WRXLink (1-2) - Subaru WRX & STI
V1-2

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   G4X 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.

G4X 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 and intake air temperature correction this gives an unprecedented level of tuning accuracy. All Link G4X ECUs are in-field upgradeable, there is no need to return the unit for software updates.

All Link G4X Plug-In Engine Management Systems are designed with flexibility and ease of installation in mind. Link Plug-In systems are designed to replace the circuit board inside the factory 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. G4X 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 G4X 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 G4X 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 G4X 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 G4X ECU is detailed in the help section of PCLink. G4X 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   Installation

This guide provides information on correctly and safely installing your new Link G4X Plug-In ECU.

1.2.1 ECU Handling Procedures

<p align="center">**WARNING!!!**</p>

<p align="center">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.</p>

<p align="center"># ANTI-STATIC HANDLING GUIDELINES</p>

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.

1. The following guidelines describe precautions that can be taken to reduce the possibility of damaging your ECU:
2. Work only on a conductive surface. A clean steel bench is suitable.
3. Always wear a wrist strap that is electrically connected to the conductive working surface.
4. Touch the working surface regularly.
5. Do NOT touch components on the circuit board.
6. Where possible, only handle the ECU by its plastic header.
7. Do NOT carry the ECU around without anti-static packaging.
8. 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.

1.2.2 Fitting the ECU

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

1.2.2.1 WRXLink (1-2), WRXLink (3-4), WRXLink (5-6), WRXLink (7-9)

The following steps outline the installation procedure for Subaru Plug-In ECUs:

1. Remove the factory ECU from the vehicle: Ensure the key is in the OFF position. The factory ECU is located under a steel cover on the passengers side floor (below the passengers feet). Lift the carpet, remove the cover panel. Unplug the wiring harness from the factory ECU. Remove the 6mm bolts (10mm socket) that retain the ECU and remove the ECU from the vehicle. DO NOT touch the exposed pins in the factory ECU connector.
2. Remove the factory ECUs circuit board from its enclosure: Ensure you are following the given anti-static guidelines and ARE WEARING A CONDUCTIVE WRIST STRAP connected to a conductive working surface. Remove the top and cover from the ECU enclosure by removing the side retaining screws. Remove the circuit board by removing the retaining screws. Hold it only by the plastic header and place it aside.
3. Fit the Link Plug-In ECU: Remove the ECU from its packaging and place it immediately in the factory enclosure. Place the factory ECU in the packaging your Link ECU came in for its protection.
4. If the ECUs USB tuning cable is to be left permanently connected, a slot will need to be cut in the top cover. The best place to do this is usually beside the factory header.
5. Reassemble the enclosure and fit the ECU back to the vehicle.
6. Connect the ECU to the factory wiring loom.

7. Do NOT attempt to start the vehicle. Proceed to read through the remaining sections of this manual first.

1.3 Additional Sensors/Functions

G4X 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.

1.3.1 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.

1.3.1.1 WRXLink (1-2), WRXLink (3-4), WRXLink (5-6), WRXLink (7-9)

The G4X WRXLink (1-2), WRXLink (3-4), WRXLink (5-6), and WRXLink (7-9) Plug-In ECUs supports several options for fitting of a MAP sensor. Any one of the following options can be used:
1. Factory MAP Sensor – From factory, all models supported by this ECU are fitted with a factory MAP sensor. The factory MAP sensor is wired to An Volt 1. For version 1 to 6 the limit of the factory sensor is 125kPa (18 psi) of boost. For version 7 - 9, 23psi.
2. Factory MAP Sensor Upgrade – The factory MAP sensor can be upgraded by simply replacing the factory MAP sensor. Contact your nearest Link dealer for upgrade options.
3. MAP Through 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.

1.3.2 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.

1.3.2.1 WRXLink (1-2)

From factory, models supported by the G4X WRXLink (1-2) Plug-In ECU are not fitted with an IAT sensor. There are two options for connecting an IAT sensor to the ECU.
1. 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.
2. IAT Through AFM – The factory AFM wiring can be used to install a IAT sensor, connect the IAT signal to the AFM signal wire and use a 1K external pull-up resistor. The IAT can then be set to use An Volt 2. See **PCLink Help > Wiring Information > Input Signal Wiring > Analog Inputs > Using voltage channels with NTC sensors** for more details.

1.3.3 E-Throttle Output

It is becoming more common to convert cable throttle vehicles to Electronic Throttle control, this section explains how (if it is possible) to do this for each plugin.

1.3.3.1 WRXLink (1-2)

Aux 9 & 10 are not exposed on this plugin and so to use E-Throttle it is recommended to use Aux 1 & 2 (ISC Close and ISC Open) with an external E-Throttle controller.

More than three Analog inputs are available on the expansion connectors which can be used to add TPS (Sub) and the APS inputs.

1.3.4   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.

1.4   PC Tuning

G4X 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 G4X ECUs must be used with the correct version of PCLink.

<p align="center">**IMPORTANT!**
The G4X 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 will not work with the G4X ECU and are difficult to uninstall. The correct USB drivers are installed as part of PCLink installation, as described in the following section. Should internet download not be practical, a copy of the drivers on CD can be obtained from your nearest Link dealer.</p>

1.4.1   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. Should internet download not be practical, a copy of the drivers on CD can be obtained from your nearest Link Dealer.

1.4.2   Installing PCLink Tuning Software

Due to the frequent updates PCLink is no longer shipped with each ECU. You will be required to download the latest version of PCLink from: 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 downloads and software updates 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.

1.4.3   Communicating With Your ECU

After PCLink installation, you will be able to connect the G4X ECU to the laptop to perform set-up and tuning work.
1. Connect the ECU to your laptop using a Link G4X 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.
2. If this is the first time you have connected a G4X USB ECU to your laptop follow the driver installation instructions that appear. When prompted if you want to install drivers select 'Continue Anyway'.

3. Start PCLink by double clicking on the PCLink icon on the windows desktop.
4. Switch the key to the ON position. This will provide power to the ECU.
5. In PCLink, under the 'Options' menu, select 'Connection'. The connection options dialogue will open. Select the correct COM Port number from the drop down list or select auto for automatic com port detection.
6. 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.
7. Make sure the connection shows "ONLINE" in the top right corner of PCLink.
8. 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.

1.5   Pre-Start Configuration

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

1.5.1   Firmware Version

It is recommended to ensure that the Link G4X 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 this is 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.

1.5.2   Base Configuration

All G4X Plug-In ECUs are shipped with base configuration settings. Note that these are provided to reduce initial setup and tuning times. They are NOT recommended tuning values. PCLink includes base configurations for various models. Download the appropriate base configuration 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 file and then select 'Open'. Downloading large configuration files can take up to a few minutes. Be patient and acknowledge any messages PCLink shows.

1.5.3   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 G4X ECUs use an on-board barometric sensor that is calibrated prior to dispatch. This ensures that all PCLink Tuning Software programs (pclx Files) give a consistent state of tune throughout the ECU range. This allows a pclx file to be transferred between G4X 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 Channels menu, select the An Volt channel that has been wired to the MAP sensor. Select the correct MAP Sensor Type.
3. Under the 'Options' menu, select 'MAP sensor calibration'.
4. Follow the on screen instructions.
5. Select the 'Analog Inputs' tab in the runtime values section of PCLink (lower part of the screen).
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 G4X Users Manual -> Tuning Operating Procedures -> ECU Controls -> MAP Sensor Calibration.

1.5.4 TPS Calibration

The Throttle Position Sensor (TPS) is used by the ECU to calculate various engine management parameters used by functions such as idle speed control,acceleration enrichment and motor sport features. It is important that the ECU knows when the throttle is open and closed (or part way in between). The following procedure calibrates the ECU to match the TPS and is for engines using a cable driven throttle:

1. Connect a laptop/notebook PC to the ECU and connect to the ECU using PCLink.
2. Under the Analog Channels menu, ensure that the correct An Volt channel is set to 'TPS (Main)'. Refer to the pin functions section of this manual for details.
3. Under the 'Options' menu, select 'TPS calibration'.
4. Follow the on screen instructions.
5. Select the 'Analog Inputs' tab in the runtime values section of PCLink (lower part of the screen).
6. Ensure the Throttle Position value reads 0% when the throttle is closed and 100% when fully open.
7. Perform a 'Store' by pressing F4.

For engine setups that use Electronic Throttle Control the Accelerator Position Sensor (APS) and Throttle Position Sensor (TPS) need to be calibrated.

For Link Plug-in ECUs see PCLink Help > G4X ECU Tuning Functions > Electronic Throttle Control

1.5.5 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.

1.5.6 Input and Output Setup

As the Link G4X Plug-In ECUs are designed to run several models there are a few items that must be set-up to make the ECU specific to your model.
The Pin Functions 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 Inputs runtime values (lower section of the PCLink screen) to confirm each channels operation.
All Analog Volt and Temperature Inputs
Look at the Analog Inputs runtime values (lower section of the PCLink screen) to confirm each channels operation.

1.5.7 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 G4X ECU is calibrated to precisely measure engine position.

1. Connect the ECU to PCLink.

2. Select 'Fuel', then 'Fuel Set-up':
   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. Click on 'Triggers' then 'Calibrate Triggers'.
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 G4X ECU Tuning Functions -> Triggers -> Calibration.

1.6   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.
   b. MAP – should read approx 101 kPa (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. Locate the 'Master Fuel' setting. This can be found in the ECU Settings Menu under: *Fuel > Fuel Setup > Fuel Main*.
   a. This will need to be adjusted during or just after start-up.
6. Crank the engine until it starts. Some throttle may be required for first time start-up due to imperfect tuning. If necessary adjust the Master setting to enrich/lean the engine (increase to enrich).
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, adjust the 'Master' (under fuel settings) setting to achieve best possible running.
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.

1.6.1   Final Checks

To avoid potential engine damage and wasted time, the adjustments presented in the following sections must be made before attempting to start the engine.
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.

1.6.2   Initial Setup

After all checks described in previous sections have been performed, the ECU is ready to be configured for a particular application. The following set-up procedure should be used on all installations as a minimum:

Configuration and Fueling Set-up

If the ECU is to be used to control fuel injection, all of the following steps must be performed. If the ECU will not be controlling fuel injection, then only steps 1 and 2 are required.

1. If you have a .pclx file containing a base configuration, this is the time to load it into the ECU. To do this, select 'Open' form the 'File' menu. Select the required .pclx file and then select 'Ok'. When prompted if you want to load the file into the ECU, select 'Yes'.
2. Click on the 'Configuration' heading in the ECU Settings function tree (top left of PCLink Tuning Software screen):
   a. Select the correct engine type
   b. Select the correct number of cylinders/rotors.
   c. Enter the engines firing order.
3. Click on Fuel > Fuel Setup > Fuel Main:
   a. Select the desired Injection Mode (e.g. Sequential or Group).
   b. Select 'Fuel Table1' from under the 'Fuel' heading. Right click on the table, select 'Axis Setup'. Set the Y Axis (Load) to the appropriate option (e.g. MGP or TPS).
4. Click on 'Accel Enrichment':
   a. Turn Accel Mode OFF for first time set-ups.
5. Click on Fuel Corrections > IAT Fuel Correction:
   a. If air temperature correction is to be used and an air temperature sensor is fitted, set the 'IAT Mode' to ON. Then select and fill in the IAT Fuel Trim Table.
   b. Turn OFF air temp correction (under 'IAT Mode') if air temperature correction is not going to be used
6. Click on Fuel > Fuel Setup > Injector Setup:
   a. Select '2D Table' or '3D Table'. Fill in the dead-time table with the information from your injector data-sheet.
7. Click on 'Overrun Fuel Cut':
   a. Set 'Fuel cut Mode' to OFF.
8. Click on Fuel Corrections > Dual Fuel Table:
   a. Set Table 2 Mode' to OFF.
9. Click on Fuel Corrections > 4D Fuel Table:
   a. Set '4D Fuel Mode' to OFF.
10. Click on Fuel Setup > Injector Test:
    a. Turn each injection channel on one by one and check that the correct cylinders injector clicks. Fix any problems now if the injectors do not operate.
11. Perform a Store to permanently save changes to the ECU by pressing F4.

Ignition Set-up

If the ECU is to be used to control ignition, all of the following steps must be performed. If the ECU will not be controlling ignition, then only the first step is required.

1. Click on Ignition > Ignition Set-up > Ignition Main:
   a. Select the correct type of 'Ignition Mode' for the application. Set to 'OFF' if ignition is not controlled by the ECU.
   b. Set 'Maximum Advance' to a suitable value.
   c. Enter appropriate values for coil dwell time in the 'Ignition Dwell Time' table.
2. Click on Ignition Corrections > ECT Ign Trim:
   a. Set ECT Trim Mode to OFF (for now).
3. Click on 'IAT Ign Trim':
   a. Set IAT Trim Mode to OFF (for now).
4. Click on Individual Cyl Ign Trim > Individual Cyl Ign Trim:
   a. Set 'Indiv Ign Mode' to OFF (for now).
5. Click on Ignition Corrections > Dual Ign Table:
   a. Set Table 2 Mode to OFF (for now).
6. Click on '4D Ign Table':
   a. Set '4D Ign Mode' to OFF (for now).
7. Click on Ignition Setup > Ignition Test:
   a. Turn each ignition channels test function on one by one.
   b. Check for a quiet clicking sound from each coil or alternately connect a spark gap and check for spark on the correct cylinders.
   c. Correct any problems before continuing.
8. Perform a Store to permanently save changes to the ECU by pressing F4.

Limits Set-up

At this stage it is not necessary to precisely set all limits. However, it is essential to ensure they are set to values that will not interfere with tuning procedures. It is advisable to err on the conservative side when setting limit values.

1. Click on Limits > RPM Limit > RPM Limit:
   a. Select the desired 'RPM Limit Mode'
   b. Select the RPM Limit Table, enter the required RPM limiting value for each engine temperature in the 'RPM Limit Table'.
2. Click on Limits > MAP Limit > MAP Limit:
   a. Select the desired 'MAP Limit Mode'
   b. Select the MAP Limit Table, enter the required MAP limiting value for each engine temperature in the 'MAP Limit Table'.
3. Click on Limits > Speed Limit:
   a. Set 'Speed Limit Switch' and 'Speed Limit Switch 2' to 'OFF' to ensure it is not invoked during tuning. Note that this limit will only be effective if a vehicle speed sensor is correctly wired and configured.
4. Perform a Store to permanently save changes to the ECU by pressing F4.

Trigger Set-up

Trigger set-up requires entering information regarding the way in which engine speed and position is measured. Consult the PCLink Tuning Software online help for further information on functions.

WARNING!
These are probably the most critical set-up values. Do not attempt to start the engine unless you are 100% confident that these values are correct.

If trigger information is unknown, consult your nearest Link dealer for further assistance.

1. Click on 'Triggers' then 'Trigger Set-up':
   a. Configure triggers as required.
2. Click on 'Trigger1':
   a. Select correct trigger type and set-up completely.
3. Click on 'Trigger2':
   a. Select correct trigger type and set-up completely.

4. Perform a Store to permanently save changes to the ECU
   by pressing F4.

Additional Set-up

It is important that all features not required for initial tuning are either disabled or correctly set-up. It is recommended that features be initially disabled to ensure they do not complicate tuning.

1. Click on 'Motorsport' then 'Antilag':
   a. Set 'Antilag Mode' to OFF.
2. Click on 'Launch Control':
   a. Set 'Launch Control Mode' to OFF..
3. Click on 'Gear Cut Control':
   a. Set 'Gear Cut Control Mode' to OFF.
4. Click on Boost Control > Boost Set-up:
   a. Configure Boost Control as described in the PCLink
      Tuning Software online help.
5. Click on 'Multiple Boost Tables':
   a. Set 'Active Tables' to 1 Table.
6. Perform a Store to permanently save changes to the ECU
   by pressing F4.

1.6.3 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.

Master

Master 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.

1.7 Pinouts

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

1.7.1 WRXLink (1-2)

```
1  2  3  4  5  6  7  8  9  10 11 12 13    31 32 33 34 35 36 37 38    51 52 53 54 55 56    71 72 73 74 75 76 77 78 79 80 81
14 15 16 17 18 19 20 21 22 23 24 25 26    39 40 41 42 43 44 45 46    57 58 59 60 61 62    82 83 84 85 86 87 88 89 90 91 92
```

Subaru V1-2 WRX/STi, RS Legacy					
Pin	**ECU Pin**	**Function**	**Pin**	**ECU Pin**	**Function**
1	Injector 1	Injection	55	An Volt 3	TPS (Main)
2	Injector 2	Injection	56	Ground (TPS)	
3	Injector 3	Injection	57	DI 3	Ignition Switch
4	Ignition 1	Ignition	58	DI 4	Vehicle Speed
5	Ignition 3	Ignition	59	nc	
6	Ignition 2	Ignition	60	nc	
7	Ignition 4	Ignition	61	nc	
8	Aux 7	Purge	62	nc	
9	nc				
10	Injector 5 (Aux)	Fan Relay 2	71	Ground (Signal)	
11	Aux 4	Wastegate Solenoid	72	Ground (AFM)	
12	Aux 2	ISC Open (ISC Solenoid)	73	An Volt 2	AFM Signal
13	Aux 1	ISC Close (ISC Slave)	74	AFM +12V	
14	Injector 4	Injection	75	An Temp 1	ECT
15	Ground		76	An Volt 4	Oxygen Sensor Signal
16	Ground		77	nc	
17	Aux 5	Fuel Pump Relay	78	An Volt 1	Factory MAP Sensor
18	Aux 6	A/C Out	79	+5V Out (MAP)	
19	nc		80	+14V	ECU Power
20	nc		81	nc	
21	Aux 8	CE Light	82	Ground (Signal)	
22	nc		83	Ground (MAP)	
23	Injector 6 (Aux)	Fan Relay 1	84	nc	
24			85	nc	
25			86	nc	
26	Ground		87	Ground (O2 Shield)	
			88	nc	
31	nc		89	nc (+12V constant)	
32	nc		90	nc	
33	nc		91	+14V	ECU Power

34	Knock 1	Knock	92	nc	
35	Ground (Knock)				
36	Ground (Trig 2 Shield)		Expansion 1	Ground (Signal)	
37	Ground (Trig 2)		Expansion 2	+5V Out	
38	Trig 2	Trig 2	Expansion 3	DI 5	
39	Aux 3	Tacho	Expansion 4	DI 6	
40	nc		Expansion 5	An Volt 5	
41	nc		Expansion 6	An Volt 6	
42	nc		Expansion 7	An Temp 2	
43	nc		Expansion 8	An Temp 3	
44	nc		Expansion 9	Ground (Signal)	
45	DI 1	Start Signal	Expansion 10	+5V Out	
46	DI 2	A/C In	Expansion 11	DI 9	
			Expansion 12	DI 10	
51	Ground (Trig 1 Shield)		Expansion 13	An Volt 8	
52	Ground (Trig 1)		Expansion 14	An Volt 9	
53	Trig 1	Trig 1	Expansion 15	Ignition 7 (Aux)	
54	+5V Out		Expansion 16	Ignition 8 (Aux)	

Note: Injector Drives 7 and 8 aren't exposed and don't have the hardware required to drive Injectors.

1.8   CAN Information

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

1.8.1   WRXLink (1-2)

The G4X WRXLink (1-2) Plug-in ECU has two CAN buses. These CAN buses exist to support aftermarket CAN devices.

CAN bus 1 uses a 5 pin connector and is labeled on the ECU as 'CAN 1/RS232'.
If using this connector for CAN ensure the cable being used doesn't have Serial wires connected as this can act as an aerial and prevent USB communications from working.

CAN 1/RS232 Connector		
Pin	**Function**	**Colour**
1	Comms GND	Brown
2	CAN1 L	Green
3	CAN1 H	White
4	RS232-RX	Grey
5	RS232-TX	Yellow

CAN bus 2 uses a 5 pin connector and is labeled on the ECU as 'CAN 2/OBD'.

CAN 2/OBD Connector		
Pin	**Function**	**Colour**
1	GND	Brown
2	CAN2 L	Green
3	CAN2 H	White
4	NC	Grey
5	+14V	Yellow

To learn more about CAN see PCLink help.

1.9   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.

1.9.1   WRXLink (1-2)

There are currently no known issues.