Updates to this document since the previous version have a light yellow background.

# NISSAN R35 GT-R ENGINE PLUG-IN KIT (RHD & LHD)

*For racing and off-road use only*

**MoTeC's Nissan R35 GT-R Engine Plug-In ECU Kit is a fully programmable replacement for the factory-fitted engine ECU. No rewiring is necessary; the kit plugs into the stock wiring harness using the original fuel system and sensors (except Lambda sensors).**

**All Original Equipment (OE) functions are maintained, including dashboard, traction control and gearbox systems.**

**Every aspect of the ECU's functionality is fully tunable, including additional capabilities far beyond the OE ECU tailored for drag and circuit racing applications.**

## 2019 UPDATE

- Firmware version 01.05.0078 for M150, version name April 2016.
- ECU firmware is compatible with all known variants of R35 in all geographic regions, 2007 to current (2019).

  **Note:** Each variant may have unique tuning settings.
- Adaptor Box Revision D supports 2017+ models with **Exhaust Sound** control and **Alternator Current** sensing.

This update provides extensive feature improvements and adds many new features.

- Slip-Based **Traction** Control added
- **Traction Model** system added
- **Flex Fuel** and **Dual Fuel** control added
- **AWD control** added
- **Internal TCM data** reading added
- **Boost** Dual Bank Control added
- **Nitrous** control added
- **Boost Servo** control added
- **Gear Up shift** Torque reduction control added
- **Clutch Slip Control** improvements
- **Knock** control system improvements
- **Launch** system improvements
- **OE CAN Integration** tunability improvements
- **Driver** map switch additions and improvements
- **Warning** system additions and improvements
- **OE VDC (ABS)** removal support
- **Bosch Motorsport ABS M4 and M5** support
- **Bosch CAN Inertial sensor** support
- **Calculation rates increased** to improve control of various subsystems
- Bug fixes, additions and improvements to many other areas.

For more details on new and existing features, see the *Feature Details* section.

For details on migrating an existing tune from an older version to this release, see the *Migration Checklist*.

## KIT CONTENTS (11501 - 11502)

### Hardware

- **13150** – M150 ECU preloaded with the Nissan GT-R 2007 VR38DETT Engine M1 Package. (A MoTeC M1 Licence is required to run this Package.)
- **61245** – M150 NISSAN GTR R35 RHD ADAPTOR KIT – containing:
  - 61248 – M150 NISSAN GTR R35 ADAPTOR BOX
  - 61247 – M150 NISSAN GTR R35 BREAKOUT LOOM
  - 61250 – M1 ADAPTOR 200MM 34W KEY 2 STUB LOOM
  - 61251 – M1 ADAPTOR 120MM 26W KEY 3 STUB LOOM
  - 61252 – M1 ADAPTOR 120MM 34W KEY 1 STUB LOOM
  - 61253 – M1 ADAPTOR 200MM 26W KEY 1 STUB LOOM
  - 61225 – NETWORK CABLE RJ45 1.5 METRE
  - 61305 – LTCND - DUAL NTK LAMBDA TO CAN
  - 61220 – LAMBDA SENSOR EXTENSION LOOM FOR NTK E1 0.55 METRES x 2
  - 57007 – NTK UEGO WIDEBAND LAMBDA SENSOR x 2
  - 54002 – DELCO AIR TEMPERATURE SENSOR 14 x 1.5mm
  - 3M DUAL LOCK VELCRO 100MM x 3
- **61249** – M150 NISSAN GTR R35 LHD ADAPTOR KIT – containing:
  - 61248 – M150 NISSAN GTR R35 ADAPTOR BOX
  - 61247 – M150 NISSAN GTR R35 BREAKOUT LOOM
  - 61254 – M1 ADAPTOR 150MM 34W KEY 2 STUB LOOM
  - 61255 – M1 ADAPTOR 150MM 26W KEY 3 STUB LOOM
  - 61256 – M1 ADAPTOR 200MM 34W KEY 1 STUB LOOM
  - 61404 – M1 ADAPTOR 250MM 26W KEY 1 STUB LOOM
  - 61225 – NETWORK CABLE RJ45 1.5 METRE
  - 61305 – LTCND - DUAL NTK LAMBDA TO CAN
  - 61220 – LAMBDA SENSOR EXTENSION LOOM FOR NTK E1 0.55 METRES x 2
  - 57007 – NTK UEGO WIDEBAND LAMBDA SENSOR x 2
  - 54002 – DELCO AIR TEMPERATURE SENSOR 14 x 1.5mm
  - 3M DUAL LOCK VELCRO 100MM x 3

### Licence

- **23002** – NISSAN R35 GT-R

This Licence is required to run the Nissan GT-R 2007 VR38DETT Engine M1 Package in the M150 ECU.

## FEATURE DETAILS

- M150 ECU hardware
  - 40 outputs
  - 45 inputs
  - 3 x CAN, RS232, LIN, Ethernet.
- **Traction** control
  - Controls front to rear wheel slip closed loop to an aim value.
  - Torque reduction by ignition timing or cut for fast response.
  - Tunable and dynamically adjustable aim slip.
- **Traction Model** system
  - Controls the maximum wheel torque via throttle reduction.
  - Dynamically adjustable for lateral and vertical G force and downforce.
  - This open loop system works in conjunction with the closed loop slip based control.
- **Flex Fuel** and **Dual Fuel** control
  - Model based fuel type selection, reduces tuning time.
  - Comprehensive tunability.
  - Ethanol sensor support.
- **AWD control**
  - Replaces the OE AWD control unit.
  - Controls torque to the front wheel.
  - Open loop and closed loop control based on driving conditions.
  - Allows 2WD mode (gearbox hardware dependant).
- **Internal TCM data**
  - Reading and logging of over 50 Internal TCM channels.
  - Includes clutch pressure actual and commanded, rest and touch points, selector positions, axis pressures, etc.
  - Very useful for transmission tuning and fault finding.
- **Boost** dual control
  - Two separate closed loop control systems with respective boost control solenoid outputs and boost pressure sensors.
  - Comprehensive tuning including influences for Barometric pressure and Gear.
  - Allows cross-flow intercoolers to be used on the GT-R while maintaining bank to bank boost-pressure balance.
  - Integrates with Torque Control System; torque control by boost control option.

- **Nitrous** control
  - For wet or dry nitrous oxide systems.
  - Two stage with multiple trigger conditions and time limits.
  - Nitrous transport delay for dry systems.
  - Fuel pump trigger.
- **Boost Servo** control
  - Controls a servo operated wastegate or blow-off valve.
  - Multiple sources for aim position.
  - Use for boost control, blow-off valve or turbo surge prevention.
- **Gear Up shift** Torque reduction
  - Fully tunable gear shift torque reduction amount based on current torque and clutch slip.
  - Ignition retard and/or ignition/fuel cut methods.
  - Integrates with TCM based torque reduction control.
- **Clutch Slip Control**
  - Reduce torque by throttle control to protect the clutch from damage (overheat).
  - Reduce torque (by ignition retard) closed loop to an aim slip, which maximises performance from the clutch.
- **Knock** control system
  - Engine Knock detected by DSP to filter out noise.
  - Individual cylinder control, only acts on cylinder that is knocking.
  - Controls knock for excessive events by:
    - Reducing ignition timing
    - Adding fuel or ignition cut
  - Control filtering based on single event, transient conditions or gear shift.
- **Launch** control
  - Closed loop engine speed control using ignition timing and cut.
  - Builds boost without loading the engine, giving very consistent engine speed and torque available for takeoff.
  - Fast boost building using higher engine speed, reducing to desired launch engine speed as boost rises to the requested.
  - 'Bump in' functionality specific for GT-R.
- **Driver** map switch
  - Multiple toggle, latching or 10 position switch inputs.
  - Link switches to one or multiple subsystem controls.
  - Map switching and/or enable control for useful subsystems, e.g. **Throttle Pedal**, **Traction** Control, **Gear shift**, **Anti Lag**.
- **Warning** system
  - Light output and Check Engine Lamp.
  - Solid or flashing at 0.5Hz, 1Hz or 5Hz depending on severity of the warning.
  - Threshold limits with time delays all configurable.
  - Warnings for diagnostic conditions and subsystem active.
- Comprehensive OE systems integration
  - Rescale Boost gauge reading on MFD for high boost.
  - Show Ethanol content sensor on the dash.
  - Steering wheel map switching display on the dash.
- OE TCM (DSG transmission) integration
  - Obeys commands from the TCM as per OE.
  - Down shift Throttle Blip with rev matching.
  - Up shift torque reduction by ignition retard.
  - Torque limit for shift blending and transmission limp home.
  - Tunable for takeoff, shift feel, shift points, launch and more.
- **OE VDC** (ABS) integration
  - VDC system operates as per OE.
  - Obeys torque reduction commands for traction control, ESP and Limp home (tunable).
  - Supports removal of the VDC and other OE systems will still operate as normal.
- **Bosch Motorsport ABS M4 and M5** support
  - This can replace the OE VDC unit.
- **Bosch CAN Inertial sensor** MM5.10 support
- **Torque** modelling
  - Based on normal engine tuning, e.g. the tuning process is no more difficult or time consuming than tuning an M1 ECU without torque modelling.
  - Limit torque accurately, compensates for any boost pressure.
  - Integrates with ignition timing and ignition/fuel cut systems for seamless blending between torque reduction methods.
- **Engine Load** (fuelling) calculation from different sources
  - **Inlet Manifold Pressure** sensors.
  - **Mass Air Flow** sensors.
  - **Throttle Position** and **Boost Pressure**.
  - Combination of the above.
- **Cruise Control**
  - Functionality exactly like the OE ECU.
  - Set speed adjustable in 1 and 5 kmh or mph increments.
  - Fully tunable control.

- **Fuel Closed Loop** mixture control for individual banks.
- **Driver Steering Wheel** map switching
  - Displays setting on the OE dash.
  - Up/down buttons for 10 positions
  - Cancel button (momentary or toggle) for 2 positions.
- Integrated 250 Mbyte of logging memory.
- Includes Level 2 Data Logging
  - 200 channels at up to 200Hz.
  - Upgradable to 2000 channels at up to 1000Hz.
- Data analysis via MoTeC's renowned **i2** software.
- Control for 3 separate fuel pumps
  - OE multi speed pump control.
  - Sub fuel pump control.
  - PWM closed loop fuel pressure control system.
  - Options for many fuel pump and system configurations.
- Fallback and limp home strategies
  - If a sensor fails (e.g. MAP), alternate load sensors are used.
- Easy wiring of additional sensors via the 'breakout' connector: multiple EGTs (via TCA Thermocouple Amplifier or up to 8 via E888), GPS.
- **Gear Automatic** shift control, allows fully tunable gear shift points.
- Injector outputs for 12 individual injectors
  - Peak and Hold or Saturated drive types for all outputs
  - Tunable Balance table, injection timing,
  - Comprehensive blending and transport delay compensations for secondary (high) injectors.
- Ignition output pin for each cylinder (coil on plug).
- Camshaft timing control
- Dual bank lambda sensor control with LTCD module supplied with the kit.
- Engine Physical settings for fast setup and minor re-tuning for many modifications.
- Engine pumping efficiency, air flow and load modelling based on inlet manifold pressure.
- Dual bank fuelling
  - Each bank can be fuelled from its respective set of sensors, MAF, Boost, MAP, TP, AT.
  - Redundant sensor support; if one sensor fails the other bank's sensor is automatically substituted.
- Sensor calibrations available for many common automotive sensors.
- Transient fuelling compensation using physical modelling of fuel film remaining in the inlet manifold.
- Support of MoTeC devices: ADR, E8XX, PDM, SLM, VCS.
- Test settings for most outputs, including injection and ignition outputs, for easier setup.
- **Wastegate Pressure** closed loop control, e.g. for CO2 systems.
- **Anti Lag** system
  - Controls ignition timing, fuel volume, ignition cut, engine speed limit, boost aim and torque (opens throttle).
  - Setup for circuit, rally or roll racing (rolling launch).
- **Turbocharger** bypass valve control (electric blow-off valve).
- **Coolant** fan outputs
  - Controls OE fans.
  - Additional PWM or switched control.
  - Integrated with air conditioner and idle control.
- **Air Conditioner** control
  - Conditional clutch activation
  - Refrigerant pressure safety
  - Fan control
- **Coolant Temperature** compensations for engine speed limit, ignition timing, fuel mixture and boost limit.
- **Coolant Pump** output with PWM control.
- **Coolant Pump After Run** functionality, optionally with additional pump output.
- **Engine Speed Limiting** with ignition cut and/or fuel cut.
- **Fuel Flow Supply** and **Fuel Flow Return** sensor inputs.
- **Exhaust Sound** control for MY17+ models.
- Charcoal canister purge valve control.
- GPS data via CAN or RS232.
- **Intercooler Temperature** and spray control.
- **Differential** oil temperature control with dedicated temperature sensor and pump output.
- **Engine Charge** air temperature calculation, allows for correction of Inlet Air Temperature (compensation of heat soak effect etc.).
- **Lap** distance, time and number via BR2, GPS or switched input, with split and sector options.
- **Race Time** system
  - Trim tables for ignition timing, fuel mixture, boost limit and torque limit.
  - Integrates with launch and traction control
- **Idle** control system using ignition timing and throttle control.
- **Engine Load Average**, allows trims to be applied with persistent high engine load.
- Dedicated fuel, ignition and throttle setting for cranking and post start.
- Closed loop **Alternator** control

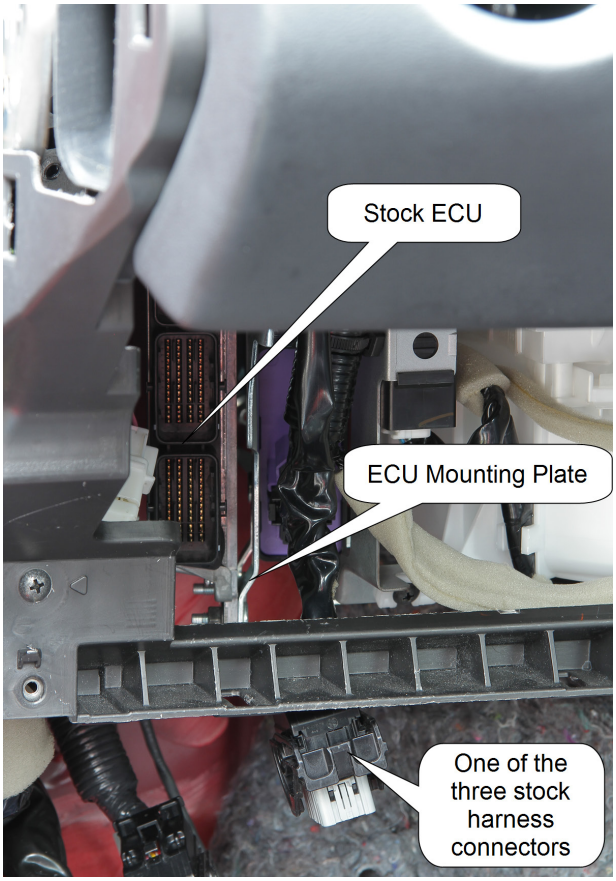
- Engine hours, odometer and trip meter.
- Configurable security for multiple users.
- Configuration of **Brake State** using a switch or a pressure sensor.
- **Brake Vacuum** system with pump control.
- ECU-internal G-force (acceleration) – longitudinal, lateral and vertical.
- ECU CAN receive from a defined CAN ID for data reception from MoTeC devices. Support of 3 CAN buses.
- ECU CAN transmit of the most common channels using standard MoTeC CAN templates, ideal for MoTeC dash displays.
- **Tachometer** output.
- Dual bank Drive by Wire **Throttle Servo** control.
- **Throttle Pedal** sensor with translation table.
- **Transmission Pump** output with transmission temperature threshold and hysteresis control.
- **Vehicle Speed** measurement using wheel speed sensors, estimation or GPS.
- **Vehicle Speed Limit Control** system (DBW-throttle based). Can also be used for pit speed limiting.
- **Auxiliary Time** system with tables for ignition timing compensation, fuel volume trim and fuel mixture aim.
- 5 **Auxiliary Outputs** for PWM control of added actuators:
  - Duty cycle tables using Engine Speed and Throttle or Manifold Pressure Axis.
  - Activation based on inlet manifold pressure or throttle position.
  - **Auxiliary Output 1** includes tables for Ignition Timing Compensation, Fuel Volume Trim and Fuel Mixture Aim.
  - **Auxiliary Output 5** includes external sensor input.
- Optional channels for additional sensors via input pin and/or CAN message, including:
  - **Airbox Mass Flow**, **Pressure** and **Temperature**
  - **Ambient Temperature**
  - **Brake Pressure Front** and **Rear**
  - **Brake Switch**
  - **Coolant Pressure** and **Temperature**
  - **Engine Oil Pressure** and **Temperature**
  - **Engine Crankcase Pressure**
  - **Exhaust Pressure Bank 1** and **Bank 2**
  - **Exhaust Temperature** (EGT) via TCA Thermocouple Amplifier, Generic CAN, or E888 for **Bank 1** and **2 Collector**, and **Cylinders 1** to **6**.
  - **Exhaust Lambda** via LTC, LTCN, or PLM for **Bank 1** and **2** Collector, and **Cylinders 1** to **6**.
  - **Fuel Pressure** and **Temperature**
  - **Fuel Tank Level**
  - Gear Neutral Switch
  - Gear shift Request
  - **Intercooler Temperature**
  - **Steering Angle** and **Pressure**
  - **Transmission Pressure** and **Temperature**
  - **Turbocharger Speed**
  - **Turbocharger Inlet/Outlet Temperature**
  - **Turbocharger Wastegate Position**
  - G-Force (**Acceleration**) – **Longitudinal**, **Lateral**, **Vertical**.
  - **Wheel Speed** sensors front/rear left/right, wired or CAN input.
  - **Auxiliary Fuel Pressure**

## INSTALLATION

Left-hand and right-hand drive cars require different mounting of the M150 ECU, but otherwise the installation process is similar.

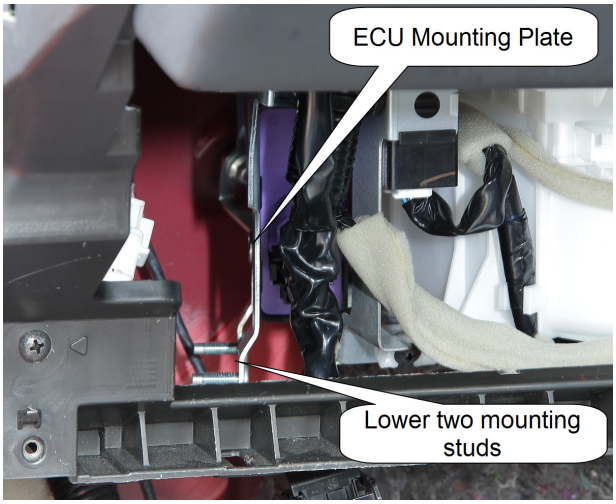
1. Remove the battery to gain access to a firewall grommet.
2. Remove the stock ECU as follows:
   (a) Access the stock ECU by removing the glovebox.
   (b) Remove harness plugs from the stock ECU, see Fig 1.

*Figure 1*




   (c) Remove and retain the four M6 flange nuts from the stock ECU.
   (d) Remove stock ECU from the mounting plate, see Fig 2.

*Figure 2*



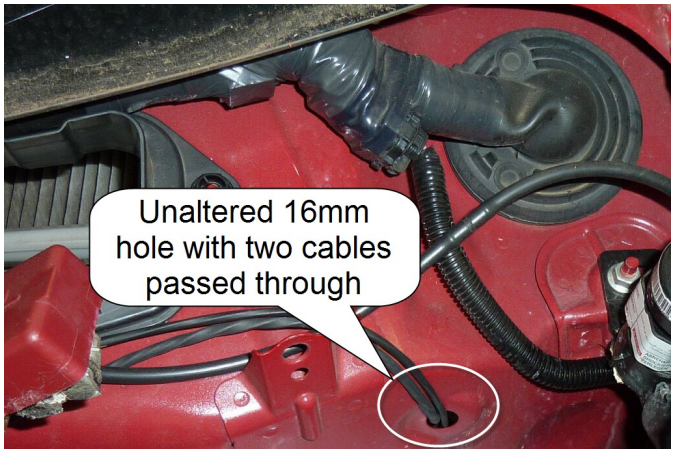

3. Use one of the following options to pass the Breakout Loom's **Air Temperature**, LTCD, and **Fuel Pressure** cables and plugs through the firewall.

   ➪ Also, see Fig 8. It shows the main harness grommet and the 16mm hole from the passenger footwell.

**Option 1**: Drill the unused existing 16mm hole (has a blank grommet installed) out to 21mm and pass through the **Fuel Pressure**, **Air Temperature**, and LTCD connectors and cables, using a suitable grommet to seal the hole.

**Option 2**: The 16mm grommet hole may be used without drilling by first removing the **Fuel Pressure**, **Air Temperature** connectors and the LTCD female pins from the LTCD socket, then passing the loom wires through the 16mm hole and sealing with a suitable grommet. Re-terminate the **Air Temperature** and **Fuel Pressure** connectors. The LTCD connector need only have the female contacts re-inserted and the orange cap replaced.

*Figure 3*



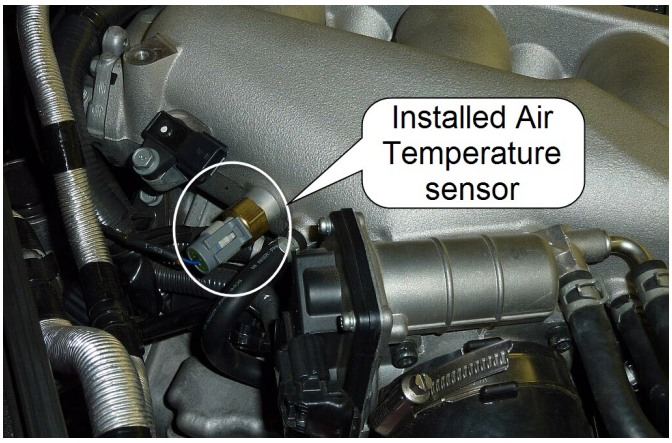

**Option 3**: Remove the main harness rubber boot from the upper firewall (best done from inside the passenger compartment). Feed the cables and connectors through the main harness rubber boot by adjusting or modifying the boot to suit. The rubber boot should then be re-positioned, ensuring a good seal. See Fig 4.

*Figure 4*

4. Replace the stock Lambda sensors with the supplied NTK Lambda sensors, extended via NTK extension looms to LTCD NTK.
5. Install the supplied **Air Temperature Sensor**.

   ➪ It is highly recommended that this is installed in the inlet manifold. Ideally, the manifold should be removed and an M14 x 1.5 threaded hole should be drilled and tapped as shown in Fig 5.

*Figure 5*




6. Insert the four Stub Looms into the M150 ECU. The Stub Looms, except for the loom with the Ethernet connector (see note) are symmetrical and either end may be inserted into the M150 ECU. The connectors are keyed so that they can only be inserted into the corresponding sockets.

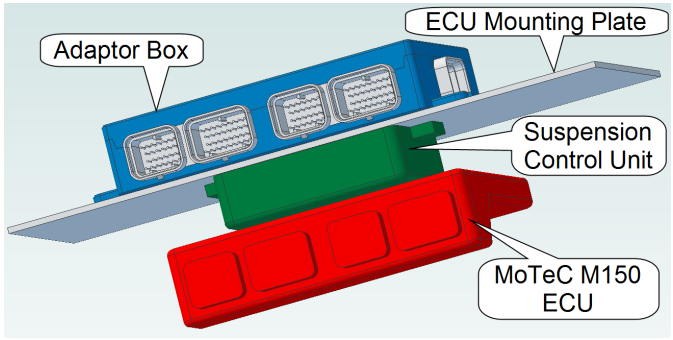
   ➪ For the Stub Looms with the Ethernet cable, ensure the plug containing the Ethernet cable is plugged into the M150.

7. Fix the three Velcro Dual Lock strips to the M150 mounting position, orientated to match the orientation of the velcro strips on the ECU. The mounting position is different for RHD and LHD vehicles, as described below:

   **Choose from:**

   - For RHD — M150 mounting position is on top of the Adaptor Box, as shown on the first page product image.
   - For LHD — M150 mounting position is behind the original ECU Mounting Plate, on top of the Suspension Control Unit. See Fig 6 for a representation of the assembly.

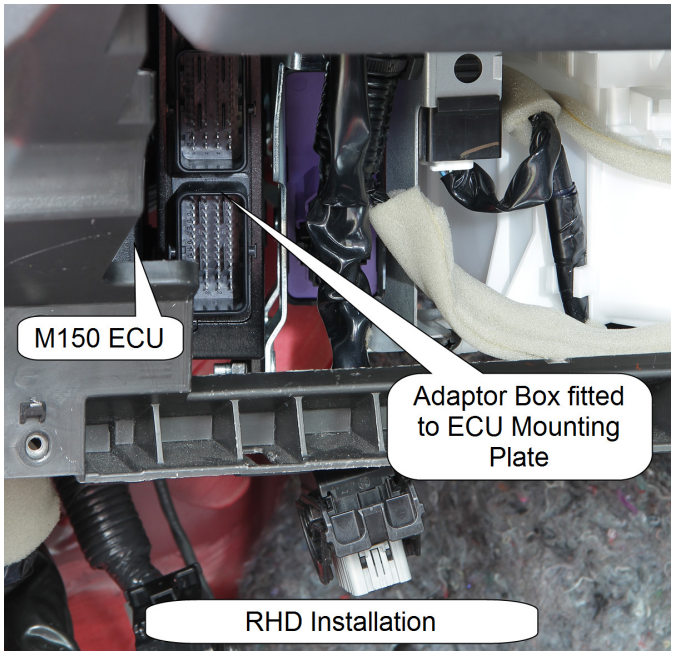
*Figure 6*




8. Place M150 over mounting position and secure by applying firm pressure to ensure Velcro locks.
9. Plug Stub Looms into the Adaptor Box.
10. Place Adaptor Box onto stock ECU mounting studs and fix using original four M6 flange nuts.

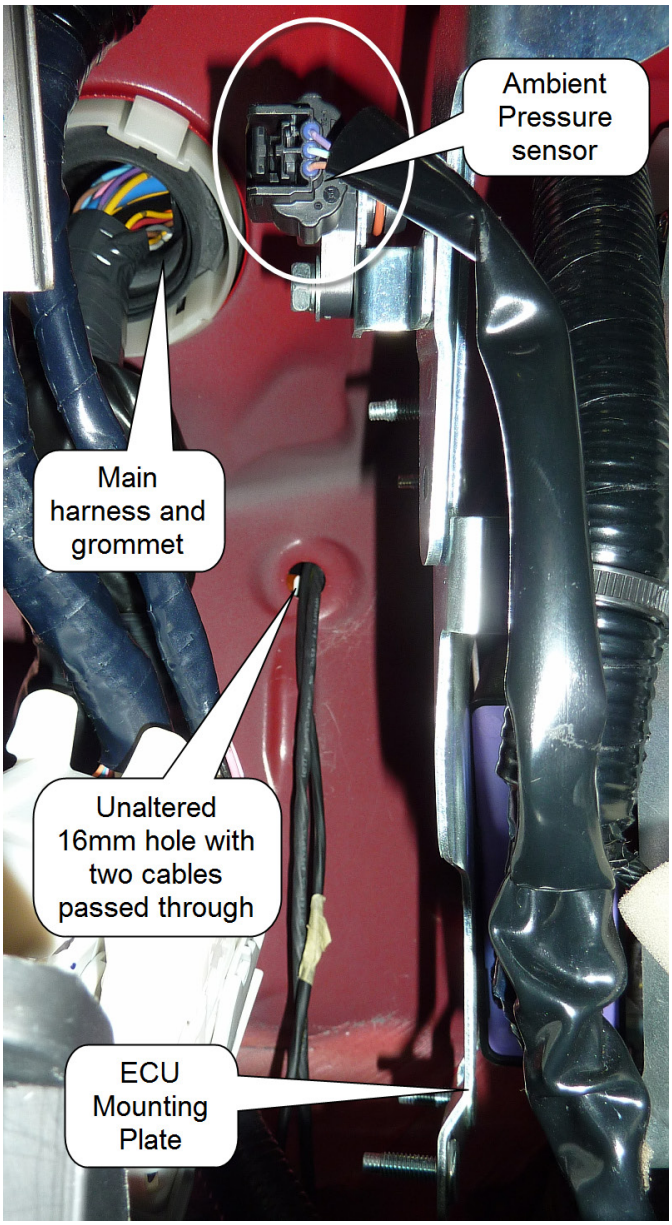
    ➪ LHD mounting requires a metal tab to be bent away from Adaptor Box housing.

*Figure 7*




11. Connect the R35 Breakout Loom to the Adaptor Box.
12. Connect the stock ECU harness plugs to the Adaptor Box.
13. Position the Ethernet cable for easy access and connect to a laptop with M1 Tune installed.
14. There are several engine and sensor combinations on this vehicle. Ambient Pressure sensor has two options. It may be derived from a sensor in the evaporative canister, or a sensor may be mounted above the ECU, as in Fig 8.

*Figure 8*


Ambient Pressure sensor
Main harness and grommet
Unaltered 16mm hole with two cables passed through
ECU Mounting Plate

## MODIFICATIONS GUIDE

While many components may be changed to achieve better performance, some combinations are more likely to deliver improvements with minimal re-tuning from the installer, tuner, or customer.

In general, Original Equipment (OE) or stock fuel injection components are suitable for improved performance. However, when the capabilities of certain OE fuel injection components reach their limits (for example, inadequate injector flow), it is necessary to replace these components with higher performance alternatives.

MoTeC has conducted many tests to characterise components for optimal performance within the M1 environment. This is particularly relevant in regard to our comprehensive, precise and highly repeatable injection calibration testing, which allows for fuel pressure and supply voltage variations. Each injector for which we supply data has been subject to some 400 tests; this level of detail is not likely to be achieved by installers, tuners or customers.

It is our recommendation that components are chosen from our list of suitable options when selecting alternate parts.

Each component listed below includes the settings which should be adjusted or checked with M1 Tune. Clicking on these settings within M1 Tune displays operational help relevant to the item.

## COMPONENT MODIFICATION SETTINGS

### Flex Fuel and Dual Fuel

When adding Flex Fuel (variable ratio of gasoline and ethanol) or Dual Fuel (separate fuels on primary and secondary injectors) to the engine, see the M1 Flex Fuel User Guide available on the MoTeC website.

### Fuel Type

The fuel type can be changed to one of a different chemistry (provided the fuel is compatible with spark ignition engines), like ethanol or methanol. Changing the Fuel Properties setting for the new fuel will adjust the fuel delivery to give close to the correct fuel mixture.

Other aspects of changing the fuel type may require re-tuning to take advantage of a better quality fuel, or for engine safety. For example, ignition timing, fuel film, boost aim and knock control might be some of the systems that require re-tuning.

### Fuel Injectors

When changing the injectors, the settings under the **'Fuel Injector'** group **must** be adjusted to reflect such a change.

If accurate injector calibrations are used, only minor re-tuning may be necessary.

### Primary/Secondary Injectors

If a secondary set of injectors is fitted higher in the inlet manifold runner, the following setting groups require setup and tuning:

- **Fuel Injector Secondary**
- **Fuel Cylinder N Secondary Output Resource**
- **Fuel Timing Secondary**
- **Fuel Film Secondary**

Additional wiring is required to run from the ECU to the engine bay carrying ECU 12V power and 6x Peak Hold injector outputs.

### Turbo and Wastegate

Any suitable turbo and wastegate combination may be used. Settings in the **Boost** group will need adjusting. Depending on the wastegate type, **Boost Servo** or **Wastegate** groups may also need adjusting.

### Throttle Bodies

Any throttle body with direct actuation of the DC servo can be used, including those with digital SENT throttle position sensors. The following setting groups must be tuned:

- **Throttle Servo** - If your new throttle part number is not in the 'Throttle Servo Calibration' list, please contact MoTeC for advice.
- **Throttle Mass Flow Area Factor** - This parameter sets the maximum airflow factor of the throttle. It may be scaled by the change in throttle area from old throttle to new. For example, if increasing from 60mm to 70mm throttles, the **Throttle Mass Flow Area Factor** would be multiplied by 1.361.
- **Throttle Area** - This table sets the relationship between throttle position and throttle opening area. This is tuned by matching **Inlet Manifold Pressure Bank N Sensor** to **Inlet Manifold Pressure Modelled**. For low throttle opening and especially near idle, accuracy of this table is important, but also easy to tune. At higher throttle openings tuning becomes more difficult, but also much less important. Provided the shape of the table from the base tune is maintained, accurate torque control can be obtained for all throttle openings in a short time.

### Fuel Pumps

There are many aftermarket fuel pump kits available for the GT-R. The M1 Package has flexible configuration to allow switched, staged PWM or closed loop PWM control of 3 separate fuel pumps. An external driver module such as MoTeC Dual Half Bridge (DHB) may be used for high current PWM control.

Please see the Package help in the following groups:

- **Fuel Pump**
- **Fuel Pressure Control**

## Inlet Manifold and Plenum Chamber

If the OE inlet manifold is changed, this can have a small effect on the Torque Control System. The following settings should be adjusted:

- **Inlet Manifold Volume**, set to the new manifold volume.
- **Inlet Manifold Pumping Gain**, set by testing the response of a changing torque limit.
- A change in the manifold will also likely change the engine's pumping efficiency so re-tuning of fuel and ignition should be carried out.

## Intercooler

Previously, fitting a cross-flow type intercooler meant the boost pressure could become unbalanced from bank to bank as there is only a single boost control valve for both turbos. Now, if a cross-flow intercooler is fitted, it is recommended to also fit a second boost control solenoid so that the ECU has control over both turbos independently. The second boost control is set up in **Boost Control Bank 2**. It is also recommended to fit a second inlet manifold pressure sensor so that each bank is fuelled from its own sensor.

## MAF (Mass Air Flow) Sensor

OE MAF sensors may be removed. While their signal can be used for fuelling, it is not a necessity.

The standard MAF sensor provides an adequate measurement range up to 650HP (480kW). If the standard sensor is placed in a larger diameter housing it is necessary to adjust the sensor calibration. An approximate calibration can be achieved by using the squared ratio of cross-sectional areas of the original housing and the replacement housing.

**For example:**

Standard housing is 64mm, new housing may be 80mm.
Ratio would be (80/64) ^ 2 = 1.5625
Squared Ratio would be 1.5625 (that is, 56% more flow at a given voltage reading).

For best accuracy, the sensor can be physically calibrated against a flow bench or reference sensor.

## Boost and MAP Sensors

The OE boost sensor has a range to 270kPa absolute which equates to 1.7 bar or 25lbs of boost. If higher boost levels are required, the boost sensor must be replaced with another that has a higher range. Boost sensors must be absolute or sealed gauge type sensors. Gauge sensors are not supported, but the sensors do not need to read below ambient pressure (vacuum).

The OE MAP sensor must also be changed to cover the full range of boost down to high vacuum. If a second MAP sensor is fitted to the other bank plenum, the ECU will fuel each bank from its respective sensor. This has the advantage of correctly fuelling both the banks in case of a turbo or boost control issue causing unbalanced boost pressures.

Respective sensor settings must be updated to suit the new sensor.

## AWD control

The **Transfer** of torque to the front wheels is achieved by energising the AWD solenoid inside the transmission. The GT-R has a control module dedicated to this solenoid, solely reading information from the CAN bus to calculate the amount of front wheel torque required at any given time.

The M1 ECU can replace the front wheel torque transfer functionality by removing the AWD control module located beneath the front right hand seat and extending the wiring for the solenoid (two wires) to the GT-R Adaptor Box 'E' Connector, pins 17 and 18.

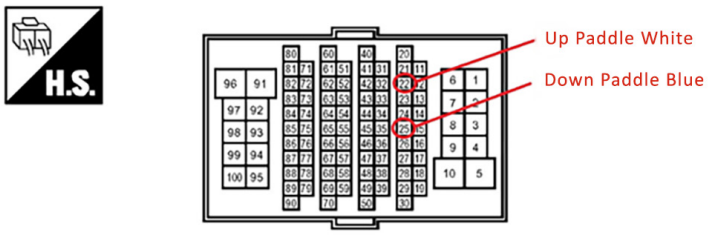
AWD control is then fully tunable from within the ECU and can be switched off for 2WD mode (depending on the AWD clutch assembly). The ECU then also controls the AWD dash warning lamp. See the **Transfer** group in the Package.

## ECU Gear shifting

Gear shifts can be triggered by the ECU based on Engine Speed, Throttle Position and Driver switch setting allowing fully automatic gear shifting (up and down) for circuit or drag racing and street driving.

The ECU is wired to the shift paddles to trigger the gear shifts. Wire from spare low side ECU outputs (recommend Ign LS 11,pin A08 and Ign LS 12, pin A09) to the OE connector located near the ECU as shown below from the Nissan GT-R workshop manual.

| | |
|---|---|
| Connector No. | B1 |
| Connector Name | WIRE TO WIRE |
| Connector Type | TH80FW-CS16-TM4 |




To set up gear shifting, see **Gear Request**, **Gear Automatic** and **Gear Shift** groups in the Package.

## MIGRATION CHECKLIST

The April 2016 (v1.05.0078) Package differs dramatically from the previous release (May 2015 v01.04.0005). It uses the newer M1 system version 1.4, which allows greater flexibility in selecting resources and hiding unused features from the Tune interface.

If upgrading the Package, the tuning values for fuel, ignition, sensor/injector calibrations and the like remain the same so the car should not need to be re-tuned on a dyno. However, the fuel mixture and timing values should be checked after the upgrade process is complete.

⇨ It is MoTeC's strong recommendation that current users of this product download the new Package from MoTeC Online and migrate only those settings from their existing Packages that are unique for their vehicle, such as **Engine Efficiency**, **Ignition Timing** and **Boost Aim**.

Below is a list of the more important objects that should and shouldn't be migrated from an existing tune from a previous version. This is not a comprehensive list; settings or setting groups that are not mentioned specifically should be compared from version to version using the 'Compare Firmware' tool. Read the help detail for both and decide if the tuning for the object should be migrated, re-tuned or the base setting kept.

Many new settings and subsystems have been added that can be explored.

**Settings that may be migrated directly:**

- **Anti Lag** group (except **Anti Lag Ignition Timing** table)
- **Brake Switch** settings
- **Coolant Temperature** tables
- **Cruise** subsystem
- **E8XX** settings
- **Engine Efficiency** table
- **Engine Load Average** group
- **Engine Speed** group
- **Engine Overrun** group
- **Fuel Mixture** group
- **Fuel Film** group
- **Fuel Pressure Control** group (except **Fuel Pressure Control Aim/Pump**)
- **Fuel Injector Primary/Secondary** groups. Note: settings have been added.
- **Fuel Purge** group
- **Fuel Pump** group (except **Fuel Pressure Control Pump**)
- **Fuel Closed Loop** group
- **Gear** group
- **GTR** group (except for items that moved to generic subsystems, **GTR Air Conditioner** and **GTR Coolant Fan**).
- **Idle** group (except **Idle Ignition Timing** group).
- **Ignition** group (except **Ignition Coil** group)
- **Inlet Manifold** group (except **Inlet Manifold Temperature** group).
- **Inlet Camshaft** group. Note: some parameters have changed to tables.
- **Launch** group (except **Launch Ignition Timing**).
- **Throttle** group. Note: there are some differences and settings should be checked after migrating all.
- **Torque** group (except **Torque Ideal Generated** and **Torque Ideal Correction**).
- **Vehicle Speed** group

**Settings that can be migrated but object names have changed:**

- All **Sensor Calibration** tables have changed to **Sensor Translation**. The **Sensor Calibration** name is now used to select specific sensor parts.
- **Anti Lag Ignition Timing Limit Advance** has changed to **Anti Lag Ignition Timing**.
- **Boost Control** group has changed to **Boost Control Bank 1**.
- **Engine Charge Cooling** group, parameters changed to tables.
- **Exhaust Lambda Bank/Cylinder N Mode** has changed to **Exhaust Lambda Bank/Cylinder N CAN Bus**.
- **Fuel Molar Mass/Stoichiometric Ratio/Density** setting has changed to the **Fuel Properties** group.
- **Fuel Volume Cylinder N** groups has been combined with **Fuel Cylinder N** groups.
- **Fuel Timing Primary/Secondary** tables has changed to **Fuel Timing Primary/Secondary Main**.
- **Fuel Pressure Aim** has changed to **Fuel Pressure Control Aim**.
- **Fuel Pressure Pump External** has changed to **Fuel Pressure Control Pump**.
- **Inlet Manifold Temperature** group has changed to **Inlet Air Temperature**. Note: **Inlet Manifold Temperature** now refers to the temperature of the manifold itself.
- **Idle Ignition Timing Limit Advance** group changed to **Idle Ignition Timing**.
- **Ignition Charge** group has changed to **Ignition Coil Charge** group.
- **Torque Ideal Frictional Loss** has changed to **Torque Ideal Correction Internal Loss**.

For subsystems that have changed substantially, the base file settings should be kept, but can be re-tuned for non standard installations.

- **Air Conditioner** subsystem
- All **Sensor CAN** has been changed so the CAN resource is now selected in the **Sensor Resource**.
- **CAN** group settings
- **Clutch Slip** subsystem
- **Coolant Fan 1**, now integrated with **Air Conditioner**.
- For all **Driver** switch settings, the items preset in the base file must be kept. Driver switches from a previous Package can be reassigned to empty positions.
- **ECU** group
- **Engine Run Switch** group
- **Engine Oil** group
- **Knock** group has undergone a major upgrade, so some re-tuning is required. **Frequencies** and **Knock Threshold** table may be carried over.
- **Launch Ignition Timing Limit Advance** has changed to use the **Ignition Timing Control** system, requires some re-tuning.
- **Torque Ideal Generated** table has been replaced with **Torque Ideal Generated Scale** parameter. A scale of 12mg is equal to an Engine load of 4000mg = Torque of 8000Nm.
- **Warning** system, while most objects will migrate, the system has some major improvements which can be reviewed.
- **Wheel Speed** group, retain the base settings unless the OE VDC unit has been removed.

## PINOUT

### M150 Connector A - 34 Way

**Mating Connector**: Tyco Superseal 34 Position Keying 2 (MoTeC #65067)

| Pin Number | Designation | Full Name | OE Pin | Function |
|---|---|---|---|---|
| A01 | AT5 | Analogue Temperature Input 5 | 102 | Steering Wheel Button |
| A02 | AT6 | Analogue Temperature Input 6 | E16 | Inlet Manifold Temperature Bank 2 |
| A03 | AV15 | Analogue Voltage Input 15 | 78 | Ambient Pressure |
| A04 | AV16 | Analogue Voltage Input 16 | E09 | Spare to Breakout Plug |
| A05 | AV17 | Analogue Voltage Input 17 | E15 | Fuel Pressure |
| A06 | IGN_LS9 | Low Side Ignition 9 | TP19 | Not Externally Available |
| A07 | IGN_LS10 | Low Side Ignition 10 | TP20 | Not Externally Available |
| A08 | IGN_LS11 | Low Side Ignition 11 | TP21 | Not Externally Available |
| A09 | IGN_LS12 | Low Side Ignition 12 | Not Used | Not Externally Available |
| A10 | SEN_5V0_C1 | Sensor 5.0V C | | Sensor Supply Analogue |
| A11 | LA_NB1 | Lambda Narrow Input 1 | Internal | Front Drive Clutch current sense |
| A12 | LA_NB2 | Lambda Narrow Input 2 | E10 (Rev all), 35 (Rev E) | Battery Current Sensor (MY12+ models) |
| A13 | KNOCK3 | Knock Input 3 | E21 | Spare to Breakout Plug |
| A14 | KNOCK4 | Knock Input 4 | E13 | Spare to Breakout Plug |
| A15 | DIG2 | Digital Input 2 | E20 | Spare to Breakout Plug |
| A16 | DIG3 | Digital Input 3 | E33 | Spare to Breakout Plug |
| A17 | DIG4 | Digital Input 4 | E34 | Spare to Breakout Plug |
| A18 | SEN_5V0_C2 | Sensor 5.0V C | E29, E30, E31 | Sensor Supply Analogue |
| A19 | SEN_5V0_B2 | Sensor 5.0V B | 87, 88, 91,92, 90 (Rev E) | Sensor Supply Rotation |
| A20 | LIN | LIN Bus | TP23 | Not Externally Available |
| A21 | RS232_RX | RS232 Receive | E22 | GPS Receive |
| A22 | RS232_TX | RS232 Transmit | E23 | Telemetry Transmit |
| A23 | DIG1 | Digital Input 1 | E12 | Spare to Breakout Plug |
| A24 | BAT_NEG3 | Battery Negative | 6,54,124,128,E01,E02,E11 | Power Ground |
| A25 | BAT_NEG4 | Battery Negative | 6,54,124,128,E01,E02,E11 | Power Ground |
| A26 | SEN_0V_C1 | Sensor 0V C | 71 | Sensor Zero Volts Analogue |
| A27 | SEN_0V_C2 | Sensor 0V C | E05, E06, E07, E08 | Sensor Zero Volts Analogue |
| A28 | CAN3_HI | CAN Bus 3 High | Not Used | Not Externally Available |
| A29 | CAN3_LO | CAN Bus 3 Low | Not Used | Not Externally Available |
| A30 | CAN2_HI | CAN Bus 2 High | E04 | 1M CAN to LTC |
| A31 | CAN2_LO | CAN Bus 2 Low | E03 | 1M CAN to LTC |
| A32 | BAT_NEG5 | Battery Negative | 6,54,124,128,E01,E02,E11 | Power Ground |
| A33 | SEN_0V_B1 | Sensor 0V B | 20 | Sensor Zero Volts Analogue |
| A34 | SEN_0V_A1 | Sensor 0V A | 15,19,22,26 | Sensor Zero Volts Analogue |

## M150 Connector B - 26 Way

**Mating Connector**: Tyco Superseal 26 Position Keying 3 (MoTeC #65068)

| Pin Number | Designation | Full Name | OE Pin | Function |
|---|---|---|---|---|
| B01 | OUT_HB9 | Half Bridge Output 9 | Not Used | Not Externally Available |
| B02 | OUT_HB10 | Half Bridge Output 10 | Not Used | Not Externally Available |
| B03 | UDIG8 | Universal Digital Input 8 | 30 | Fuel Pump Control Check |
| B04 | UDIG9 | Universal Digital Input 9 | 93 | Sub Fuel Pump + |
| B05 | UDIG10 | Universal Digital Input 10 | 94 | Sub Fuel Pump - |
| B06 | UDIG11 | Universal Digital Input 11 | E24 | Spare to Breakout Plug |
| B07 | UDIG12 | Universal Digital Input 12 | E14 | Pit switch |
| B08 | INJ_LS5 | Low Side Injector 5 | 8 | Evaporative Canister Volume Control Valve |
| B09 | INJ_LS3 | Low Side Injector 3 | 61 | Boost Actuator |
| B10 | AV9 | Analogue Voltage Input 9 | 48 | Inlet Manifold Pressure Bank 2 |
| B11 | AV10 | Analogue Voltage Input 10 | 80 | Boost Pressure Bank 2 |
| B12 | AV11 | Analogue Voltage Input 11 | 79 | Boost Pressure Bank 1 |
| B13 | BAT_POS | Battery Positive | 1,49 | Switched Supply |
| B14 | INJ_LS6 | Low Side Injector 6 | E25 | Fuel Pump External |
| B15 | INJ_LS4 | Low Side Injector 4 | 126 | Sub Fuel Pump Relay |
| B16 | AV12 | Analogue Voltage Input 12 | 83 | Power Steering Pressure |
| B17 | AV13 | Analogue Voltage Input 13 | 89 | Air Conditioner Refrigerant Pressure |
| B18 | AV14 | Analogue Voltage Input 14 | E28 | Spare to Breakout Plug |
| B19 | BAT_POS | Battery Positive | 1,49 | Switched Supply |
| B20 | OUT_HB7 | Half Bridge Output 7 | 29 via 5K6 | Fuel Pump Main |
| B21 | OUT_HB8 | Half Bridge Output 8 | Internal | Front Drive Clutch control |
| B22 | INJ_PH9 | Peak Hold Injector 9 | Not Used | Not Externally Available |
| B23 | INJ_PH10 | Peak Hold Injector 10 | Not Used | Not Externally Available |
| B24 | INJ_PH11 | Peak Hold Injector 11 | Not Used | Not Externally Available |
| B25 | INJ_PH12 | Peak Hold Injector 12 | Not Used | Not Externally Available |
| B26 | SEN_5V0_A | Sensor 5.0V A | 95 | Sensor Supply Analogue |

## M150 Connector C - 34 Way

**Mating Connector**: Tyco Superseal 34 Position Keying 1 (MoTeC #65044)

| Pin Number | Designation | Full Name | OE Pin | Function |
|---|---|---|---|---|
| C01 | OUT_HB2 | Half Bridge Output 2 | 50 | Throttle Servo Bank 2 Motor + |
| C02 | SEN_5V0_A | Sensor 5.0V A | 84,100 | Sensor Supply Analogue |
| C03 | IGN_LS1 | Low Side Ignition 1 | 10 | Ignition Cylinder 1 Output |
| C04 | IGN_LS2 | Low Side Ignition 2 | 9 | Ignition Cylinder 2 Output |
| C05 | IGN_LS3 | Low Side Ignition 3 | 13 | Ignition Cylinder 3 Output |
| C06 | IGN_LS4 | Low Side Ignition 4 | 33 | Ignition Cylinder 4 Output |
| C07 | IGN_LS5 | Low Side Ignition 5 | 34 | Ignition Cylinder 5 Output |
| C08 | IGN_LS6 | Low Side Ignition 6 | 38 | Ignition Cylinder 6 Output |
| C09 | SEN_5V0_B | Sensor 5.0V B | 96,99 | Sensor Supply Analogue |
| C10 | BAT_NEG1 | Battery Negative | 6,54,124,128 | Power Ground |
| C11 | BAT_NEG2 | Battery Negative | 6,54,124,128 | Power Ground |
| C12 | IGN_LS7 | Low Side Ignition 7 | 57 (Rev E) | Exhaust Sound Output (Muffler Valve, MY17+) |
| C13 | IGN_LS8 | Low Side Ignition 8 | 113 | Tacho out |
| C14 | AV1 | Analogue Voltage Input 1 | 40 | Throttle Servo Bank 2 Position Main |
| C15 | AV2 | Analogue Voltage Input 2 | 36 | Throttle Servo Bank 2 Position Tracking |
| C16 | AV3 | Analogue Voltage Input 3 | 28 | Throttle Servo Bank 1 Position Main |
| C17 | AV4 | Analogue Voltage Input 4 | 32 | Throttle Servo Bank 1 Position Tracking |
| C18 | OUT_HB1 | Half Bridge Output 1 | 53 | Throttle Servo Bank 2 Motor - |
| C19 | INJ_PH1 | Peak Hold Injector 1 | 25 | Fuel Cylinder 1 Output |
| C20 | INJ_PH2 | Peak Hold Injector 2 | 21 | Fuel.Cylinder 2.Output |
| C21 | INJ_PH3 | Peak Hold Injector 3 | 17 | Fuel Cylinder 3 Output |
| C22 | INJ_PH4 | Peak Hold Injector 4 | 37 | Fuel Cylinder 4 Output |
| C23 | INJ_LS1 | Low Side Injector 1 | 116 (Rev E only) | Driver Exhaust Sound Switch (input signal, MY17+) |
| C24 | INJ_LS2 | Low Side Injector 2 | 105,127 | ECM relay, DBW on/off relay |
| C25 | AV5 | Analogue Voltage Input 5 | 104 | Throttle Pedal Main |
| C26 | BAT_POS | Battery Positive | 1,49 | Switched Supply |
| 27 | INJ_PH5 | Peak Hold Injector 5 | 41 | Fuel Cylinder 5 Output |
| C28 | INJ_PH6 | Peak Hold Injector 6 | 45 | Fuel Cylinder 6 Output |
| C29 | INJ_PH7 | Peak Hold Injector 7 | Not Used | Not Externally Available |
| C30 | INJ_PH8 | Peak Hold Injector 8 | Not Used | Not Externally Available |
| C31 | OUT_HB3 | Half Bridge Output 3 | 5 | Throttle Servo Bank 1 Motor - |
| C32 | OUT_HB4 | Half Bridge Output 4 | 2 | Throttle Servo Bank 1 Motor + |
| C33 | OUT_HB5 | Half Bridge Output 5 | 51 | Inlet Camshaft Bank 2 Actuator |
| C34 | OUT_HB6 | Half Bridge Output 6 | 52 | Inlet Camshaft Bank 1 Actuator |

## M150 Connector D - 26 Way

**Mating Connector**: Tyco Superseal 26 Position Keying 1 (MoTeC #65045)

| Pin Number | Designation | Full Name | OE Pin | Function |
|---|---|---|---|---|
| D01 | UDIG1 | Universal Digital Input 1 | 64 | Engine Speed |
| D02 | UDIG2 | Universal Digital Input 2 | 63 | Inlet Camshaft Bank 1 Position |
| D03 | AT1 | Analogue Temperature Input 1 | E32 | Spare to Breakout Plug |
| D04 | AT2 | Analogue Temperature Input 2 | 44 | Airbox Temperature |
| D05 | AT3 | Analogue Temperature Input 3 | 27 | Engine Oil Temperature |
| D06 | AT4 | Analogue Temperature Input 4 | 46 | Coolant Temperature |
| D07 | KNOCK1 | Knock Input 1 | 72 | Knock Sensor Bank 1 |
| D08 | UDIG3 | Universal Digital Input 3 | 67 | Inlet Camshaft Bank 2 Position |
| D09 | UDIG4 | Universal Digital Input 4 | 106 | Ignition Switch |
| D10 | UDIG5 | Universal Digital Input 5 | 110 | Brake Switch |
| D11 | UDIG6 | Universal Digital Input 6 | 111 | Neutral Switch |
| D12 | BAT_BAK | Battery Backup | 118 | Keep Alive Memory power |
| D13 | KNOCK2 | Knock Input 2 | 76 | Knock Sensor Bank 2 |
| D14 | UDIG7 | Universal Digital Input 7 | 117 | Cruise Control Brake Switch |
| D15 | SEN_0V_A | Sensor 0V A | 74,103 | Sensor Zero Volts Analogue |
| D16 | SEN_0V_B | Sensor 0V B | 62,66,68,75,107,58(Rev E) | Sensor Zero Volts Analogue |
| D17 | CAN1_HI | CAN Bus 1 High | 101 | 500k vehicle CAN bus to ABS,Dash |
| D18 | CAN1_LO | CAN Bus 1 Low | 97 | 500k vehicle CAN bus to ABS,Dash |
| D19 | SEN_6V3 | Sensor 6.3V | | Internal Use |
| D20 | AV6 | Analogue Voltage Input 6 | 108 | Throttle Pedal Tracking |
| D21 | AV7 | Analogue Voltage Input 7 | 47 | Inlet Mass Flow Bank 2 |
| D22 | AV8 | Analogue Voltage Input 8 | 31 | Inlet Mass Flow Bank 1 |
| D23 | ETH_TX+ | Ethernet Transmit+ | Ethernet Green/White | |
| D24 | ETH_TX- | Ethernet Transmit- | Ethernet Green | |
| D25 | ETH_RX+ | Ethernet Receive+ | Ethernet Orange/White | |
| D26 | ETH_RX- | Ethernet Receive- | Ethernet | |

## Breakout Connector E - 34 Way

| Pin Number | Designation | Full Name | OE Pin | Function |
|---|---|---|---|---|
| E01 | BAT_NEG | Battery Negative | S01 | PWR/CAN Ground |
| E02 | BAT_NEG | Battery Negative | L01 | LTC Ground |
| E03 | CAN2_LO | | S02,L02 | LTC CAN Lo |
| E04 | CAN2_HI | | S03,L03 | LTC CAN Hi |
| E05 | SEN_0V_C | Sensor 0V C | T01, F01 | Sensor Ground Air Temp, Fuel Pressure |
| E06 | SEN_0V_C | Sensor 0V C | G01 | Sensor Ground GPS |
| E07 | SEN_0V_C | Sensor 0V C | | |
| E08 | SEN_0V_C | Sensor 0V C | | |
| E09 | AV16 | Spare | | |
| E10 | LA_NB2 | Spare | | |
| E11 | BAT_NEG | WiFi Power Negative | | |
| E12 | DIG1 | Spare | | |
| E13 | KNOCK4 | Engine Mode Switch | | |
| E14 | UDIG12 | Pit Switch | | |
| E15 | AV17 | Fuel Pressure | F02 | Fuel Pressure Signal |
| E16 | AT6 | Air Temp | T02 | Air Temp Signal |
| E17 | Clutch Lo | | | |
| E18 | Clutch Hi | | | |
| E19 | BAT_BAK | WiFi Power Positive | | |
| E20 | DIG2 | Spare | | |
| E21 | KNOCK3 | Traction Control Trim Switch | | |
| E22 | RS232_RX | GPS Receive | G02 | GPS Receive |
| E23 | RS232_TX | Telemetry Transmit | | |
| E24 | UDIG11 | Spare | | |
| E25 | INJ_LS6 | Fuel Pump Relay | | |
| E26 | ECUPWR | | S04 | Switched Power to PWR/CAN plug |
| E27 | ECUPWR | | L04 | Switched Power to LTC plug |
| E28 | AV14 | Spare | | |
| E29 | SEN_5V0_C | Sensor 5V C | | |
| E30 | SEN_5V0_C | Sensor 5V C | F03 | Fuel Pressure 5V Supply |
| E31 | SEN_5V0_C | Sensor 5V C | G04 | GPS 5V Supply |
| E32 | AT1 | Spare | | |
| E33 | DIG3 | Spare | | |
| E34 | DIG4 | Spare | | |