QUICK START GUIDE

NEXUS REBEL LS 0VERVIEW

What is a Nexus Rebel LS Engine Control Unit?

- A new generation engine management system designed to control GM LS engines
- A wideband O2 controller
- A data logger
- A high speed Wi-Fi communications module
- All natively interconnected with each other
- All programmable with one single piece of software

The Rebel LS ECU is one of Haltech's advanced engine control units in the Nexus range, offering additional functionality beyond simply controlling your GM Gen III or Gen IV LS engine. It functions not only as an engine control unit but also as a wideband O2 controller, a data logger, and a Wi-Fi module, all integrated into a single unit. With its innovative and user-friendly technology, the Rebel LS ECU sets a new standard in the market for LS engine management. Paired with a Nexus Rebel LS terminated harness, it provides a comprehensive range of performance and tuning capabilities for GM LS engines.

NEX-US [noun]

- a connection or series of connections linking two or more things.
- a connected group or series
- the central or most important point or place

Scan this QR code to access more information about the Nexus Rebel LS ECU

What's in the box?

- NEXUS Rebel LS ECU
- 4AWG ring terminals, nuts and washers
- Terminal boots (Red & Black)
- Wi-Fi Antenna RP-SMA 108mm
- Mounting Bolts
- USB-C Cable
- USB-C Dust Cap

HT-186500

HT-186501

HT-186124

HT-186502

HT-186503

HT-186125

HT-186123

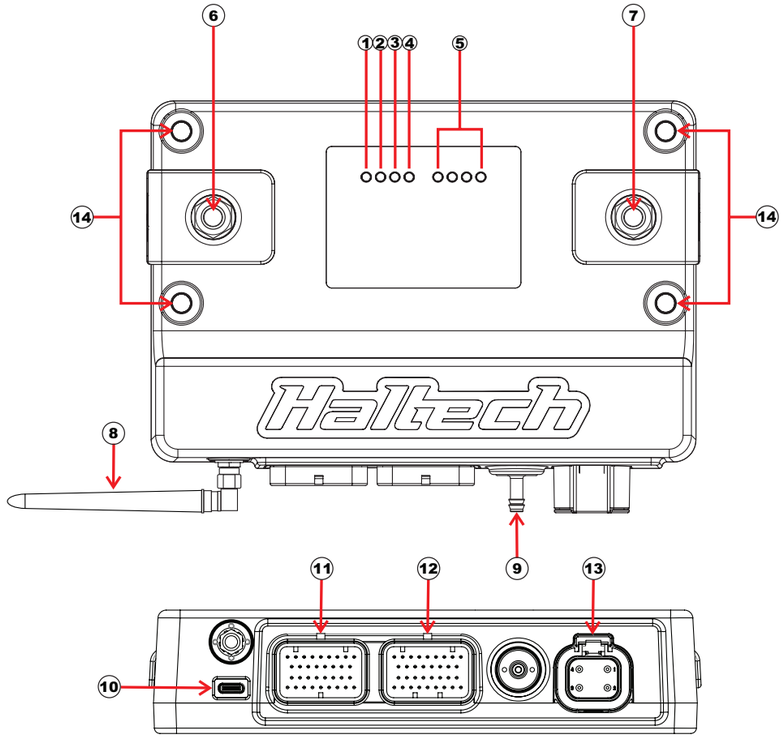
HT-010718

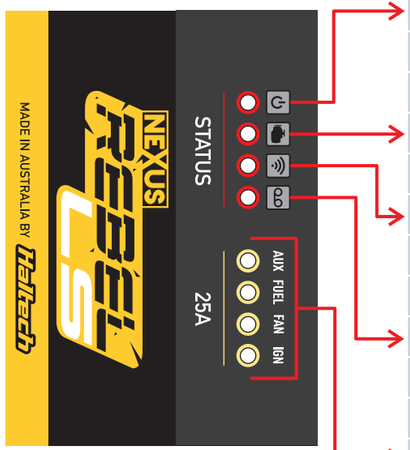
Rebel LS accessories

These can be purchased separately or as part of a kit:

- Main terminated harness: HT-186500
- EV1 injector sub-harness: HT-186501
- EV6 injector sub-harness: HT-186502
- Multec 2 injector sub-harness: HT-186503
- 6-pin DBW adapter harness: HT-186505
- 8-pin DBW adapter harness: HT-186506
- Bosch pedal adapter harness: HT-186512
- Corvette pedal adapter harness: HT-186507
- Cable Throttle + IAC sub-harness: HT-186504
- T56 transmission sub-harness: HT-187003
- Gen IV oil press. sensor adapter harness: HT-186510
- Gen IV MAP sensor adapter harness: HT-186511
- Gen III knock sensor adapter harness: HT-186508
- 2-pin Bosch alternator adapter harness: HT-186123
- 4-pin Delco alternator adapter harness: HT-186124
- 2-pin Yazaki alternator adapter harness: HT-186125
- Bosch LSU 4.9 wideband sensor: HT-010718

1 Power LED
2 DTC LED
3 Wi-Fi LED
4 Datalog LED
5 25A HCO LEDs
6 Battery Negative Stud
7 Battery Positive Stud
8 Wi-Fi Antenna (RP-SMA)
9 Onboard MAP sensor (4 BAR)
10 USB-C Port (Comms)
11 Connector A (AMP 34 pin Keyway 1)
12 Connector C (AMP 34 pin Keyway 2)
13 Connector E (DTP 4 pin)
14 Mounting Holes





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)
WiFi	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
HCO (25A)	None	Channel is off
	Green	Channel is on - duty cycle is >0% and operating correctly
	Red	Channel is not allowed to be driven. Usually caused by (but not limited to) an overcurrent this drive cycle

REBEL LS ECU SPECIFICATIONS

FEATURES	
Drive-By-Wire Throttle Support	Single
Flex Fuel	YES
Closed Loop O2 Control	YES
Knock Control	YES
Long Term Learning	Up to 3D
Data Logging	Laptop + Onboard
Anti-Lag Rotational Idle	YES
Launch Control	YES
Traction Control	YES
Tuning Table Resolution	32 x 32

FEATURES continued	
CAN Network	1
Nitrous Control Stage	6
Boost Control	3D Closed Loop
CO2 Control	YES
Flat Shift Control	Advanced
Shock Travel & Ride Height	YES
Trans Brake	YES
Race Timer	YES
On-board Wideband	Single Channel LSU 4.9
Engine Protection	Multi Level

OUTPUTS	
Ignition	8
Injector (High Impedance only)	8
Digital Pulsed Outputs (user definable)	5
Tachometer Output	1
Half Bridge Outputs (IAC or Drive-By-Wire Throttle)	4
CAN / Transmission Power Supply (8A)	2
Ignition / Injector Power Supply (25A)	1
Fuel Pump Control (25A)	1
Fan Control (25A)	1
Auxiliary AX25+ Output (25A) (user definable)	1

INPUTS	
Differential Engine Position Inputs	2 (Trigger and Home)
Coolant / Air Temperature Input	2
Fuel / Oil Pressure Input	2
Throttle Position / Pedal Position Input	4
MAP Sensor Input	1
Onboard MAP sensor (4 bar)	1
Analog Voltage Inputs (user definable)	2
Synchronised Pulsed Inputs (user definable)	4
Transmission / Vehicle Speed Sensor Inputs	2
Knock Sensor Inputs	2
On-board Wideband Controller (Bosch LSU 4.9 sensor only)	1

COMMUNICATIONS	
CAN Bus Network (Haltech CAN devices only)	1
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	900 kB/s datalog extraction. Hardware lockout for security

DATA LOGGING AND ANALYSIS	
Location	Onboard or PC logging
Onboard storage	32MB
Maximum sampling frequency	1kHz
Maximum channels per log	300
4 Channel Oscilloscope	50kSa/s per channel, 2ms/Div limit

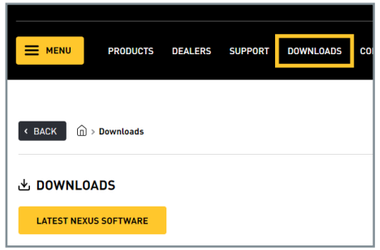
DIMENSIONS	
Enclosure (Not including connector protrusion)	196 x 130 x 44.5 mm (7.7 x 5.2 x 1.8 in)
Overall (Including connector protrusion)	196 x 149 x 44.5 mm (7.7 x 5.9 x 1.8 in)
Weight	1.15 kg (2.53 lbs)
Operating Temperature (ambient)	-40 to 85°C (-40 to 185°F)
12 x Onboard Temperature Sensing Zones	ECU: -40 to 125°C (-40 to 255°F)
	PDM: -40 to 150°C (-40 to 302°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

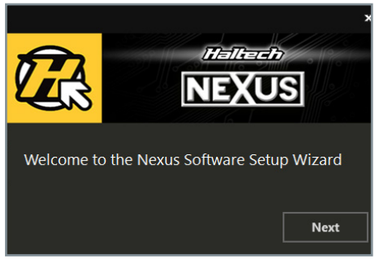
Haltech NSP (Nexus Software Programmer) is the software used for tuning and programming the Nexus Rebel LS ECU. Follow these steps to install the Haltech NSP software:

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.

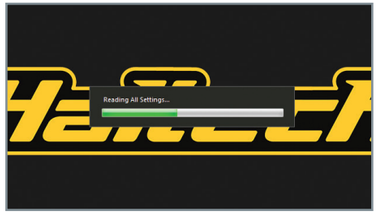
3. Launch Haltech NSP - Once the installation is complete, you can launch the Haltech NSP software from the Windows 'Start' menu or using the desktop shortcut that was created.



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 Rebel LS 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 through the setup wizard 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.



Rebel LS ECU Setup Wizard

The NSP software features a comprehensive setup wizard, designed to tailor the Rebel LS ECU settings for specific LS engine applications.

The process begins with naming your vehicle, which creates a dedicated folder on your laptop for saving maps and datalog files, and offers the option to add a vehicle description - a useful feature for quickly identifying different map versions.

Next, you select a base engine from a list of GM LS engines, a step that determines engine capacity and compression ratio settings in the map, along with other engine-specific information.

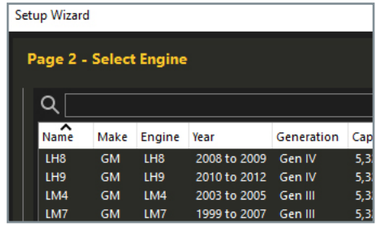
In the next step, you define the camshaft profile being used, which influences map parameters like fueling, spark, idle control, and O2 control.

The air intake system setup follows, allowing you to choose between naturally aspirated or forced induction systems and between cable-operated or Drive-By-Wire throttles, with NSP software adjusting inputs and outputs accordingly.

The next step involves selecting the appropriate MAP sensor, with an onboard 4-bar sensor for naturally aspirated and boosted engines up to 43 psi, or the option for an external sensor.

In the last few steps you define the fuel and ignition system setup by selecting the specific fuel injectors, choose your fuel regulator setup and define the base fuel pressure. The wizard will also let you configure the ignition setup by selecting your ignition coils from a list.

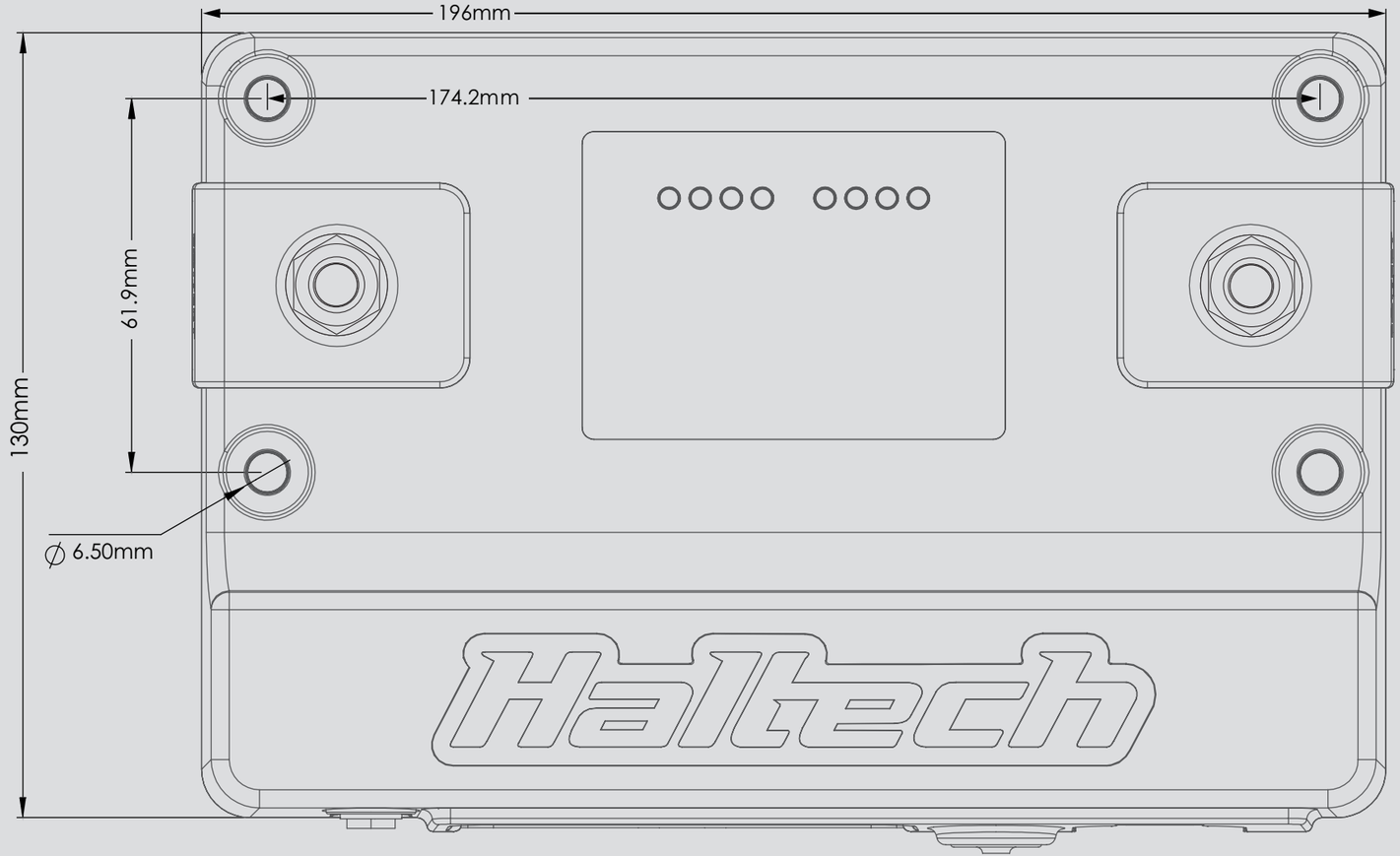
After completing these steps, NSP provides a summary of your selections for confirmation, allowing any necessary adjustments before finalizing. This thorough setup ensures that the Nexus Rebel LS ECU, coupled with a Rebel LS terminated harness, is optimally configured to start and run the engine with a base tune.



Trigger System (Crank and Cam)

The Nexus Rebel LS ECU features a trigger detection system that automatically identifies the crank and cam trigger combination on your GM LS engine. It operates by comparing the received signal against known GM LS crank and cam trigger patterns once the engine starts cranking. This eliminates the need to manually specify crank trigger, cam trigger, and TDC offset angle settings in the NSP software to start and run the engine. The supported GM LS trigger patterns include the 58x (60-2) or 24x for the crank, and either the 4x (2-big, 2-small) or 1x (half-moon) pattern for the cam. Additionally, the Nexus Rebel LS ECU can start and run the engine in half-sync mode even without a cam sensor.

MOUNTING TEMPLATE



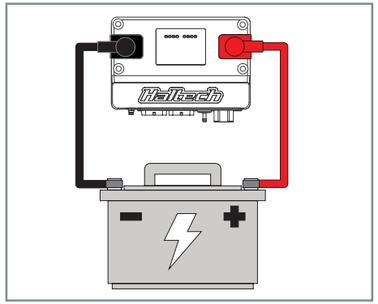
MOUNTING TEMPLATE

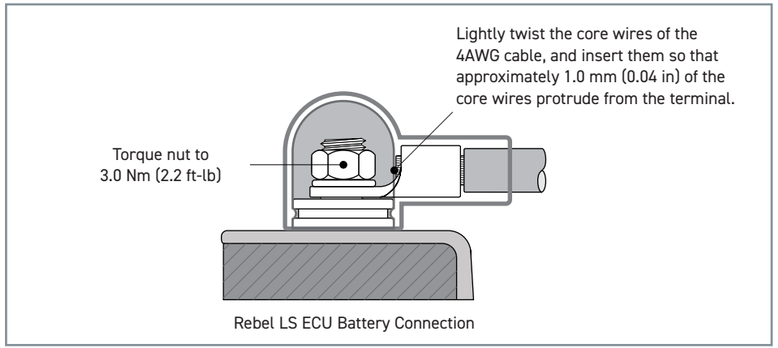
Battery Positive and Negative

For correct operation, the battery positive and battery negative must be connected to the Nexus Rebel LS ECU at all times.

Connect the positive (+) terminal of the battery to the Nexus Rebel LS ECU's positive (Red) terminal. Use the supplied ring terminal and Red boot, along with a Red 4AWG battery cable (sold separately) for the connection.

Connect the negative (-) terminal of the battery to the Nexus Rebel LS ECU's negative (Black) terminal. Use the supplied ring terminal and Black boot, along with a Black 4AWG battery cable (sold separately) for the connection.





Rebel LS ECU Battery Connection

Nexus Rebel LS Terminated Harness

The Nexus Rebel LS ECU directly integrates with a Nexus Rebel LS terminated harness, compatible with a wide range of Gen III and Gen IV GM LS engines through the use of application-specific adapters and sub-harnesses.

The harness features terminated connections for both the engine bay and cabin, including:

- Nexus Rebel LS ECU connectors
- Crank and cam sensors
- MAP sensor
- Oil and fuel pressure sensors
- Coolant and intake air temperature sensors
- Throttle and pedal connectors
- Knock sensors
- Bosch LSU 4.9 wideband lambda sensor
- Ignition switch input and alternator control
- 8x injector and 8x ignition outputs
- Thermofan and fuel pump control
- Transmission wiring
- Spare inputs and outputs
- Haltech CAN devices

More information about these connections is explained in the quick start guide included with the harness package.

Pedal (APP) adapters

Sensor adapters

Throttle adapters

Rebel LS main harness

Alternator adapters

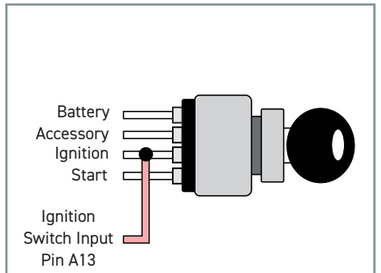
Injector sub-harnesses

Ignition Switch Input

The ignition switch input (pin A13) must be connected to a switched +12V source to turn the Nexus Rebel LS ECU on.

When connecting this pin to the ignition key switch, it is important to make sure to use the main ignition wire (i.e., not accessory) so it doesn't lose power when the key is in the "Start" position, causing the ECU to momentarily turn off.

The pink wire is the flying lead (unbraided) coming out of the in-cabin inputs and outputs connector branch on the Rebel LS terminated harness.



User Definable Inputs and Outputs

Most of the inputs and outputs (I/O) on the Nexus Rebel LS ECU are preset to match the Rebel LS terminated harness. This significantly reduces the number of wire assignments that need configuration in the NSP software.

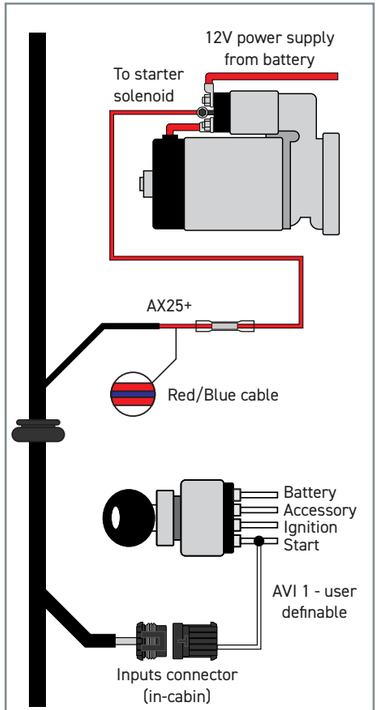
However, some I/Os are user definable, providing the right level of flexibility to meet specific needs in your application. The following section briefly explains the use of these I/Os and gives examples of typical applications.

Auxiliary High Current Output (AX25+)

The Rebel LS ECU provides a user-definable high-current output, capable of supplying +12V with a maximum rating of 25A. This output is connected via the Red/Blue 12AWG cable on the Rebel LS terminated harness, labeled as AX25+.

Within the software, you can customize this output's function to control various devices. This includes operating a secondary fuel pump or thermofan, activating a high-current solenoid (e.g., for nitrous or transbrake), or simply serving as a switched +12V supply to power auxiliary devices, vehicle lights, or additional harnesses.

Additionally, this output can be configured to control the starter solenoid if your vehicle doesn't have a starter signal wire in the body harness. This feature allows the Nexus Rebel LS ECU to inhibit the starter motor from engaging when necessary, such as if the transmission is not in Park or Neutral, or to ensure the brake or clutch pedal is pressed before starting the engine.



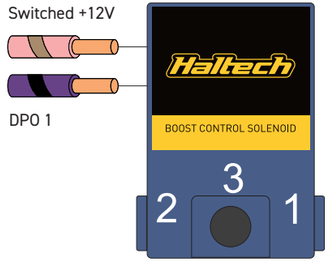
Example wiring connection

Digital Pulsed Outputs (DPO)

Number of user definable channels: 5

Digital Pulsed Outputs (DPOs) are capable of generating pulsed waveforms with varying duty cycles, varying frequencies, or switched states (On or Off). When activated by the ECU, a DPO output switches to ground.

DPOs can be used to control various low-current devices (up to 3A max), such as boost control solenoids, shift lights, or tachometers. Additionally, DPOs can be used to switch relays to drive other high-current devices.



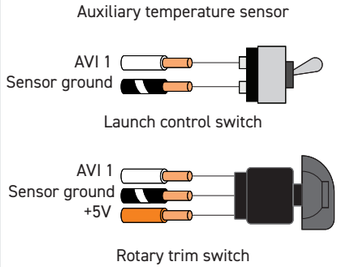
Example wiring connection

Analog Voltage Inputs (AVI)

Number of user definable channels: 2

Analog Voltage Inputs (AVIs) are inputs that accept variable voltage signals ranging from 0-5V, typical of pressure, temperature, and position sensors. These inputs can also accommodate switches that alternate between two distinct voltage levels.

AVIs feature a software-selectable 1K-ohm pull-up resistor to 5V, which is typically enabled for temperature-related sensors and switched to ground inputs. They are usually disabled for sensors with an external +5V supply, such as trim switches or linear position sensors.



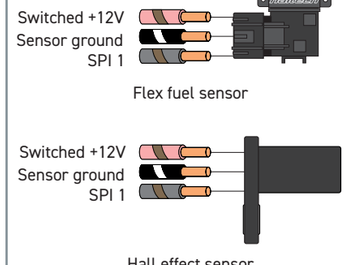
Example wiring connection

Synchronized Pulsed Inputs (SPI)

Number of user definable channels: 4

Synchronized Pulsed Inputs are capable of measuring the duty cycle or frequency of a signal, in addition to analog voltages like AVIs. These inputs are suitable for various sensors, including flex fuel composition sensors or wheel speed sensors with a software-selectable 1K-ohm pull-up resistor to 5V, if the sensor requires.

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

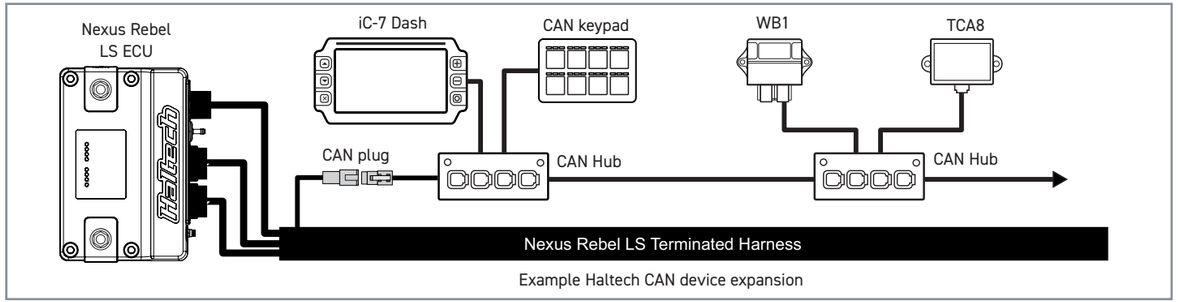


Example wiring connection

Haltech CAN System

The Nexus Rebel LS ECU features a CAN channel that facilitates communication with a range of Haltech CAN expansion devices, available for separate purchase. This integration capability enhances the functionality and versatility of the ECU, allowing for a more comprehensive and customized vehicle control system.

The range of compatible Haltech CAN expansion devices includes display dashes, keypads, power distribution modules, external wideband controllers, I/O expanders, thermocouple amplifiers, and CAN hubs.



Example Haltech CAN device expansion

Setting up Wi-Fi communications

Wi-Fi communication is another method for connecting the Nexus Rebel LS 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:

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

1. Open NSP and connect your Nexus Rebel LS ECU using the provided USB-C cable.

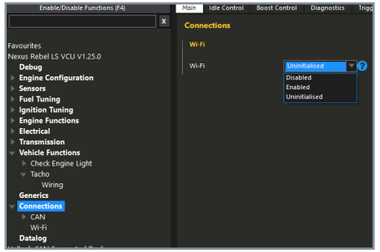
2. Click on 'Connections' in the navigation tree and enable the Wi-Fi module.

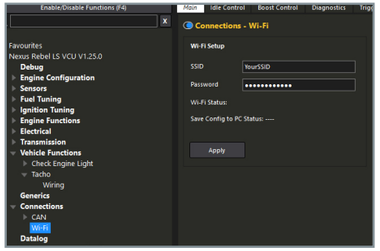
3. Under 'Connections', select 'Wi-Fi' to set up your SSID and password. Note that your SSID must be at least 1 character long, and your password at least 8 characters.

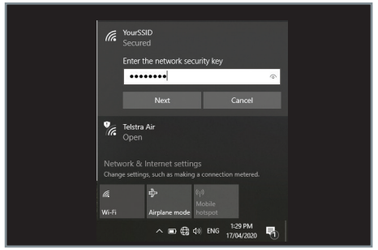
4. Click 'Apply'.

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

NOTE: The ECU must be powered by main power 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 module is disabled, it is completely inactive and held in an OFF state.







ENGINE START UP GUIDE

Starting your GM LS engine with a Nexus Rebel LS ECU and terminated harness involves several steps. Please note that this is a general overview, and the exact procedure may vary based on your specific application. Here are the basic steps:

1. Preparation - Ensure that the Rebel LS ECU is properly installed and securely mounted in your vehicle. Confirm all necessary wiring connections are made as per the Nexus Rebel LS terminated harness documentation and your engine's specific requirements.

2. Power and Ground - Use a sufficiently charged car battery, connected to the Rebel LS ECU as outlined in this quick start guide. The Rebel LS terminated harness does not provide grounding for your engine. Ensure your engine is properly grounded with a grounding strap connecting it to the battery.

3. Sensors and Inputs - Check that all required sensors (e.g., crank and cam sensors, MAP sensor, coolant and air temperature sensors, throttle position sensor, etc.) are correctly connected to the harness and that sensor values read accurately in the NSP software.

4. Outputs - Make correct connections for required outputs to engine components such as injectors, ignition coils, thermofan, and fuel pump.

5. Configure the Nexus Rebel LS ECU settings - Use the setup wizard in the NSP software to configure ECU settings, specifying engine type, injector size, ignition settings, and other parameters specific to your setup.

6. Safety Checks - Double-check all connections for issues like wiring shorts or loose connections that could pose a hazard. Verify that fuel pressure is within the expected range and there are no fuel leaks. Power cycle the ECU to prime the fuel pump and pressurize the fuel system.

7. Pre Start up - Briefly crank the engine to ensure it turns over smoothly and without any unusual sounds or issues. Once confident in the setup, start the engine using the ignition key or start button.

8. Monitor and Adjust - After the engine starts and idles, monitor data such as coolant temperature and wideband O2, and listen for any abnormal sounds. While the Nexus Rebel LS ECU will run the engine using a pre-configured base map, further tuning is needed for optimal performance, fuel economy, and emissions. Conduct thorough testing under various conditions.

Remember that engine tuning and setup can be complex and require expertise. If you are not experienced with EFI (Electronic Fuel Injection) systems and engine management, seeking assistance from a professional tuner is recommended for safe and reliable engine operation.

For any questions or technical support regarding this product, you can contact Haltech using the contact details at the end of this guide. Alternatively, scan the QR code below to access the Haltech Knowledge Base and technical support page.

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.

Haltech Australia
17 Durian Place,
Wetherill Park NSW 2164
Australia
Phone: +61 2 9729 0999
Email: aus@haltech.com

Haltech New Zealand
9/B Weza Lane, Kumeu,
0810 New Zealand
Phone: +64 988 706 16
Email: nz@haltech.com

Haltech USA East
750 Miles Point Way,
Lexington, KY USA 40510
Phone: (888) 298 8116
Email: usa@haltech.com

Haltech USA West
Race Winning Brands,
10800 Valley View Street,
Cypress, CA 90630
Phone: (888) 298 8116
Email: usa@haltech.com

Haltech UK
Unit 1, Miras Business Estate,
Keys Park Road, Hednesford,
WS12 2FS
Phone: +44 121 285 6650
Email: uk@haltech.com

Haltech Europe
Ottogasse 2A,
2333 Leopoldsdorf, Austria
Phone: +43 720 883968
Email: europe@haltech.com

facebook.com/HaltechEngineManagement

youtube.com/haltechecu

instagram.com/haltechecu