LINK ENGINE MANAGEMENT

POWERED BY G5

G5 PLUG-IN

Nissan Y61 Patrol Gen 2 (2017+)
TB48
Installation Manual

EXHILARATION STARTS HERE

linkecu.com

Product Warranty Statement

LINK ENGINE MANAGEMENT LTD – LIMITED LIFETIME WARRANTY

All Engine Control Units (ECUs) manufactured or distributed by Link Engine Management Ltd are subject to the following LIMITED LIFETIME WARRANTIES, and no others.

Link Engine Management Ltd warrants only to the original purchaser of the ECU, for the lifetime of the ECU, (subject to the limitations set out below), that the ECU shall be free from defects of materials and workmanship in the manufacturing process. This warranty ceases to apply and does not apply to ECUs that have not been manufactured or distributed by Link Engine Management Ltd for a period of greater than one year.

An ECU claimed to be defective must be returned to the place of purchase. Link Engine Management Ltd, at its sole option, may replace the defective ECU with a comparable new ECU or repair the defective ECU.

This limited lifetime warranty is not transferable and does not apply to any ECU not properly installed or properly used by the purchaser or end user, or to any ECU damaged or impaired by external forces. The above warranties are the full extent of the warranties available on the ECU. Link Engine Management Ltd has no liability to the original purchaser or any other person for any loss, injury or damage to persons or property resulting from the use of the ECU or any failure of or defect in the ECU whether by general, special, direct, indirect, incidental, consequential, exemplary, punitive, or any other damages of any kind or nature whatsoever. Link Engine Management Ltd specifically disclaims and disavows all other warranties, express or implied, including, without limitation, all warranties of fitness for a particular purpose, warranties of description, warranties of merchantability, trade usage or warranties of trade usage.

For off-road use only, not intended for highway vehicles. This ECU contains a user-configurable software programme, which is updated by Link Engine Management Ltd from time to time. The user must ensure the current correct version of this programme is downloaded from the website of Link Engine Management Ltd and installed in the ECU prior to use. This limited lifetime warranty does not apply where the ECU has been installed with the incorrect version of the software programme. The user is solely responsible for the setup and testing of all user-configurable features.

Link Engine Management Ltd License Agreement

The software programme in this ECU is licensed not sold. Link Engine Management Ltd grants the user a license for the programme only in the country where the programme was acquired. No other rights are granted under this license and the programme may only be used on one machine at a time. If the programme is transferred a copy of this license and all other documentation must be transferred at the same time. The license may be terminated by the user at any time. Link Engine Management Ltd may terminate the licence if the user fails to comply with the terms and conditions of this license. In either event the copy of the programme must be destroyed.

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1 Plug-In ECU Installation Manual

1.1 Introduction

Thank you for purchasing your Link Plug-In Engine Control Unit (ECU), an advanced, fully programmable microprocessor controlled Engine Management System.

Link software employs high resolution fuel and ignition tables with configurable load and RPM centres. When coupled with up to six dimensional fuel and ignition mapping, barometric pressure compensation, fuel pressure compensation, intake air temperature correction and more this gives an unprecedented level of tuning accuracy. All Link G5 ECUs are in-field upgradeable, there is no need to return the unit for firmware or software updates.

All Link Plug-In Engine Management Systems are designed with flexibility and ease of installation in mind. Link Plug-In systems are designed to replace the factory ECU and in most cases are designed to fit inside the factory ECU's ECU enclosure. This provides an invisible install that requires minimal modification to vehicle wiring and ECU mounting.

Installing and tuning any after market engine management system is not to be taken lightly. Link ECUs give the tuner the control & flexibility that only top after-market engine management systems in the world can provide. While every effort has been made to keep Link ECUs as user friendly as possible, it should be recognised that added features bring added complexity.

The complete setup of your ECU can be divided into two important tasks:

1. This manual covers the installation of your G5 ECU. While it is not strictly essential that this work is performed by an automotive electrician, the knowledge and tools available to these professionals makes it highly recommended. Regardless of who does the installation, it is of utmost importance that instructions provided in this manual are followed exactly throughout the installation.
2. Once the ECU has been installed it will need to be tuned using a laptop computer with PCLink software. Information on the configuration and tuning of the ECU is detailed in the help section of PCLink. Link Plug-In ECUs are shipped pre-loaded with a base configuration that should be close enough to get most engines running after a few application specific adjustments have been made. While hearing the engine running on the new ECU for the first time is always a satisfying feeling, it is important to realise that the job is not complete. The amount of tuning performed and the experience of the tuner are the two most important factors in determining how happy you will be with your engine management system.

1.1.1 Safety Notice

Your Link Plug-In ECU is designed to enhance the performance of your vehicle. However in all cases, your vehicle must be operated in a safe manner. Do not tune your vehicle while operating it on public roads.

WARNING!

Failure to follow all installation and operating instructions may result in damage to the Link ECU, personal injury, or harm to property.

1.1.2 Disclaimer

All care has been taken to ensure the pin outs and interconnections of the ECU to the vehicles wiring harness are correct. However due to variations between vehicle models it is the installers responsibility to check wiring connections BEFORE installing the ECU. Link will not be held responsible for any damage caused by the incorrect installation of this product.

1.1.3 Support Options

Should any issues arise during installation, the following options exist for technical support:

1. PCLink help, press F1 while running PCLink
2. Contact your nearest Link dealer. A Link dealer list is available on our website.
3. Link website: www.linkecu.com with Online Discussion Forum.
4. Technical Support Email: tech@linkecu.com

The majority of questions received by the technical support team are clearly answered in the manuals. Please consult the manuals to make sure that your question has not already been answered.

1.2 Pre-Installation

Before installing the Link ECU into the vehicle some pre-installation checks must be performed.

1.2.1 Compatibility Check

It is essential that a compatibility check is performed before installing the ECU into the vehicle. Failure to do so may void the warranty. There are some cases where the same ECU connector is used on very similar vehicle models but with a completely different pinout.

1.2.1.1 Nissan Y61 Gen2 (2017+) TB48

This ECU is designed specifically to suit Gen 2 (2017+) Y61 Nissan Patrols fitted with the TB48 engine, it will not fit earlier models. Refer to the Pinouts section 20 of this manual for a diagram of the header plug for this ECU.

1.2.2 Injector Impedance

Injector impedance is important and needs consideration before installing the ECU.

1.2.2.1 Nissan Y61 Gen2 (2017+) TB48

The G5 Nissan Y61 Gen2 (2017+) TB48 Plug-In ECU is NOT designed to be used directly with low impedance injectors.
All models this ECU is designed for are fitted with high impedance injectors from factory. This means that the ECU is plug-in compatible with factory fitted injector combinations on all models. If low impedance injectors are to be fitted then a ballast resistor pack will be required. Contact your Link dealer for further information.

1.3 Installation

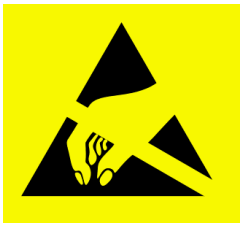
This guide provides information on correctly and safely installing your new Link Plug-In ECU.

1.3.1 ECU Handling Procedures

WARNING!!!

The following installation process will require handling of both the Link ECU and factory ECU. Both of these are highly sensitive to electrostatic discharge and are easily damaged. Follow the anti-static precautions given in this manual carefully to avoid damaging electronic components. Warranty claims for ECUs damaged by electrostatic discharge will NOT be accepted.

ANTI-STATIC HANDLING GUIDELINES



Your body builds up an electrical charge as you move around. This charge can reach very high voltages. Whenever given the opportunity this energy will attempt to discharge (usually through your finger tips!). This can be fatal to most electronic components. Most people have experienced an electrostatic discharge when they step out of their car or touch a metal bench top.

The following guidelines describe precautions that can be taken to reduce the possibility of damaging your ECU:

1. Work only on a conductive surface. A clean steel bench is suitable.
2. Always wear a wrist strap that is electrically connected to the conductive working surface. An Anti-static wrist strap is included for use during install
3. Touch the working surface regularly.
4. Do NOT touch components on the circuit board.
5. Where possible, only handle the ECU by its plastic header.
6. Do NOT carry the ECU around without anti-static packaging.
7. Do NOT touch the bare terminals in the ECU header.

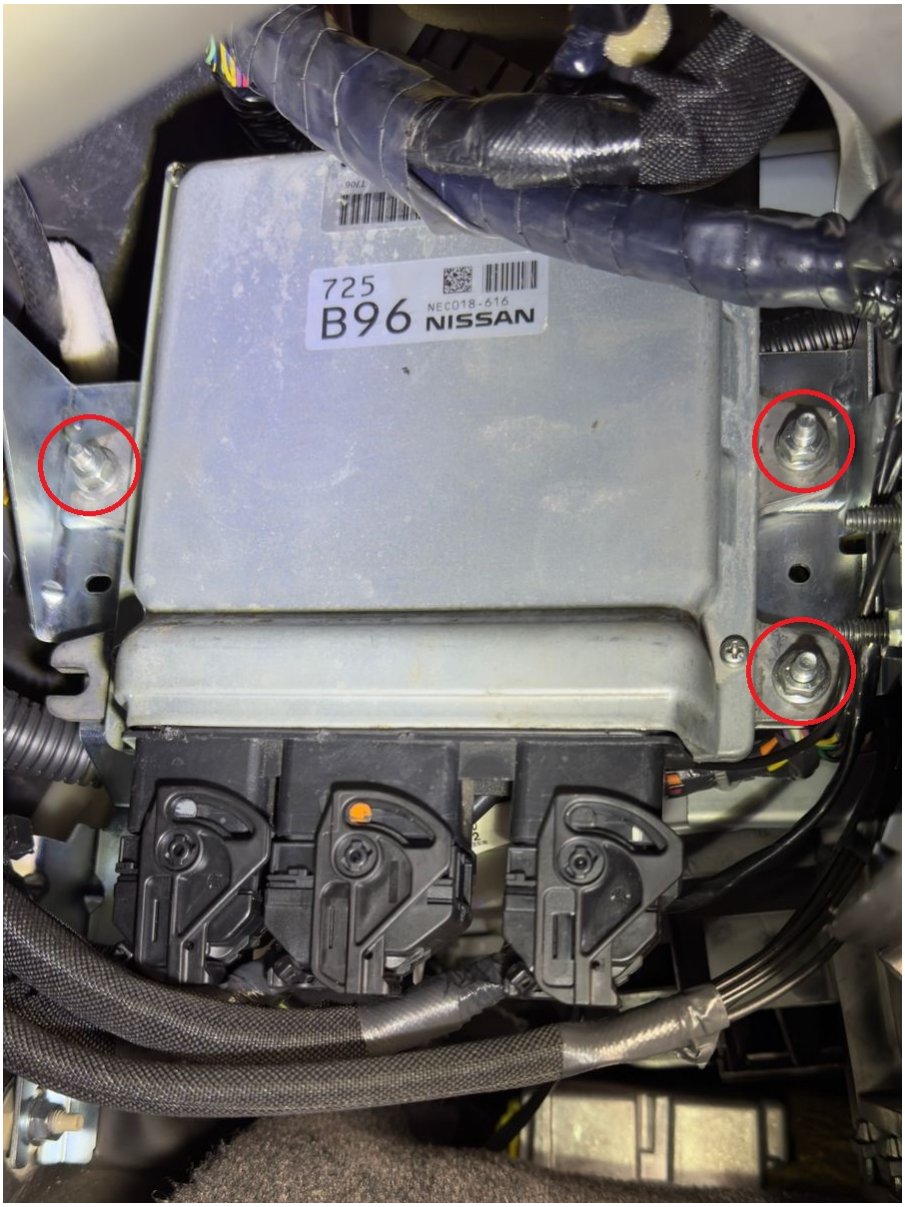
Observing the above procedures will minimise the chance of damaging the ECU. Note that failure due to static damage often does not appear until well after it was caused.

1.3.2 Fitting the ECU

Information is provided to assist in fitting the ECU into the vehicle.

1.3.2.1 Nissan Y61 Gen2 (2017+) TB48

The factory ECU is located up under the dash on the tunnel side of the drivers footwell (based on LHD vehicle, picture below). Unplug the three ECU plugs and remove the three nuts circled in the image below and then remove the factory ECU.



Removal of factory ECU

Open the USB cable rubber flap, install the Link ECU using the same three nuts to secure it (with the USB flap out of the way), plug the factory ECU connectors into the Link ECU and then connect the USB C cable.

Link ECU installed, USB C connection circled in red.

Note that the sample tune is setup to use the internal MAP sensor so a hose will need to be run from the intake manifold to the ECU for it to run correctly on the sample tune. Refer to the Nissan Y61 Gen2 (2017+) TB48 MAP Sensor 11 page for hose installation instructions.

1.4 Additional Sensors/Functions

Link Plug-In ECUs offer various options for the installation of additional sensors and devices. As a minimum it is recommended that all ECUs are installed with a Manifold Absolute Pressure (MAP) sensor and Intake Air Temperature (IAT) sensor. These parts can be purchased if required from your nearest Link dealer.

1.4.1 MAP Sensor

It is important that the pressure source for a MAP sensor be taken from a stable pressure source after the throttle body. It is common to 'T' into the fuel pressure regulators pressure signal. Do NOT share this signal with other devices such as boost gauges or blow off valves.

1.4.1.1 Nissan Y61 Gen2 (2017+) TB48

The G5 Nissan Y61 Gen2 (2017+) TB48 Plug-In ECU supports several options for fitting of a MAP sensor. Any one of the following options can be used:

1. Internal MAP Sensor – To ease installation the G5 Nissan Y61 Gen2 (2017+) TB48 ECU is fitted with an internal MAP sensor. The internal MAP sensor is wired to An Volt 11 and is rated to 4.0 Bar absolute pressure (3.0 bar boost). Use the "4 Bar" calibration.
2. MAP Sensor Wired Through the MAF – To avoid running additional wires into the engine bay, a MAP signal can be brought into the ECU via the MAF signal wire. The MAF signal is wired to An Volt 5. Refer to factory wiring manuals for MAF wiring connections. Make sure the MAF can not be reconnected.
3. MAP Via Expansion Connector - The expansion connector provides power, ground, and analog channels for the connection of a MAP sensor.

Make sure that the correct MAP sensor input has been selected in PCLink and a MAP calibration has been performed before attempting to start the vehicle.

MAP Hose Installation

The MAP hose was installed as shown below on the test vehicle.

1. Remove the 4 nuts holding the engine cover on and remove the cover.

Engine cover removal

2. Tee into the circled vacuum hose for MAP reference.

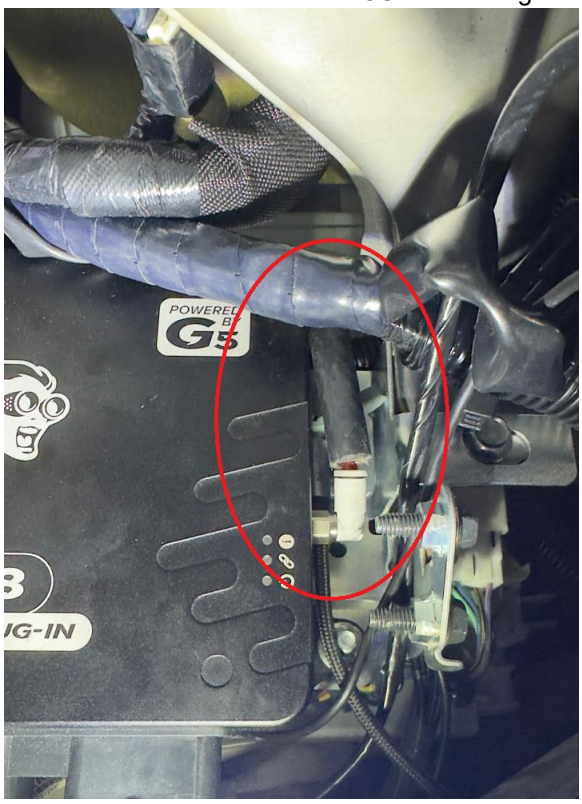
MAP reference location

3. Run the MAP hose through the firewall via the pictured boot.

Firewall boot location

Firewall boot

4. Insert the MAP hose into the ECU MAP fitting.



1.4.2 IAT Sensor

It is highly recommended that an IAT sensor be fitted in all applications to provide an input for correction of fuel and ignition based on the engines air charge temperature.
An IAT sensor should be fitted in the intake system in a location that accurately represents intake temperature. The most common location is just prior to the throttle body. Installing in the manifold is not recommended due to heat soak issues. A fast response sensor must be used in all forced induction applications.

1.4.2.1 Nissan Y61 Gen2 (2017+) TB48

The G5 Nissan Y61 Gen2 (2017+) TB48 Plug-In ECU supports several options for fitting of a IAT sensor. Any of the following options can be used:

1. Factory IAT (inside the MAF) – An Temp 2 is wired to the factory IAT sensor which is located inside of the factory MAF.
2. Aftermarket IAT wired through the factory MAF wiring – An IAT signal from an aftermarket temperature sensor can be brought into the ECU via the MAF IAT wire. The MAF IAT signal is wired to An Temp 2. Refer to factory wiring manuals for MAF wiring connections. Make sure the MAF can not be reconnected.
3. IAT Through Expansion Connector – The expansion connector provides ground and temperature channels for the connection of an IAT sensor. Note spare An Volt channels can be used as temperature inputs when a pullup resistor (to +5V) is added.

1.4.3 E-Throttle Output

1.4.3.1 Nissan Y61 Gen2 (2017+) TB48

This vehicle has E-Throttle from factory.
The E-Throttle Output pins are Aux 9 & 10 and the E-Throttle Relay is Aux Ignition 8. If the E-Throttle is found to be operating in the wrong direction this can be rectified by changing the Aux 9 Active State (Electronic Throttle -> E-Throttle 1 -> E-Throttle Setup or by swapping the +ve and -ve pins at the throttle plug.

A second E-Throttle can also be added using Aux 11 & 12 on the expansion header.

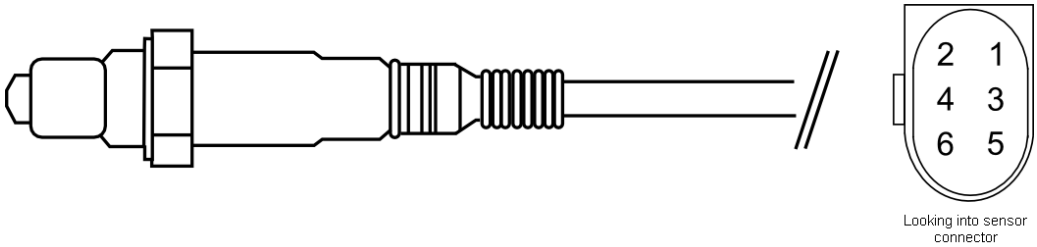
1.4.4 Internal Wideband Controller

This Plug-in ECU has one or more internal Wideband Lambda controllers.

Advantages of using the on-board controller include:

- Better oxygen sensor fault detection. External controllers often do not communicate sensor faults to the ECU.
- No external controller required, save costs, time and simplifies install.

The Internal Wideband Lambda Sensor Controller supports the Bosch LSU 4.9 oxygen sensor. The information below is provided to help with installation:



Bosch LSU 4.9 wideband oxygen sensor and connector

Bosch LSU 4.9 pin	Wire colour	Notes
1	Red	Connect to ECU pin APE
2	Yellow	Connect to ECU pin IPE
3	White	Connect to ECU pin HEATER
4	Grey	Connect to ignition switched +12V
5	Green	Connect to ECU pin MES
6	Black	Connect to ECU pin RE

Important notes on fitting wideband Lambda sensors:

- Sensors should not be installed vertically in the exhaust pipe. They must be installed with some angle to ensure that a moisture drip could not form directly on the end of the sensor.
- Ideally they should be installed between +/- 60 degrees of horizontal.
- Do not leave a wideband Lambda sensor in the exhaust without heater control. Heating is required to burn carbon deposits from the sensing element. Remove the sensor completely if it is to be run without heating.
- Locate the sensor far enough down the exhaust system where exhaust temperature does not exceed approximately 730-750 degrees C. This will ensure the sensor is able to control at its correct temperature (780 degrees C). Watch the Lambda x Temperature parameter to ensure sensor temperature is being correctly controlled.
- Do not locate the sensor so far down the exhaust that it is unable to fully heat.
- Do not locate the sensor where exhaust pressure is significantly different from atmospheric pressure. Lambda measurement will be affected by exhaust pressure.
- The current state of the Lambda Sensor can be seen by checking the appropriate Lambda Status, Error and Temperature runtimes.

1.4.4.1 Nissan Y61 Gen2 (2017+) TB48

This ECU has one Internal Wideband Lambda controller exposed on the expansion plug (refer to the pinout section 20). To use this Internal Wideband Lambda controller wire an LSU4.9 sensor up to the correct pins in the expansion connector and then set "Analog Inputs -> Lambda 1 -> Lambda Sensor Controller" to Internal.

Bosch LSU 4.9 Pin#	Function	ECU Expansion Pin#
1	APE	1
2	IPE	14

Bosch LSU 4.9 Pin#	Function	ECU Expansion Pin#
3	Heater	3
4	+12V	16
5	MES	2
6	RE	15

Note: Lambda 2 can also be set to "Internal" but there is no hardware on this specific plug-in ECU to control a second Wideband Lambda sensor.

1.5 Expansion Connector

Expansion connectors are provided to allow easy connection of additional ECU inputs. An “expansion cable” can be purchased from your Link dealer.
Important points when wiring to the expansion connector:

- Do not overload the +5V Out pin. Although this is protected against ECU damage the +5V out signal also provides power for other sensors.
- Do not connect the ground pin to chassis ground. This could cause ground loops and introduce unnecessary interference. Use this pin only to ground external sensors that are isolated from chassis ground.

The Expansion connectors available for each ECU can be found under the Pinouts Section.

1.6 PC Tuning

Link ECUs require PC/laptop tuning using the PCLink Tuning Software application running on a Windows based computer. PCLink may be downloaded from www.linkecu.com. Note that when new versions of PCLink are released they are posted on the website and may be downloaded at no cost. Also note that ECUs must be used with the correct version of PCLink.

IMPORTANT!

The Link ECU has on board USB.
BEFORE connecting the ECU to your laptop, the USB drivers must be installed. Failure to install the drivers on your laptop first may result in windows assigning incorrect drivers. These drivers may not work with the Link ECU and are difficult to uninstall. The correct USB drivers are installed as part of PCLink installation, as described in the following section.

1.6.1 Installing USB Drivers

Before connecting the ECU to your laptop or PC, the ECU USB drivers must be installed. These drivers are installed as part of PCLink installation as described in the following section.

1.6.2 Installing PCLink Tuning Software

The latest version of PCLink is available on the Link website: linkecu.com
Should access to an Internet connection be impractical, download the latest version of PCLink elsewhere to a USB drive, and then install on your laptop.
Installing from the web

1. Go to the above website and navigate to the Products -> Software -> PCLink section.
2. Download the latest version of PCLink. When prompted to run or save the file, select save. It is recommended to save this file on the desktop.
3. Double click the saved file and follow on screen instructions.
4. When prompted to install USB drivers, select yes. This may take some time.
5. When installed, open PCLink by double clicking on the icon that has been placed on the desktop.

1.6.3 Communicating With Your ECU

After PCLink installation, you will be able to connect the Link ECU to the laptop to perform set-up and tuning work.

1. Connect the ECU to your laptop using the appropriate ECU USB Cable. If not supplied with the ECU, these can be purchased from a Link dealer. No other adapter or cabling is required. Connect the cable to the connector labelled USB (typically has a red O-ring on the end of the cable).
2. Start PCLink by double clicking on the PCLink icon on the windows desktop.
3. Switch the key to the ON position. This will provide power to the ECU.
4. In PCLink, under the 'Options' menu, select 'Connection'. The connection options dialogue will open. Selecting USB will give you the fastest connection, the 'Auto' connection port option will search for ECUs on Wifi, USB and COM Ports before displaying a list of possible devices to connect to.
5. PCLink offers both mouse and keyboard control. To establish a connection between the PC and ECU press the F3 key. The same process can be used to disconnect. If a successful connection is established, PCLink will download settings from the ECU, otherwise you will be warned that an error has occurred.
6. Make sure the connection shows “ONLINE” in the top right corner of PCLink.
7. To permanently STORE any changes made to the ECU press F4. If this is not done before turning the ECUs power off all changes made will be lost.

1.7 Pre-Start Configuration

Before starting the vehicle, important pre-start configurations need to be made.

1.7.1 Firmware Version

It is recommended to ensure that the ECU is running the most up to date firmware. Firmware version information can be obtained by connecting to the ECU with PCLink and selecting 'ECU Information' under the Help menu.
The latest firmware can be downloaded from our website with PCLink.
It is recommended that firmware updates are performed by an experienced Link dealer as new features may need to be properly configured.
The firmware can be updated by selecting 'Update Firmware' under the 'ECU Controls' menu in PCLink, follow the on screen instructions to complete the firmware update process.

1.7.2 Base Configuration

All Plug-In ECUs are shipped with sample configuration settings. Note that these are provided to reduce initial setup and tuning times. They are NOT recommended tuning values. PCLink includes sample maps for various models. Download the appropriate sample map into your ECU with PCLink by connecting to the ECU (described in the Connecting To PCLink section of this manual), then selecting 'Open' under the 'File' menu. Select the appropriate .pclx or .pcl5 file and then select 'Open'. Downloading large configuration files can take up to a few minutes. Be patient and acknowledge any messages PCLink shows.

1.7.3 MAP Sensor Calibration

At key on and engine not running the Manifold Absolute Pressure (MAP) Sensor should always match the Barometric Absolute Pressure (BAP) Sensor. As well as providing altitude correction, the BAP sensor also allows the MAP sensor to be calibrated prior to tuning.
Link ECUs use an on-board barometric sensor that is calibrated prior to dispatch. This ensures that all PCLink tune files (.pclx Files for G4X or .pcl5 for G5) give a consistent state of tune throughout the ECU range. This allows a tune file to be transferred between G4X or G5 based ECUs giving an equivalent state of tune providing all factors affecting volumetric efficiency are equal.
Without the ability to calibrate all the available types of MAP Sensors to the BAP Sensor there would be significant affects on the accuracy of the resulting tune, especially when tuning with Manifold Gauge Pressure (MGP) as a load index.
To calibrate the MAP sensor:
1. Connect a laptop/notebook PC to the ECU and connect to the ECU using PCLink.
2. Under the Analog Inputs menu, select 'MAP' then set the Source setting to the correct Analog Input and set the Calibration value to the correct option for your MAP sensor.
3. Either in the MAP window or under the 'ECU Controls' menu, select 'MAP sensor calibration'.
4. Follow the on screen instructions.
5. Open the Runtime View (F12 or 'R') and select the 'General' tab.
6. Compare the MAP and BAP values and ensure they have a similar reading (within 1 kPa).

7. Perform a 'Store' by pressing F4.

A more in depth explanation is provided in the PCLink help Manual under PCLink G5 Users Manual -> Tuning Operating Procedures -> ECU Controls -> MAP Sensor Calibration.

1.7.4 TPS Calibration

E-Throttle Vehicles:

The Throttle Position Sensors (TPS Main and Sub) and Accelerator Position Sensors (APS Man and Sub) are used by the ECU to control the throttle blade position and to calculate various engine management parameters used by functions such as idle speed control,acceleration enrichment and motor sport features. It is very important that these inputs are setup correctly and the E-Throttle operation is tuned properly before starting or driving the vehicle, failure to do so can result in damage to the Throttle body, engine, vehicle and even the operator and bystanders. The following procedure shows how to calibrate the APS and TPS sensors:

1. Connect a laptop/notebook PC to the ECU and connect to the ECU using PCLink.
2. Open Electronic Throttle -> E-Throttle 1 -> E-Throttle 1 Setup and ensure that E-Throttle mode is set to Setup Mode.
3. Open Electronic Throttle -> Accelerator Position Sensor and ensure that the APS (Main) Source and APS (Sub) Source settings are set to the correct inputs. Refer to the Pinouts section of this manual for details.
4. In the same window double-click on 'APS Calibration' and follow the instructions on the screen.
5. Open Electronic Throttle -> E-Throttle 1 -> Throttle Position Sensor and ensure that the TPS (Main) Source and TPS (Sub) Source settings are set to the correct inputs. Refer to the Pinouts section of this manual for details.
6. In the same window double-click on 'TPS Calibration' and follow the instructions on the screen.
7. If your vehicle has two E-Throttles then repeat the above two steps for TPS 2(Main) and TPS 2 (Sub) in E-Throttle 2.
8. Select the 'General' tab in the Runtime Values window (F12 or 'R').
9. Ensure the APS (Main) and APS (Sub) values read 0% when the pedal is released and 100% when fully depressed.
10. Open Electronic Throttle -> E-Throttle 1 -> E-Throttle 1 Setup and ensure that E-Throttle mode is set to On Mode, repeat for E-Throttle 2 if applicable.
11. Perform a 'Store' by pressing F4.

1.7.5 IAT Sensor Selection

This section only applies when an Intake Air Temperature (IAT) sensor has been wired and fitted to the intake system. It is important that the ECU is calibrated to match the sensor installed in the engine. This procedure is as simple as selecting the correct sensor type as follows:

1. Connect a laptop/notebook PC to the ECU and connect to the ECU using PCLink.
2. Click on 'Analog Channel' in the configuration tree.
3. Select the An Temp channel the sensor has been wired to.
4. Ensure that channel (and only that channel) is set to 'Inlet Air Temperature'.
5. Select the correct 'Temp Sensor Type'.
6. Select the 'Analog Inputs' tab in the runtime values section of PCLink (lower part of the screen).
7. Ensure that IAT reads the correct temperature.
8. Perform a 'Store' by pressing F4.

1.7.6 Input and Output Setup

As the Link G4X & G5 Plug-In ECUs are often designed to run several models there are a few items that must be set-up to make the ECU specific to your model.
The Pinouts section of this manual gives a list of the functions of each channel based on the target vehicle. It is the tuners responsibility to make sure that the following channels are set-up correctly for the vehicle model the ECU is fitted to:
All Auxiliary Output Channels
Use the 'Test On' or 'Test PWM' (at 10 Hz) functions to test the wiring of channels.
All Digital Inputs
Look at the Digital tab in the Runtime Values window (F12 or 'R') to confirm each channels operation.

All Analog Volt and Temperature Inputs
Look at the Analog tab in the Runtime Values window (F12 or 'R') to confirm each channels operation.

1.7.7 Trigger Calibration

The following instructions assume that all pre-start set-up instructions given in previous sections have been completed. Only after all pre-start checks have been made should an attempt be made to crank the engine. The following steps must be performed before an attempt is made to start the engine to ensure the Link ECU is calibrated to precisely measure engine position.

1. Connect the ECU to PCLink.
2. Select Fuel -> Fuel Setup -> Fuel Main:
   a. Set 'Injection Mode' to OFF. This will prevent the engine from trying to start while the triggers are calibrated.
   b. Perform a Store (press F4) to make sure fuelling is not re-enabled if power to the ECU is lost.
3. Select Triggers -> Calibrate and then open the Set Base Timing window.
4. Perform the correct trigger calibration procedure specific to your vehicle as described in the PCLink help (Press F1).

Note that trigger calibration must be performed again once the engine is running. Due to the acceleration and deceleration of the crankshaft at low speeds, an inaccurate measurement of engine timing is usually made. Also it is often harder to see timing marks with a timing light at slow engine speeds. Trigger calibration should be checked again at between 2000-4000 RPM where engine speed is stable and a more consistent timing reading can be obtained.

A more in depth explanation is provided in the PCLink help Manual under ECU Tuning Functions -> Triggers -> Calibration.

1.8 First Time Startup

For further help on any of the settings discussed below, consult the Help in PCLink Tuning Software. Help can be invoked by pressing F1, or right clicking any item and selecting 'What's this?'.

Pre-set-up Checks

Before attempting to configure the ECU, ensure the following tasks have been completed:

1. Ensure the ECU and all associated components are connected and correctly wired/installed.
2. Fully charge the vehicle's battery, as the engine will be required to be cranked during the set-up procedure.
3. Check all oil and water levels are correct.

Connecting to PCLink Tuning Software
Use the following procedure to establish a connection between your Link ECU and PCLink Tuning Software tuning software.

1. Make sure your laptop battery is fully charged or plugged in to mains power.
2. Connect the ECU to your laptop and connect to PCLink as described in the 'Communicating with your ECU' section of this manual.

First Time Startup

After performing all set-up instructions given in previous sections, including trigger calibration, the engine is now ready to be started. The following procedure should be used for first time start-up.

1. Turn the ignition key OFF then ON. The fuel pump should prime momentarily upon power up.
2. Connect the ECU to PCLink.
3. Access the runtimes values by pressing the F12 Key, click the 'Analog' tab:
   a. TPS – spans from 0 to 100% when throttle is pressed. If not, perform a TPS Calibration. If the vehicle has an E-Throttle confirm that APS (Sub), APS (Main), TPS (Sub), TPS (Main) all operate correctly and that the throttle blade tracks the target correctly.
   b. MAP – should read approx 101 kPa (at sea level, compare to BAP if not at sea level) with the engine not running. If not, check the MAP Sensor Type setting and perform a MAP Calibration.
   c. ECT – should read current engine temperature.
   d. IAT – should read current intake air temperature.

   e. Digital Inputs (click the 'Digital' tab) – Operate switches connected to any digital inputs while watching the runtime value to ensure they operate as expected.
4. Rectify any faults found in Step 3.
5. Ensure the basic Fuelling setup is correct.
   a. If using Traditional Fuel Equation Mode then locate the 'Master Fuel' setting in the ECU Settings Menu under: *Fuel* > *Fuel Setup* > *Fuel Main*. This will need to be adjusted during or just after start-up.
   b. If using one of the Modelled Fuel Equation Modes then navigate to *Fuel* > *Fuel Setup* > *Fuel main* and enter the correct engine capacity, correct base fuel pressure, and correct fuel properties. Navigate to >Fuel>Fuel Setup>Injector Setup, enter correct injector flow rate and rated pressure.
6. Crank the engine until it starts. Some throttle may be required for first time start-up due to imperfect tuning.
   a. If using Traditional Fuel Equation Mode the Master Fuel setting can be used to enrich/lean the engine (increase to enrich).
   b. If using one of the Modelled Fuel Equation Modes the Injector Flow Rate can be decreased to add more fuel, this will need to be changed back to the correct value later but works well for first start purposes.
7. If the engine fails to start after several attempts, do not crank it endlessly. Stop and determine the problem before continuing.
8. Check the Trigger Error Counter (found under the Triggers runtime values tab). If this value increases during cranking/running then there is a trigger setup fault. It is not unusual for this number to count one or two on the first engine revolution.
9. Once the engine starts:
   a. If using Traditional Fuel Equation Mode adjust the Master Fuel setting to achieve best possible running
   b. If using one of the Modelled Fuel Equation Modes adjust the Injector Flow Rate setting to achieve best possible running, this will need to be changed back to the correct value later but works well for first start purposes.
10. The engine should now be allowed to fully warm up. It may be necessary to readjust ‘Master’ several times to maintain smooth running. Don’t forget to keep an eye on engine temperature.
11. Once the engine is warmed up and running well, perform another trigger calibration (known as “setting the base timing”).
12. Perform a Store by pressing F4.

Essential Tuning Adjustments

It is assumed that at this stage all set-up procedures described in previous sections have been completed and the engine is running. The following steps detail correct set-up procedures for some of the more critical ECU parameters (note that MAP Sensor Calibration should have already been completed by now):

Injector Voltage (Dead-time) Correction

There is always a delay between the injector being energised and the injector actually opening. Likewise, there is a small delay between the injector being de-energised and the injector closing. The opening time is considerably longer than the closing time, however the overall result is that less fuel will flow for a given pulse width than would be expected with an 'ideal injector'. To compensate for this the injector pulse widths are increased to compensate for this 'dead-time'. The dead-time for a given injector is a function of the battery voltage, differential fuel pressure and the type of injector driver (saturated or peak and hold). A typical dead-time at 3 Bar differential fuel pressure and 14 volts is just under 1ms (ms = millisecond = 1 thousandth of a second).

In applications with a linear 1:1 fuel pressure regulator (i.e. not a rising rate regulator), the differential fuel pressure (difference between manifold pressure and fuel pressure) will be constant. Therefore the only variable that is changing will be the battery voltage (this changes with electrical load and sometimes engine speed). Without correction, the changes in dead-time will cause the engine to run lean when the voltage drops. If the Injector Voltage Correction is properly set-up then changes in the battery voltage will not affect the air/fuel ratio.

The injector dead-time table allows the dead-time for different battery voltages to be entered. The values represent the dead-time in milliseconds. These should increase with falling system voltage.

Injector dead-time for a particular set of injectors can be determined using a flow bench or on a running engine.

To determine the injector dead-time using a flow bench, the injectors need to be operated at the intended operating pressure (normally three bar) and at a constant duty cycle as well as a set voltage. Vary the supply

voltage to the injector and measure minimum pulse width at which the injectors will flow for a particular voltage. This is the required dead-time for that injector at that tested voltage.
To determine injector dead-time on a running engine, with the engine fully warmed and operating at stable air/fuel ratios (a very precise AFR meter is required – a narrow band O2 sensor will not suffice), electrical drain needs to be applied to the system; the preferred method is disconnecting the alternator main fuse. Battery load testers are also useful here too.
Watching the air fuel ratios change while the battery voltage drops, the dead-time table can be trimmed to maintain the same stable air/fuel ratio. Injector dead-time can be viewed as a row graph. A smooth curve needs to be maintained at all times.
NOTE: any change to the fuel pressure or injectors will require a recalibration of the injector dead-times.

Traditional Fuel Equation Mode Master Fuel Setting
If using Traditional Fuel Equattion mode the Master Fuel setting should be set so that the numbers in the middle of the fuel table end up around a value of 50. This is to allow sufficient span of the numbers in the main fuel table.

1.9 Pinouts

Pin information is provided to assist when troubleshooting. All pinouts are looking into the ECU (wire side).

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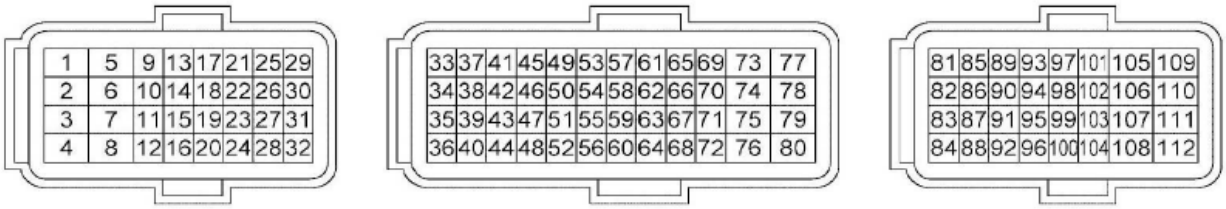
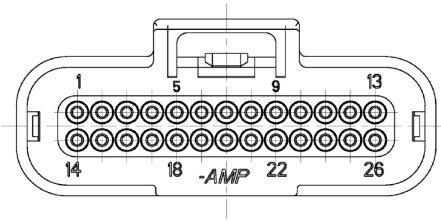


Pin	ECU Pin	Function	Pin	ECU Pin	Function
1	E-Throttle +14V	From E-Throttle Relay	57	An Temp 2	IAT
2	nc		58	Knock 2	
3	nc		59	Ground (Sensor)	Cam Sensor Ground
4	nc		60	Ground (Sensor)	ECT Ground
5	Aux 9	E-Throttle+	61	+12V Hot	
6	Aux 10	E-Throttle-	62	An Volt 1	AC Pressure
7	Aux 14	NB O2 Heater Bank 2	63	Ignition 2	Ignition
8	Aux 13	NB O2 Heater Bank 1	64	Ignition 5	Ignition
9	Aux 15	VCT Cam Solenoid	65	Ignition 6	Ignition
10	Aux 16	VIAS Solenoid	66	Ignition 1	Ignition
11	Internal Hold Power		67	Trig 1	Cam Sensor 360 Tooth
12	nc		68	nc	
13	Aux 2	Evap Purge	69	Trig 2	Cam Sensor 6 Tooth
14	nc		70	nc	
15	nc		71	Ignition 4	Ignition
16	Ground		72	Ignition 3	Ignition
17	Aux 1	Fuel Pump Relay	73	nc	
18	Ignition 8 (Aux)	E-Throttle Relay	74	nc	
19	nc		75	nc	
20	Ground		76	Ground (Sensor)	Knock Ground Bank 1

Pin	ECU Pin	Function	Pin	ECU Pin	Function
21	nc		77	nc	
22	nc		78	nc	
23	Ignition 7 (Aux)	Rear AC Relay	79	nc	
24	Ground (Sensor)	Crank Position Ground	80	Ground (Sensor)	Knock Ground Bank 2
25	Injector 4	Injection			
26	Injector 3	Injection	81	An Volt 7	APS (Main)
27	nc		82	An Volt 6	APS (Sub)
28	nc	Crank Position Sensor	83	+5V Out	
29	Injector 2	Injection	84	Ground (Sensor)	APS (Main) Ground
30	Injector 1	Injection	85	An Volt 10	Cruise Control Switches
31	Injector 5	Injection	86	DI 2	Neutral/Park Switch
32	Injector 6	Injection	87	+5V Out	
			88	K-Line 1	Data Link
33	nc		89	DI 3	Brake Switch
34	nc		90	nc	
35	nc		91	nc	
36	Ground (Sensor)	TPS Ground	92	Ground (Sensor)	Cruise Switch Ground
37	An Volt 8	TPS (Main)	93	Ignition Switch	
38	An Volt 9	TPS (Sub)	94	nc	
39	nc		95	nc	
40	Ground (Sensor)	A/C Pressure Ground	96	nc	
41	nc		97	CAN 2 Low	OE CAN bus
42	nc		98	CAN 2 High	
43	+5V Out	A/C Pressure Supply	99	nc	
44	nc		100	Ground (Sensor)	APS (Sub) Ground
45	An Temp 1	ECT	101	DI 5	Start Signal
46	+5V Out	PS Pressure Supply	102	DI 6	Brake/Clutch Switch
47	+5V Out	TPS Supply	103	nc	
48	Ground (Sensor)	PS Pressure Ground	104	nc	
49	An Volt 2	PS Pressure	105	+14V ECU Power	From Main Relay
50	An Volt 3	NB O2 Signal Bank 1	106	nc	
51	An Volt 4	NB O2 Signal Bank 2	107	Ground	
52	Ground(Sensor)	NB O2 Signal B1 Ground	108	Ground	
53	An Volt 5	MAF	109	nc	
54	Knock 1		110	nc	
55	Ground (Sensor)	NB O2 Signal B1 Ground	111	Ground	
56	Ground (Sensor)	MAF Ground	112	Ground	

Note: The Internal MAP is on An Volt 11.
Note: An Volt 10 (pin 85) has a 1kOhm pull-up to 5V fitted.



XS LOOM PIN ARRANGEMENT
EXTERNAL VIEW (LOOKING INTO XS HEADER)

Expansion Plug			
Pin	**ECU Pin**	**Pin**	**ECU Pin**
1	WB1 APE	14	WB1 IPE
2	WB1 MES	15	WB1 RE
3	WB1 Heat	16	+12V (WB1)
4	Ground (Signal)	17	+5V Out
5	CAN 1 High	18	CAN 1 Low
6	Aux 11	19	Aux 12
7	An Volt 12	20	An Volt 13
8	An Volt 14	21	An Volt 15
9	An Volt 16	22	An Temp 4
10	An Temp 3	23	DI 1
11	Aux 3	24	DI 4
12	Aux 4	25	Injector 7 (Aux)
13	Aux 5	26	Injector 8 (Aux)

Note: CAN 1 is available both in the Expansion Plug and in the 4 pin WEiPU connector.

1.10 CAN Information

The following CAN (Controller Area Network) information is provided:

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CAN 2:
The CAN 2 bus is connected to the OE vehicle CAN bus and should be set to use the "Nissan Patrol Y61 Gen 2" vehicle CAN mode.
Details for this CAN mode shown below:

CAN Function
CAN Freq 1 - LH Front wheel speed
CAN Freq 2 - RH Front wheel speed
CAN Freq 3 - LH Rear wheel speed
CAN Freq 4 - RH Rear wheel speed
CAN Freq 5 - Transmission Input Shaft speed (auto only)
CAN DI 1 - AC Request
CAN DI 2 - VCD Disabled
CAN AntiTheft - see Anti Theft
Gear position (Auto trans only)
Shifter Position (Auto trans only)

This OEM CAN mode receives a CAN Anti Theft (Immobiliser) signal over CAN, it is up to the user if they want this signal to be used - see Anti Theft.

The factory shifter position is received by the ECU and shown in the Gear Shifter Position runtime.
The current gear position is also received by the ECU and shown in the Gear runtime, to ensure this works correctly set the Gear Detection Mode to Off/CAN.
The AC Request is received by he ECU through CAN DI 1, set the AC Request Source to CAN DI 1 to make use of this.

Automatic Transmission Torque reduction requests are received into the Torque Reduction % Request runtime and this requires the Torque Request Table to be setup appropriately.

The Engine Fans and AC Clutch on a Gen 2 Y61 Patrol are controlled over CAN and the Link ECU sends this information out via the Engine Fan 1&2 runtimes and the AC Clutch runtime. To make the Engine Fans work correctly an output must be selected (for engine fan 1&2) so we recommend selecting an unused virtual auxiliary for each of these functions.

CAN 1:
The CAN 1 bus is exposed both in the Expansion Plug 20 and in the 4 pin WEiPU connector:

CAN - WEiPU SF610B/P4

1. Ground	Black
2. CAN Low	Green
3. CAN High	White
4. Power	Red

Note: Orientation of pin 1 on the WEiPU connectors is relative to the locator notch in the connector, not the mounted orientation

1.11 G5 GPS, Wi-Fi and Ethernet connections

The GPS plug is the SMA Standard one (Socket center on ECU side). There will be a GPS Antenna included in the box.
The Wi-Fi plug is RP-SMA (reverse polarity) Standard (Pin center on ECU side). There will be a Wi-Fi stub antenna included in the box.

Ethernet – WEiPU SF810B/P8

1. Orange/White
2. Orange
3. Green/White
4. Green
5. Blue/White
6. Blue
7. Brown/White
8. Brown

Note: A USB tuning cable is included in the box but Ethernet tuning cables are purchased separately.

1.12 Known Issues

All plug-in ECUs are fully tested on a range of relevant vehicles, although there are often variations that have not been tested. For this reason issues can arise.

WARNING: Always download the latest Installation Manual from linkecu.com and check the latest status of known issues before installing the ECU.

Please contact your nearest Link dealer when suspecting a compatibility issue.

1.12.1 Nissan Y61 Gen2 (2017+) TB48

The "Nissan Patrol Y61 Gen 2" CAN Vehicle Mode doesn't currently work for Automatic vehicles (no shifting torque reduction value received).