NISSAN R35 GT-R ENGINE PLUG-IN ECU KIT

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 sensors and fuel system.

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

FEATURES

- Compatible with all known variants of R35 in all geographic regions 2007 – 2012.

  Note: Each variant may have a unique Start File.
- Fully integrates with stock systems including VDC traction control and transmission, and complies with OE system requests.
- Torque limiting delivered via throttle and ignition control.
- Engine load calculation based on MAF, MAP, throttle position and boost pressure, or a combination of these, to provide optimum results in all situations.
- Full Cruise Control capability.
- Integrated fully tuneable DSP knock control on individual cylinders.
- Tuneable individual bank closed loop Lambda control.
- Boost control integrated with torque control system.
- Launch control integrated with torque control system – torque and engine speed limits can be defined for launch.
- Launch sequence builds boost prior to launch – critical with large turbochargers.
- Additional 10 position switch for VDC gain – adjusts severity of VDC events.
- Additional 2 position switch for switching maps: Boost Aim, Engine Speed Limit, Fuel Mixture Aim, Ignition Timing, Throttle Pedal Translation.
- 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 i2 software.
- External fuel pump output for closed loop fuel pressure control.
- Sensor fallback – if a sensor fails (e.g. MAP) alternate load sensors are used.
- Additional sensors may be added via the breakout connector: multiple EGTs (via TCA Thermocouple Amplifier or up to 8 via E888), GPS.

KIT CONTENTS (11501) RHD

- **13150** – M150 ECU
- **61245** – NISSAN R35 GT-R RHD ADAPTOR KIT – containing:
  - 61248 – NISSAN R35 GT-R ADAPTOR BOX
  - 61247 – NISSAN R35 GT-R 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 – LTCD NTK - LAMBDA TO CAN DUAL - NTK VERSION
  - 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

KIT CONTENTS (11502) LHD

- **13150** – M150 ECU
- **61249** – NISSAN R35 GT-R LHD ADAPTOR KIT – containing:
  - 61248 – NISSAN R35 GT-R ADAPTOR BOX
  - 61247 – NISSAN R35 GT-R 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
  - 61257 – M1 ADAPTOR 250MM 26W KEY 1 STUB LOOM
  - 61225 – NETWORK CABLE RJ45 1.5 METRE
  - 61305 – LTCD NTK - LAMBDA TO CAN DUAL - NTK VERSION
  - 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

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 Figure 1.

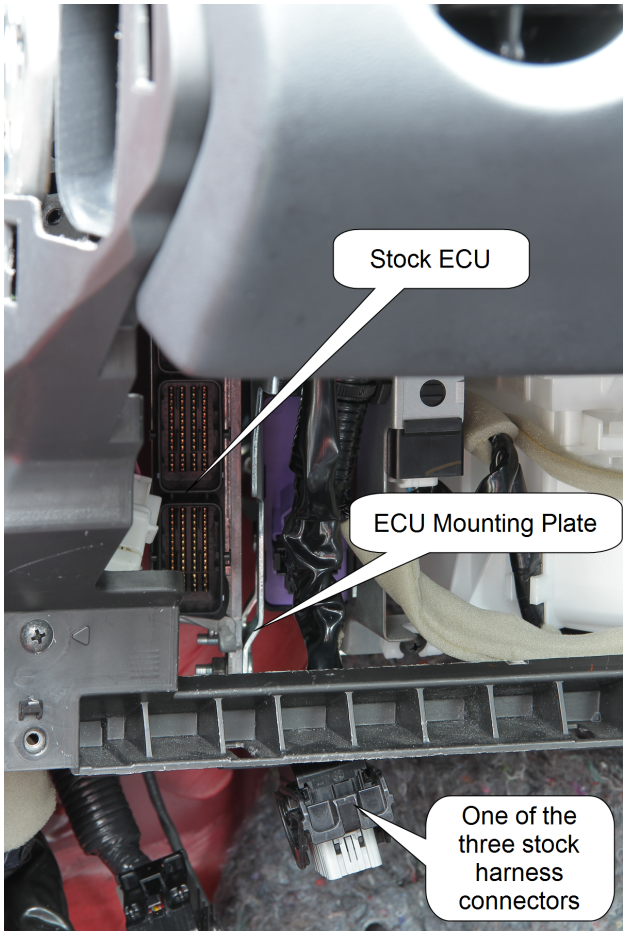

Figure 1.

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

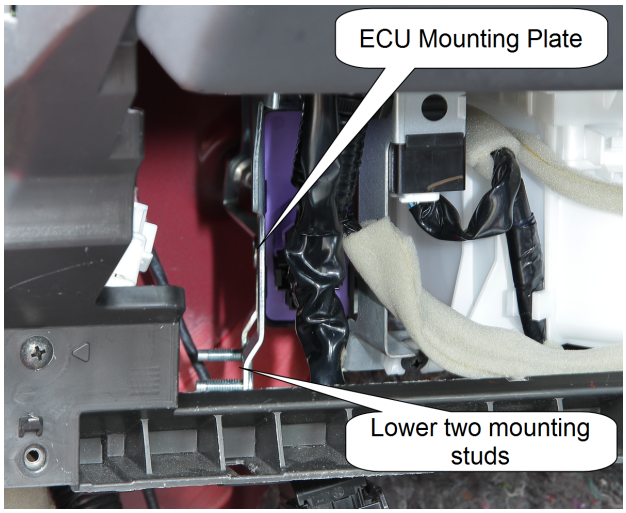

Figure 2.

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

   Also, see Figure 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 Temp 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 Temp connectors and the LTCD female pins from the LTCD socket, then passing the loom wires through the 16mm hole and seal with a suitable grommet. Re-terminate the Air Temp 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 Figure 4.

Figure 4.

4. Replace stock Lambda sensors with 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 Figure 5.

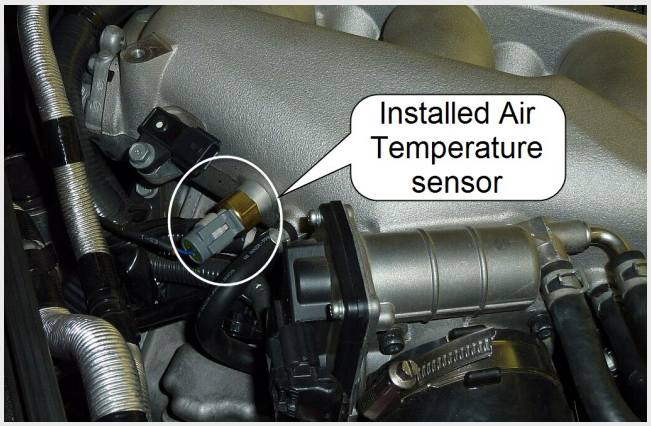

Figure 5.

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 Loom 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:
   - 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 Figure 6 for a representation of the assembly.

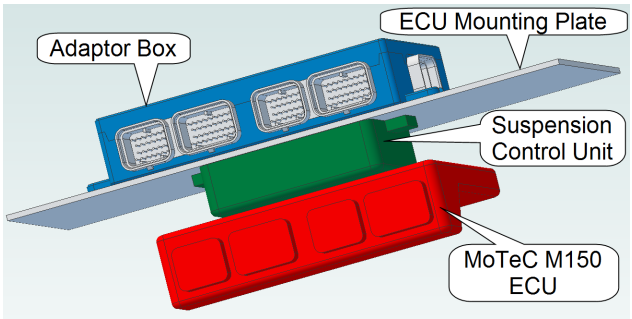

Figure 6.

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.

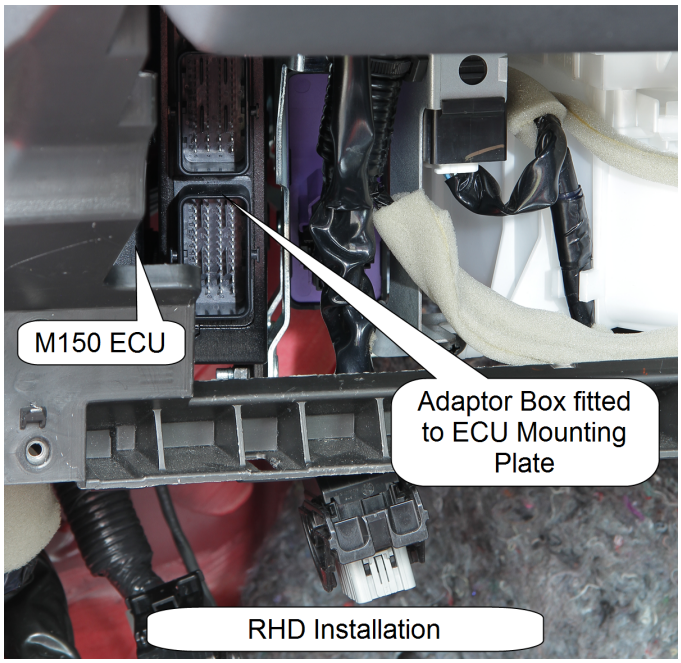

Figure 7.

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. As there are several engine and sensor combinations on this vehicle, confirm which package file should be loaded into the M150 ECU:
    - 2007 - 2011 models use identical injectors
    - 2012 models use alternate injectors
    - 2013 models use alternate injectors
    - 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 Figure 8.

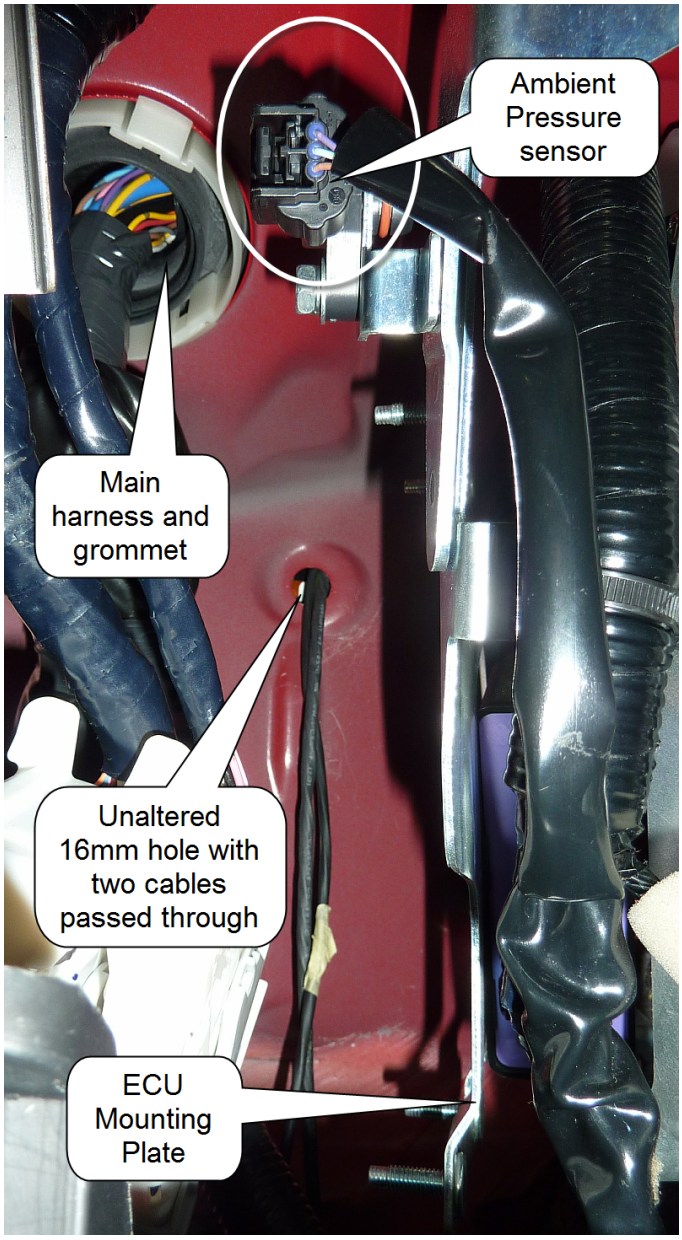

Figure 8.

PIN-OUT

M150 Connector A - 34 Way

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 Analog
A11	LA_NB1	Lambda Narrow Input 1	Internal	Front Drive Clutch current sense
A12	LA_NB2	Lambda Narrow Input 2	E10	Spare to Breakout Plug
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 Analog
A19	SEN_5V0_B2	Sensor 5.0V B	87, 88, 91,92	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 Analog
A27	SEN_0V_C2	Sensor 0V C	E05, E06, E07, E08	Sensor Zero Volts Analog
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	20,62,66,68,75,107	Sensor Zero Volts Analog
A34	SEN_0V_A1	Sensor 0V A	15,19,22,26	Sensor Zero Volts Analog

M150 Connector B - 26 Way

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 Analog

M150 Connector C - 34 Way

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 Analog
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 Analog
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	Not Used	#N/A
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	Not Used	#N/A
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	#N/A
C30	INJ_PH8	Peak Hold Injector 8	Not Used	#N/A
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

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	Ignition Knock Sensor 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	Ignition Knock Sensor 1
D14	UDIG7	Universal Digital Input 7	117	Cruise Control Brake Switch
D15	SEN_0V_A	Sensor 0V A	74,103	Sensor Zero Volts Analog
D16	SEN_0V_B	Sensor 0V B	20,62,66,68,75,107	Sensor Zero Volts Analog
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		

FREQUENTLY ASKED QUESTIONS

Can I change turbos?

Yes, alternate turbos can be characterised via the Boost Aim table and PID boost control settings.

Can I use external waste gates?

Yes, however, they must be characterised via PID boost control parameters.

Can I change throttle bodies?

Yes, however, we recommend using the stock throttle bodies as these are sufficient even for high powered drag applications. Alternate throttle bodies must be fully characterised.

Can I change injectors?

Yes, as long as the injector calibrations are changed to suit. MoTeC provides standard calibrations, a limited range of injectors is recommended.

Do I need to re-tune the engine after an injector change?

As long as the injector calibrations are correct, the system will recalculate fuel delivery and only fine tuning may be required.

Can I change fuel pumps?

Yes, switch points can be adjusted to suit. In addition, an external PID controlled pump can be used, which requires a MoTeC DHB (Dual Half Bridge) to drive the pump.

Can I change plenum chambers?

Yes, a single control parameter must be changed and the efficiency may need retuning.

Can I change intercoolers?

Yes, crossover type intercoolers are compatible but not recommended.

Can I change intercooler piping?

Yes, changing ECU settings should be unnecessary.

Can I change the MAF sensor or sensor housing?

Yes, the calibration must accurately reflect the sensor behaviour.

Can the MAF sensors be removed?

Yes, the software can use another combination of load sensors to run the engine.

Can I change boost and MAP sensors?

Yes, as long as the calibration reflects the altered sensors.

Can I run high/low injectors?

The kit hardware has the capability, however, the feature is not available in the initial release.

Can I use stock Lambda sensors?

No, the kit includes 2 NTK wideband sensors and an LTCD-NTK controller for accurate and repeatable measurements.

Can I change fuel formulations?

Yes, as long as the Fuel Density and Fuel Stoichiometric Ratio calibrations are changed to suit. Flex fuel sensors are not supported in the initial product release, but maybe supported in the future.

Will my stock odometer and tripmeter work?

Yes.

Does cruise control work?

Yes, full Cruise Control is included.

Can I use this system with a standalone VR38DETT engine in another vehicle?

This firmware is designed for full vehicle integration with the Nissan R35 GT-R and errors will result if the associated vehicle systems are not detected. The engine may be used standalone, however, some sub systems may not function correctly.

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 will be 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

High / Low Injectors

The initial release of the M1 Adaptor Kit does not accommodate high/low injection. Future releases will have this feature and settings will be detailed at the time of release.

Fuel Formulation

Current MoTeC injector calibrations are performed with a reference fluid which closely models unleaded gasoline. If fuel formulations such as E85 are used where the density is dramatically different to conventional gasoline, it may be necessary to recalibrate injectors to suit such fuel. In most cases, however, it is sufficient to make the following setting adjustments:

- Fuel Density Reference
- Fuel Density Temperature Coefficient
- Fuel Stoichiometric Ratio

Fuel Injectors

Standard injector flow is 580cc/min or 620cc/min at 3 bar fuel pressure. Suitable replacements are:

- ID1000 injectors – 1000cc/min at 3 bar. Fully calibrated for M1.
- Siemens Deka 110333 – 2315cc/min at 3 bar.

  The Siemens Deka 110333 requires extra spacing for the fuel rail, but otherwise fits under the OE manifold.

The following M1 ECU settings **must** be adjusted to reflect such a change:

- Fuel Cylinder 1 Injector Linearisation
- Fuel Cylinder 1 Injector Minimum Volume
- Fuel Cylinder 1 Injector Reference Flow
- Fuel Cylinder 1 Injector Reference Pressure

The above four settings for cylinder 1 must also be adjusted for cylinders 2 to 6.

- Fuel Injector Peak Current
- Fuel Injector Hold Current
- Fuel Injector Peak Time
- Fuel Injector Off Time
- Fuel Injector Pin Drive

Turbo and Wastegate

Any suitable turbo and wastegate combination may be used, however, the following M1 ECU settings **must** be adjusted to optimise performance:

- Boost Filter
- Boost Activate
- Boost Margin
- Boost Maximum
- Boost Hysteresis
- Boost Aim Main
- Boost Control Feed Forward
- Boost Control Proportional Gain
- Boost Control Integral Gain
- Boost Control Derivative Gain
- Boost Actuator Polarity
- Boost Actuator Minimum
- Boost Actuator Maximum
- Boost Actuator Output Frequency

Throttle Bodies

Standard throttle bodies have been used in engines delivering up to 1500HP. We suggest retention of standard throttle bodies. The M1 throttle model is a characterisation of the flow characteristics of the throttle body and recalibration is not easily performed by the installer, dealer or tuner.

Fuel Pump

A replacement fuel pump is recommended as the standard pump may be inadequate. The M1 package allows for PWM control of an external fuel pump (via a suitable driver device such as MoTeC Dual Half Bridge - DHB). The following M1 ECU settings **must** be adjusted to reflect such a change:

- Fuel Pump External Output Frequency
- Fuel Pump External Polarity
- Fuel Pressure Control Default
- Fuel Pressure Control Over Pressure Margin
- Fuel Pressure Control Feed Forward
- Fuel Pressure Control Proportional Gain
- Fuel Pressure Control Integral Gain
- Fuel Pressure Control Integral Minimum
- Fuel Pressure Control Integral Maximum
- Fuel Pressure Control Derivative Gain

Inlet Manifold or Plenum Chamber

The stock manifold may have horsepower limits, and numerous aftermarket devices are available. The following M1 ECU settings **must** be adjusted to optimise performance:

- Inlet Manifold Volume
- Inlet Manifold Time Constant

Intercooler

Alternate intercoolers may be used, cross-flow types are not recommended. Tuning adjustments may only be required if airflow changes significantly.

MAF (Mass Air Flow) Sensor

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 = 1.25

Squared Ratio would be 1.5625 (that is, 56% more flow at a given voltage reading).

For best accuracy the sensor should be physically calibrated.

The following M1 ECU settings **must** be adjusted to reflect such a change:

- Airbox Mass Flow Bank 1 Sensor Calibration
- Airbox Mass Flow Bank 2 Sensor Calibration

Boost and MAP sensors

The stock boost sensor has a range to 270kPa absolute, that is, 1.7 bar or 25lbs of boost. If higher boost levels are achieved the boost sensor can be replaced with another which has a higher range. Boost sensors may only need to read down to 100kPa absolute. The following M1 ECU settings **must** be adjusted to reflect such a change:

- Boost Pressure Bank 1 Sensor Calibration
- Boost Pressure Bank 2 Sensor Calibration
- Boost Pressure Bank 1 Sensor Voltage Filter
- Boost Pressure Bank 2 Sensor Voltage Filter

The stock MAP sensor may also be changed, however replacement MAP sensors should be capable of reading down to 20kPa. M1 ECU settings **must** be adjusted to reflect such a change:

- Inlet Manifold Pressure Bank 1 Sensor Calibration
- Inlet Manifold Pressure Bank 2 Sensor Calibration
- Inlet Manifold Pressure Bank 1 Sensor Voltage Filter
- Inlet Manifold Pressure Bank 2 Sensor Voltage Filter