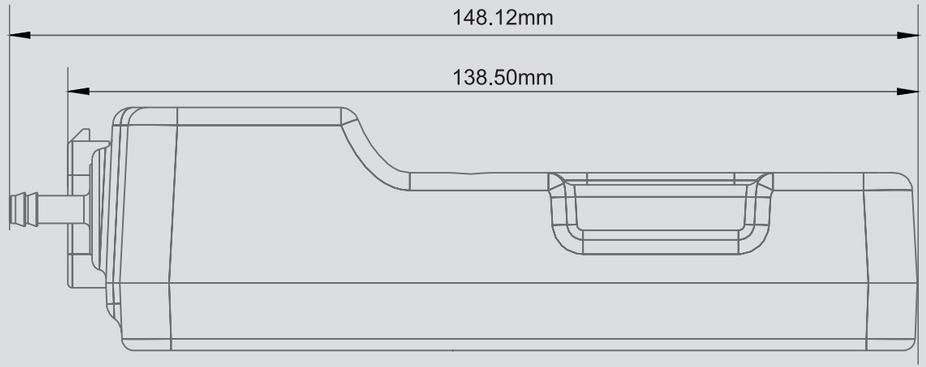
HT-030204 Relay pin layout and schematic



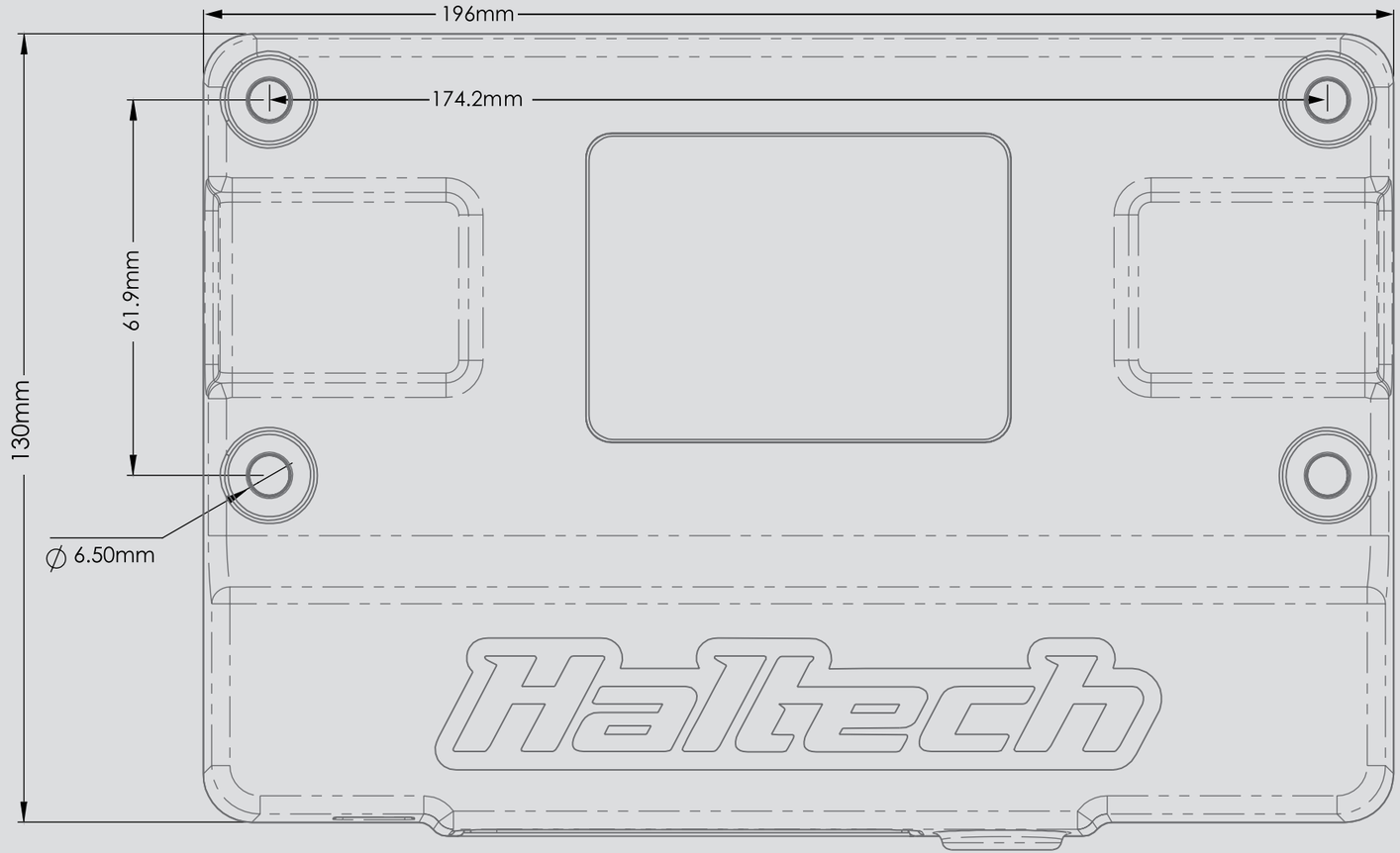
Example wiring configuration for the ECU's main power and ground, with the ECU controlling the Engine Control Relay (ECR).

NOTE: The relay depicted in this diagram corresponds to the pin numbering for a HT-030204 relay. If you're using a different relay, make sure you wire it according to the pinout that specific relay requires.

MOUNTING TEMPLATE



MOUNTING TEMPLATE



MOUNTING TEMPLATE

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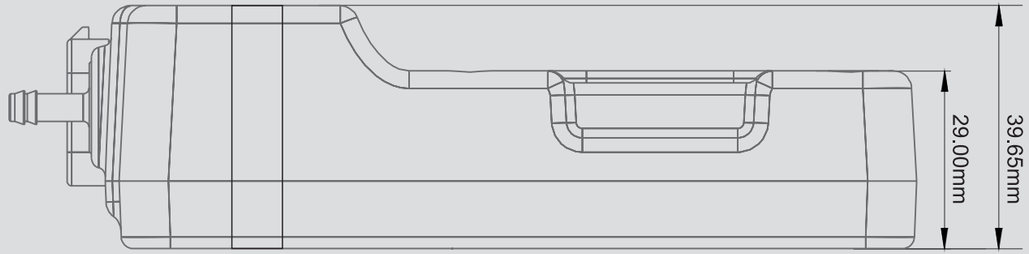


Crank (Trigger) and Cam (Home) Inputs

The crank and cam position sensors are necessary for providing the ECU with vital information to determine engine speed and position at any given moment. Typically, two sensors are required – one for cam position and one for crank position. However, many engines may only have a cam position sensor capable of supplying sufficient information for the ECU to effectively manage engine operation.

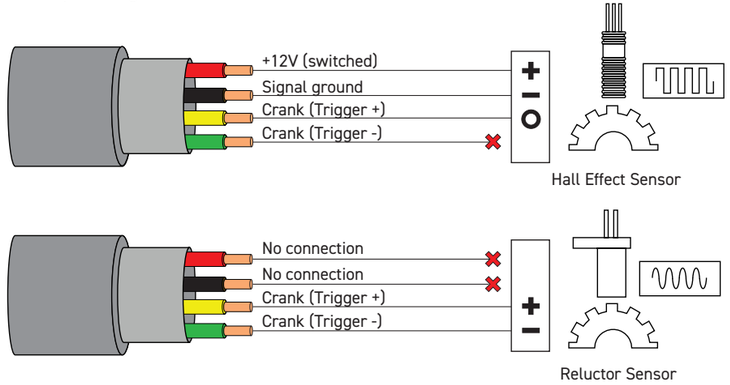
Vehicles equipped solely with a crank position sensor lack the capability to differentiate between compression and exhaust strokes, making them unsuitable for sequential fire applications. In such cases, it may be necessary to add a cam position sensor.

It is recommended to use four-core or twin-core shielded cable for crank and cam position sensors. Shields must be terminated to battery ground at one end only.

Specs:

- -10V to +10V input
- Selectable 1k2 or 440R pull-up to 5V
- Selectable ground reference (full differential standard mode)
- -75 to +75V indefinite withstand
- 48kHz max signal frequency

Example Wiring Connections



✖ indicates no connection. Please insulate and isolate to avoid damage to the ECU.

There are two common types of crank/cam sensor signals:

- **Hall effect/optical signal**
  (0-5V digital square wave signal)

This type of sensor sends out a digital square wave signal. Hall effect sensors typically have three wires: a power supply (5V, 8V, or 12V), a ground, and a signal output wire.

The power supply can be drawn from the +5V pin, +8V pin, or a HBO set to provide +12V as needed. The internal pull-up will typically need to be enabled in the software settings for Hall effect/optical sensors.

- **Reluctor signal** (analog style signal)

This type of sensor generates a sine wave signal and typically uses two wires: signal positive (+) and signal negative (-).

Reluctor sensors do not require external power, as they are passive sensors and can generate their voltage signal by sensing a moving tooth or trigger. It is important to disable the internal pull-up in the NSP settings for reluctor sensors.

Injector Outputs

All injectors should be directly wired to the ECU's corresponding cylinder output pins. During an injection event, the ECU grounds the output pin, prompting the injector to open and flow fuel for a specified duration.

It is essential to wire all injectors to a common +12V supply switched by an injector relay.

When not used for injection, these pins can be utilized as generic Digital Pulsed Outputs (DPO), capable of switching 2A to ground.

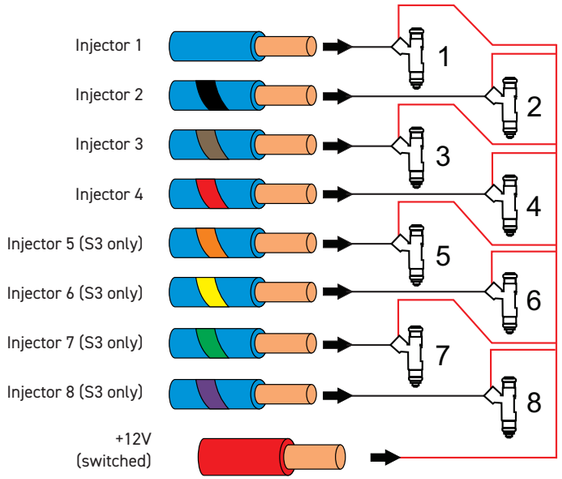
Specs:

- Number of channels - Nexus S3: 8 | Nexus S2: 4
- Current controlled output
- 8A Peak, 2A Hold
- 0 to 55V voltage feedback

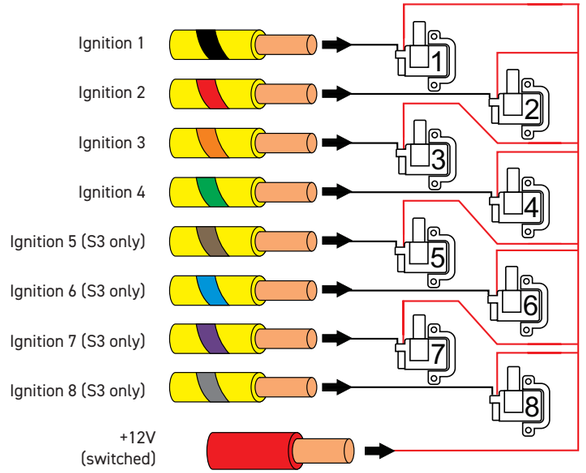
Unused injector outputs can also be used as:

- Generic switched or PWM outputs (2A)
- Low speed digital switch inputs (0-12V)

8-Cylinder Sequential Injection
(Wire as per cylinder order)



8-Cylinder Direct Fire Ignition
(Wire as per cylinder order)



NOTE: The coils (HT-020102) illustrated in this diagram are equipped with internal igniters. Do not connect ignition outputs directly to coils unless they have internal igniters, as doing so will damage the ECU. For coils without internal igniters, an external igniter module is required.

Ignition Outputs

The ignition outputs generate a signal between 12V and ground to control the charging and firing of an ignition coil. Ignition outputs can be connected directly to ignition coils only if the coils are equipped with internal ignitors. Ignition coils without internal ignitors draw large amounts of current and, as such, must use an external ignitor module to be safely triggered by the ECU. Connecting directly to ignition coils without internal ignitors will result in damage to the ECU.

Specs:

- Number of channels - Nexus S3: 8 | Nexus S2: 4
- Software selectable global 12V or 5V pull-up
- Software selectable individual 270R pull-up
- 10kHz switching speed
- Automatic overtemp, overcurrent, flyback protection
- 0 to 27V voltage feedback

Unused ignition outputs can also be used as:

- Generic DPO (3A sink) or PWM outputs
- Low speed digital switch inputs (0-12V)

WARNING

Connecting the ECU to an ignition module before setting the ignition firing edge correctly may damage the module and coils. Therefore, it is advised to disconnect the module or disable the power to the ignition system until the unit has been set up and configured.

Half Bridge Outputs (HBO)

Half Bridge Outputs are push-pull Pulse Width Modulated (PWM) outputs designed for controlling DBW throttle motors, idle air stepper motors, or electronic wastegates.

When not used as push-pull drivers, the Half Bridge Outputs on the Nexus S3/S2 ECU can serve as generic high-side or low-side outputs capable of driving 8A to 12V or sinking 8A to ground.

For DBW throttle motors, any Half Bridge Output pair can be arbitrarily selected and assigned (e.g., HBO 1 and HBO 4) in the DBW wiring settings in the NSP software.

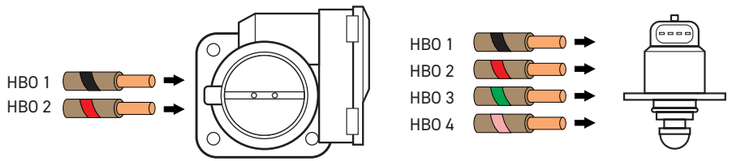
Specs:

- Number of channels: 4
- 8A to 12V (high), or 8A to ground (low) output
- 5A max when used as push-pull PWM (eg DBW)
- Automatic overcurrent and overtemperature protection
- 0 to 27V feedback
- High side current feedback
- 18kHz switching speed in DBW mode

Unused HBOs can be used as:

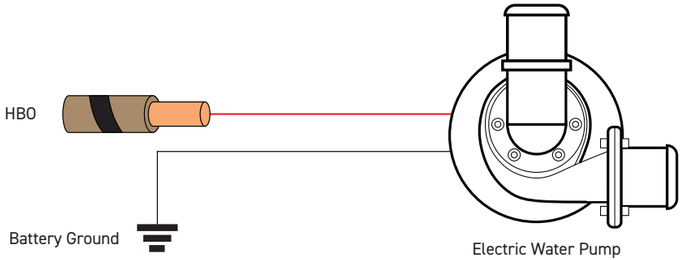
- Generic push/pull 2.2kHz PWM output

Example Wiring Connections



NOTE: The Nexus S3/S2 ECU supports up to two DBW throttles, independently controlled in closed loop. Any pair of HBOs can be assigned in NSP to control each throttle motor.

Example Wiring Connections



Digital Pulsed Outputs (DPO)

Digital Pulsed Outputs (DPO) are designed to ground-switch devices or to provide frequency-based control or pulse width modulation as needed.

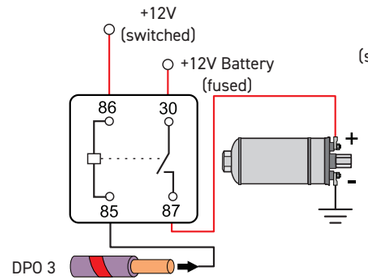
Common devices paired with DPOs include relays, idle air control valves, boost control solenoids, oil control valves, etc. Each DPO channel has a maximum sink current of 3A.

Unused DPOs can also function as low-speed digital switch inputs (0-12V).

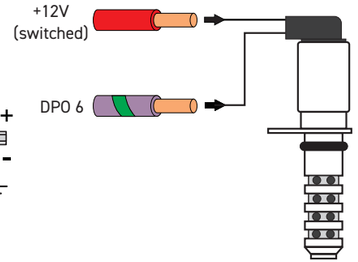
Specs:

- Number of channels: 6
- Low side drive (3A max current)
- Software selectable 4k7 pullup to +12V or +5V
- Overcurrent and flyback protection
- Over temperature protection
- 10kHz switching speed
- 0 to 27V feedback

Example Wiring Connections



Example of a wiring connection for a DPO controlling a high-current device, such as a fuel pump, via a relay.



Example of a wiring connection for a DPO controlling a low-current device (less than 3A), such as an oil control valve or cam control solenoid.

Analog Voltage Inputs (AVI)

Analog Voltage Inputs are inputs to the Nexus S3/S2 ECU that accept variable voltage signals ranging from 0V to 5V, such as signals from pressure, temperature, and position sensors.

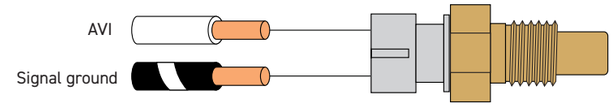
These inputs can also accept switched inputs that change between two different voltage levels. The On Voltage and Off Voltage set in NSP define the thresholds between the On and Off states. Common examples of switched inputs include the A/C Request switch or a Launch Control Enable switch.

AVIs feature a software-selectable 1K pull-up resistor to 5V, which can be enabled or disabled within the setup page. Pull-up resistors are generally enabled for temperature-related sensors and switched-to-ground inputs, and disabled for inputs with an external +5V supply, such as a MAP sensor or throttle position sensor.

Specs:

- Number of channels: 11
- 0 to 5V analog inputs
- 1000 samples per second
- Selectable 1k pull-up to 5V
- -10 to +30V indefinite withstand
- 1.5kHz signal frequency max

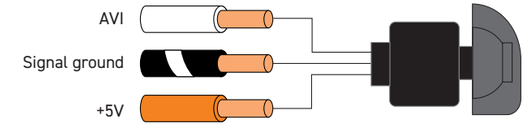
Example Wiring Connections



Temperature Sensor

Pull-up resistors are generally enabled for temperature related sensors and switched to ground inputs. The following configuration requires the pull-up resistor be enabled.

Example Wiring Connections



Rotary Trim Switch

Sensors with a +5V supply do not require the pull-up resistor be enabled, for example, rotary trim modules. Any Sensor +5V pin can be used with any Signal Ground pin for sensors.

Synchronized Pulsed Inputs (SPI)

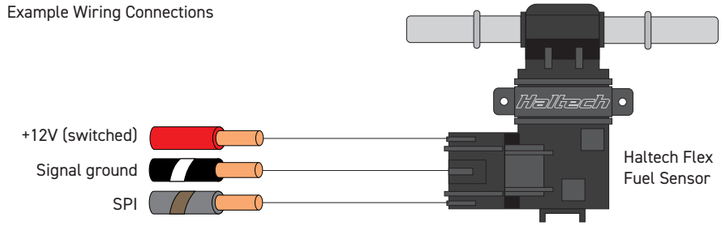
Synchronized Pulsed Inputs are capable of measuring the position, duty cycle, frequency, or state of a signal, similar to analog voltage inputs. These inputs are suitable for sensors such as cam position sensors, fuel composition sensors, road speed sensors, and flat shift switches.

Synchronized Pulsed Inputs are compatible with both digital (hall effect or optical) and analog (reluctor) based sensors. They have a maximum input voltage rating of 25V and can measure up to a maximum frequency of 22.5kHz.

Specs:

- Number of channels: 6
- -10 to +10V digital input
- 0 to 5V analog input
- Selectable 1k pull-up to 5V
- -15 to +30V indefinite withstand
- 22.5kHz signal frequency max

Example Wiring Connections



Haltech Flex Fuel Sensor

Knock Inputs

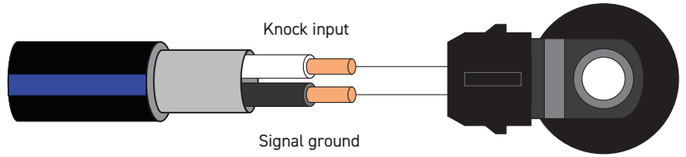
A knock sensor detects engine knock and sends a voltage signal to the Nexus S3/S2 ECU.

The ECU utilizes the knock sensor signal to adjust ignition timing if knocking is detected. Knock detection can be achieved by installing a compatible piezoelectric knock sensor mounted to the engine block. It is recommended to use twin-core shielded cable for knock sensors, with shields terminated to battery ground at one end only.

Specs:

- Number of channels: 2
- -2.5 to +2.5V AC input only
- 160Hz to 48kHz signal frequency band
- +/-3V indefinite AC voltage withstand
- 50V indefinite DC withstand

Example Wiring Connections



Knock Sensor

Wideband Sensor Input

A wideband O2 sensor can be connected directly to the Nexus S3/S2 ECU's onboard wideband controller. This type of sensor measures a broad section of the Air Fuel Ratio (AFR) scale, making it a useful tool for fuel tuning, closed-loop O2 control, or engine protection.

The Nexus S3/S2 ECU specifically supports onboard wideband control for Bosch LSU 4.9 or NTK wideband sensors, which can be selected in the wideband O2 sensor settings in NSP.

For applications requiring more than one wideband O2 sensor, the Nexus S3/S2 ECU can be expanded to use multiple sensors by integrating external Haltech CAN wideband controller kits such as the Haltech WB1 or Haltech WB2. The diagram below illustrates an example of a dual wideband sensor connection, with one sensor connected directly to the ECU and the other through an external CAN WB controller.

Haltech CAN System

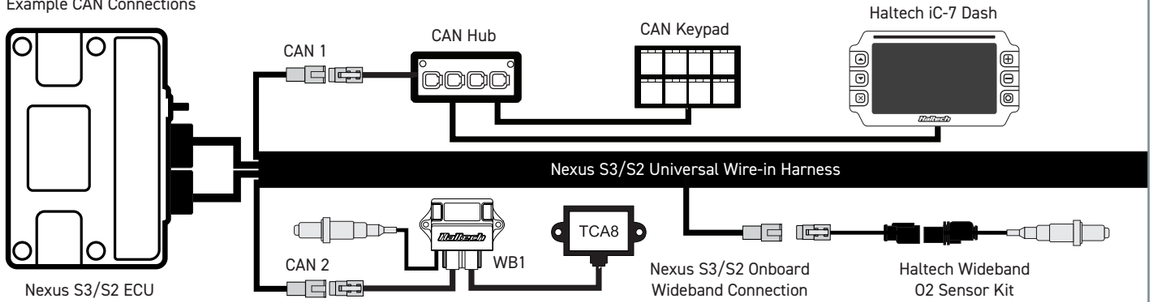
The Nexus S3/S2 ECU features two channels of CAN: CAN 1 and CAN 2, which can be utilized with a range of Haltech CAN expansion products or to interface with supported vehicle CAN devices (e.g., factory cluster).

The diagram below illustrates an example connection to multiple Haltech CAN devices (sold separately).

Specs

- Supports CAN speeds up to 1 Mbit/s
- Selectable 120ohm termination resistor per CAN channel
- Supports all Haltech CAN expansion products
- Selectable preconfigured vehicle CAN interface (OBDII compliant)

Example CAN Connections



WARRANTY CERTIFICATE

At Haltech we make every effort to design and manufacture fault-free products that perform up to or above the market expectations. All our products are covered by a Limited 12 Month Warranty.

Haltech Limited Warranty

Unless specified otherwise, Haltech warrants its products to be free from defects in material or workmanship for a period of 12 months from the date of purchase.

If the Haltech product is found to be defective as mentioned above, it will be replaced or repaired if returned prepaid along with proof of purchase. Proof of purchase in the form of a copy of the original purchase invoice, receipt or bill of sale which indicates that the product is within the warranty period, must be presented to obtain warranty service.

Replacement or repair of a defective product shall constitute the sole liability of Haltech. To the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representations, either expressed or implied, including any implied warranty of merchantability or fitness. In no event shall Haltech, be liable for special or consequential damages.

Product Returns

Please include a copy of the original purchase invoice, receipt or bill of sale along with the unused, undamaged product and its original packaging. Any product returned with missing accessory items or packaging will incur extra charges to return the item to a re-saleable condition.

All product returns must be sent via a freight method with adequate tracking, insurance and proof of delivery services. Haltech will not be held responsible for product returns lost during transit.

Returns of Products Supplied in Sealed Packaging

The sale of any sensor or accessory supplied in sealed packaging is strictly non-refundable if the sealed packaging has been opened or tampered with. This will be clearly noted on the product packaging. If you do not accept these terms please return the sensor in its original unopened packaging within 30 days for a full refund.

A sensor or accessory product may be returned after 30 days of purchase (with its sealed packaging intact) for credit only (no refunds given) and will be subject to a 10% restocking fee.

Installation of Haltech Products

No responsibility whatsoever is accepted by Haltech for the fitment of Haltech Products. The onus is clearly on the installer to ensure that both their knowledge and the parts selected are correct for that particular application. Any damage to parts or consequential damage or costs resulting from the incorrect installation of Haltech products are totally the responsibility of the installer.

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.

Do not overcharge the battery or reverse the polarity of the battery or any charging unit. Disconnect the Haltech ECU from the electrical system whenever doing any welding on the vehicle by unplugging the wiring harness connector from the ECU.

After completing the ECU installation, make sure there is no wiring left un-insulated. Uninsulated 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.

All fuel system components and wiring should be mounted away from heat sources, shielded if necessary and well ventilated. Always ensure that you follow workshop safety procedures. If you're working underneath a jacked-up car, always use safety stands!

Haltech Off-Road Usage Policy

In many states it is unlawful to tamper with your vehicle's emissions equipment. Haltech products are designed and sold for sanctioned off-road/competition non-emissions controlled vehicles only and may never be used on a public road or highway.

Using Haltech products for street/road use on public roads or highways is prohibited by law unless a specific regulatory exemption exists (more information can be found on the SEMA Action Network website www.semasan.com/emissions for state by state details in the USA).

It is the responsibility of the installer and/or user of this product to ensure compliance with all applicable local and federal laws and regulations. Please check with your local vehicle authority before purchasing, using or installing any Haltech product.

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