

MoTeC

M150 MERCURY RACING QC4V KIT



This Plug-In Kit is designed as a complete replacement for the factory OE (original equipment) ECU, using existing wiring, sensors and mounting hardware to deliver plug-in convenience with fully programmable control. The ruggedised M150 ECU is supplied with the Package preloaded, providing complete functionality for the Mercury Racing QC4V engine. The Package is based on MoTeC's GPR Package with additional features unique to this engine.

Along with dual drive-by-wire, fuel, ignition and dual turbocharger control, this Package adds knock control to the QC4V and also supports OE ECU features, including:

- **Key start**
- **OE dash or MoTeC dash operation via OE CAN busses**
- **Trim up and trim down control**
- **Gear forward and reverse operation**
- **Trim tab position port and trim tab position starboard monitoring**
- **Stern leg position monitoring**

The start file supplied in the Package contains all the calibrations and settings for the sensors, fuel injectors, ignition coils, knock control, throttle servo and turbocharger wastegates. Users can begin tuning to their desired power level right away with the assurance of a safe base tune that is equivalent to the original ECU.

In addition, as the OE CAN bus systems operate at 250 kbit/second, a restricted version of MoTeC's pre-defined CAN messaging is used to allow the addition of E888, LTC, and Display Loggers without overloading CAN communications.

In particular, an E888 I/O Expander with 250 kbit/second CAN messaging is available for use with this Plug-In Kit.

► KIT CONTENTS

Hardware

- **13150M** - M150 ECU MARINE pre-loaded with MERCURY RACING QC4V Kit.
- **61438** - M150 MERCURY RACING QC4V ADAPTOR KIT
 - **61442** - MERCURY RACING M1 CONNECTOR A STUB LOOM
 - **61443** - MERCURY RACING M1 CONNECTOR B STUB LOOM
 - **61444** - MERCURY RACING M1 CONNECTOR C STUB LOOM
 - **61445** - MERCURY RACING M1 CONNECTOR D STUB LOOM
 - **61305L** - LTC-D - DUAL NTK LAMBDA TO CAN LONG LOOM
 - **57007** x 2 - NTK UEGO WIDEBAND LAMBDA SENSOR
 - **53120** x 2 - KNOCK SENSOR (045)
 - **61441** - M150 MERCURY RACING QC4V MOUNTING KIT
 - **61440** - MERCURY RACING QC4V BREAKOUT LOOM
 - **61439** - M150 MERCURY RACING QC4V ADAPTOR BOX

Licence

23418 – M1 LICENCE - MERCURY RACING QC4V

This Licence is required to run the Mercury Racing QC4V Package in the M150 ECU.

▶ FEATURES

- Fully integrates with these OE systems: key start, trim up/down, gear forward/reverse, servo wastegates, dash.
- Lambda control is supported with included LTCD NTK and NTK sensors, requiring additional installation.
- Pre-configured sensor calibrations for OE sensors and engine triggers including:
 - Exhaust EGT port and starboard
 - Fuel tank level
 - Trim tab position port and starboard
 - Stern leg position
 - Shift pressure B
 - Steering angle
 - Steering pressure
 - Engine oil temperature
 - Engine oil pressure
 - Fuel pressure
 - Coolant pressure
- Pre-configured control of primary fuel system.
- Pre-configured reference mode for engine synchronisation.
- Pre-configured physical settings for engine displacement, fuel density, stoichiometric ratio, fuel pressure, and primary injector linearisation, which allow for simplified engine start-up prior to tuning.
- Pre-configured CAN messaging for OE systems including key start, throttle pedal and dashboard.
- Pre-configured transient fuelling compensation using physical modelling of fuel film.
- Pre-configured on-board knock control for each cylinder using two included knock sensors (optionally can be configured to use up to 4 sensors) and selectable centre frequency.
- Configurable boost control with dual OE wastegate actuators.
- Configurable anti-lag with ignition timing limit, fuel volume trim, ignition cut, fuel cut, engine speed limit, boost aim and throttle aim tables.
- GPS acquisition and logging via CAN or RS232.
- Intercooler temperature and spray control.
- Lap distance, time and number with split and sector options via MoTeC's BR2 (Beacon Receiver) or switched input.
- Configurable launch control with tables.
- Race time system with tables for ignition timing trim, fuel mixture aim, boost limit, and throttle limit.
- Engine load average channel with tables for engine speed limit, ignition timing trim, fuel mixture aim, boost limit, and throttle limit.
- Engine run time total for engine hour logging.
- Configurable security for multiple users with differing access options.
- ECU CAN receive from a defined ID base address for data reception from MoTeC devices.
- 6 configurable driver switches, 4 rotary switches and 6 CAN switches each with 9 positions that can be simultaneously mapped to launch control, pit switch, anti-lag, traction, race time reset, engine speed limit maximum, throttle pedal translation, fuel volume trim, ignition timing, fuel mixture aim, boost limit, traction aim, and traction control range.
- Pulsed tachometer output with configurable output pin and scaling.
- Optional channels for additional sensors via input pin and/or CAN message, including:
 - Airbox Mass Flow, Temperature and Pressure
 - Ambient 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 Collector, Bank 1 and 2 Collector, and Cylinders 1 to 8
 - Exhaust Lambda via LTC, LTCN or PLM for Collector, Bank 1 and 2 Collector, and Cylinders 1 to 8
 - Fuel Temperature
 - Intercooler Temperature
 - Transmission Temperature
 - Turbocharger Speed
 - G-Force (acceleration) - Longitudinal, Lateral, Vertical.

▶ INSTALLATION

The following procedure details installation of this kit into a Mercury Racing QC4V.

Step 1:

Remove the engine cowl. Disconnect the 3 engine harness connectors from the OE ECU.

Step 2:

Using a ratchet, extension and 10 mm socket, remove the 3 flange bolts that secure the OE ECU to the OE mounting plate, and the 2 flange bolts that secure the rear of the mounting plate to the manifold.

Step 3:

1. Remove the OE ECU and detach the 3 rubber grommets and spacers from the ECU.
2. Fit the grommets and spacers to the MoTeC mounting plate in matching positions.

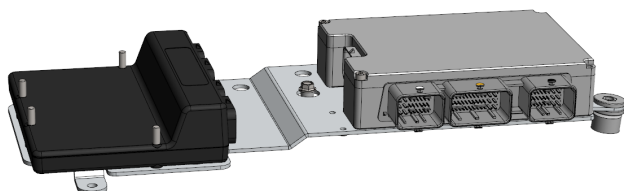
Step 4:

Assemble the MoTeC kit components onto the mounting plate:

1. Connect the Adaptor Stub Looms to the M150. When connecting Adaptor Stub Loom D, the Ethernet comms cable end **must** be connected to the M150 (Pin D23 to D26).
2. Attach the M150 ECU to the Mounting Plate by sliding carefully on to the 4 captive studs on the plate. Secure the M150 by means of 4 x M5 Nylock nuts and 4 x M5 washers.
3. Connect the Breakout Loom plug to the Adaptor Box, ensuring that the cable assembly exits towards the port side of the mounting plate when installed on the engine.
4. Slide the Adaptor Box into position towards the M150, ensuring that the Breakout Loom cable is positioned under the Stub Looms.
5. Connect the Adaptor Stub Looms to the Adaptor Box.
6. Attach the Adaptor Box to the mounting plate by fitting supplied M4 x 10 screws and M4 flat washers to the underside of the plate and screwing into the adaptor box.

Step 5:

Install the assembled adaptor kit onto the Mercury Racing QC4V engine. Do not fit the centre flange bolt (now masked by looms). Re-fit the 2 end flange bolts through rubber grommets (now located around the Adaptor Box) and fit 2 flange bolts to the folded plate bracket below the M150 ECU.

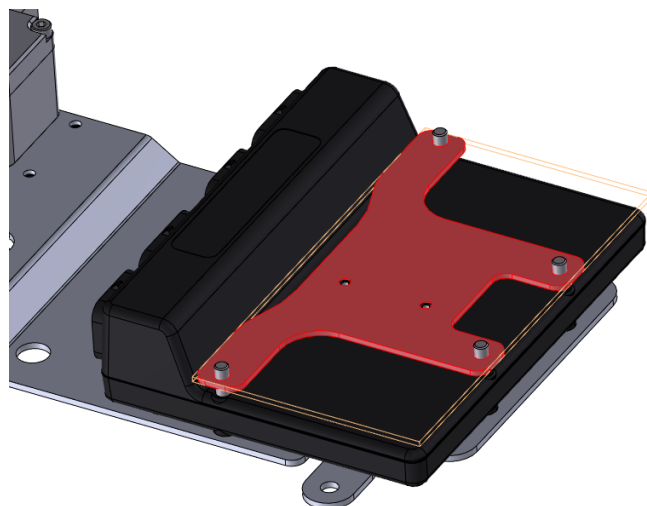


Step 6 (optional):

Complete this step if dual lambda measurement (using supplied LTCD and NTK sensors) is required.

! *Mercury Racing QC4V engines have water cooled exhaust manifolds which do not have OE exhaust Lambda probes. Comprehensive engine tuning requires Lambda measurement and this Plug-In Kit is supplied with two NTK probes and a MoTeC LTCD device.*

1. Attach the LTCD to the LTCD Mounting Plate by fitting supplied M3 x 30 screws through the top of the LTCD and screwing into captive threads in plate.
2. Attach the LTCD Mounting Plate on top of the M150 ECU by sliding carefully onto the 4 captive studs. Secure the LTCD Mounting Plate by means of 4 x M5 Nylock nuts and 4 x M5 washers.



3. Drill and tap Lambda sensor threads (M18 x 1.5 mm) into the exhaust manifolds in the outlets of the turbocharger exhaust housings.
4. Install supplied NTK Lambda sensors into exhaust manifold fittings.
5. Route the DTM4 plug in the Breakout Loom to the installed LTCD Device.
6. Route the long Lambda sensor plugs from the LTCD to both banks and connect to installed NTK Lambda Sensors.

Step 7:

1. Route the knock sensor cables from the Breakout Loom to both banks of the engine block and fit the supplied Knock Sensors. Each front engine mount has 4 bolts. Sensor mounting position is on the upper rear bolt, which should be replaced with a stepped bolt onto which the Knock Sensor is mounted.
2. Connect the 3 Mercury Racing OE harness connectors to the Adaptor Box headers.

▶ **M150 ECU PINOUT****M150 Connector A - 34 Way**

Mating Connector: Tyco Superseal 34 Position Keying 2 – MoTeC #65067

Pin	Designation	Full Name	OE Pin	Description
A01	AT5	Analogue Temperature Input 5	CB2	Exhaust Temperature Bank 1 Collector Sensor 1k Pull up to SEN_5V_C
A02	AT6	Analogue Temperature Input 6		1k Pull up to SEN_5V_C
A03	AV15	Analogue Voltage Input 15	BC4	Fuel Tank Level 1 Sensor
A04	AV16	Analogue Voltage Input 16	CE2	Trim Tab Position Port Sensor
A05	AV17	Analogue Voltage Input 17	BG3	Shift Pressure B Sensor
A06	IGN_LS9	Low Side Ignition 9	AE2	Cranking Output
A07	IGN_LS10	Low Side Ignition 10		
A08	IGN_LS11	Low Side Ignition 11		
A09	IGN_LS12	Low Side Ignition 12		
A10	SEN_5V0_C1	Sensor 5.0V C		
A11	LA_NB1	Lambda Narrow Input 1	Breakout 15	
A12	LA_NB2	Lambda Narrow Input 2		
A13	KNOCK3	Knock Input 3	Breakout 13	Knock Bank 2
A14	KNOCK4	Knock Input 4	Breakout 14	Knock Bank 2
A15	DIG2	Digital Input 2		
A16	DIG3	Digital Input 3		
A17	DIG4	Digital Input 4		
A18	SEN_5V0_C2	Sensor 5.0V C		
A19	SEN_5V0_B2	Sensor 5.0V B	Breakout 4,5,6,7	
A20	LIN	LIN Bus		
A21	RS232_RX	RS232 Receive	Breakout 16	Optional GPS Receive
A22	RS232_TX	RS232 Transmit		
A23	DIG1	Digital Input 1		
A24	BAT_NEG3	Battery Negative		
A25	BAT_NEG4	Battery Negative		
A26	SEN_0V_C1	Sensor 0V C	BJ2	0V Crank Sensor
A27	SEN_0V_C2	Sensor 0V C		
A28	CAN3_HI	CAN Bus 3 High	BB2	OE Boost Control CAN Bus
A29	CAN3_LO	CAN Bus 3 Low	BB1	OE Boost Control CAN Bus
A30	CAN2_HI	CAN Bus 2 High	BC1, Breakout 28	OE Body CAN Bus
A31	CAN2_LO	CAN Bus 2 Low	BC2, Breakout 27	OE Body CAN Bus
A32	BAT_NEG5	Battery Negative		
A33	SEN_0V_B2	Sensor 0V B	BL4, Breakout 20, 21, 22, 29, 30, 31	
A34	SEN_0V_A2	Sensor 0V A	AD4	

M150 Connector B - 26 Way

Mating Connector: Tyco Superseal 26 Position Keying 3 – MoTeC #65068

Pin	Designation	Full Name	OE Pin	Description
B01	OUT_HB9	Half Bridge Output 9	Breakout 18	
B02	OUT_HB10	Half Bridge Output 10	AD3 via Power transistor	ECU Power Relay Output
B03	UDIG8	Universal Digital Input 8	Breakout 19	
B04	UDIG9	Universal Digital Input 9	BH3	Driver Switch 1 - Engine Run Switch
B05	UDIG10	Universal Digital Input 10	BG4	Driver Switch 2 - Engine Power Sense
B06	UDIG11	Universal Digital Input 11		
B07	UDIG12	Universal Digital Input 12		
B08	INJ_LS5	Low Side Injector 5		
B09	INJ_LS3	Low Side Injector 3		
B10	AV9	Analogue Voltage Input 9	CF1	Steering Angle Sensor
B11	AV10	Analogue Voltage Input 10	CE3	Trim Tab Position Starboard Sensor
B12	AV11	Analogue Voltage Input 11	CA3	Stern Leg Position Sensor
B13	BAT_POS	Battery Positive		
B14	INJ_LS6	Low Side Injector 6	AE3	Trim Up Output
B15	INJ_LS4	Low Side Injector 4	AE4	Trim Down Output
B16	AV12	Analogue Voltage Input 12	Breakout 23	
B17	AV13	Analogue Voltage Input 13	BD4, Breakout 24	Fuel Tank Level 2 Sensor
B18	AV14	Analogue Voltage Input 14	BF4	Steering Pressure Sensor
B19	BAT_POS	Battery Positive		
B20	OUT_HB7	Half Bridge Output 7	AH3	Gear Reverse Output
B21	OUT_HB8	Half Bridge Output 8	AH4	Gear Forward Output
B22	INJ_PH9	Peak Hold Injector 9		
B23	INJ_PH10	Peak Hold Injector 10		
B24	INJ_PH11	Peak Hold Injector 11		
B25	INJ_PH12	Peak Hold Injector 12		
B26	SEN_5V0_A2	Sensor 5.0V A		

M150 Connector C - 34 Way

Mating Connector: Tyco Superseal 34 Position Keying 1 – MoTeC #65044

Pin	Designation	Full Name	OE Pin	Description
C01	OUT_HB2	Half Bridge Output 2	CG4	Throttle Servo Bank 2 Motor Output
C02	SEN_5V0_A1	Sensor 5.0V A	CD4	
C03	IGN_LS1	Low Side Ignition 1	AA4	Ignition Cylinder 1 Output
C04	IGN_LS2	Low Side Ignition 2	AA3	Ignition Cylinder 2 Output
C05	IGN_LS3	Low Side Ignition 3	AA2	Ignition Cylinder 3 Output
C06	IGN_LS4	Low Side Ignition 4	AA1	Ignition Cylinder 4 Output
C07	IGN_LS5	Low Side Ignition 5	AB4	Ignition Cylinder 5 Output
C08	IGN_LS6	Low Side Ignition 6	AB3	Ignition Cylinder 6 Output
C09	SEN_5V0_B1	Sensor 5.0V B	CE4	
C10	BAT_NEG1	Battery Negative	Breakout 8,9,17	
C11	BAT_NEG2	Battery Negative	CG1,CG2	
C12	IGN_LS7	Low Side Ignition 7	AB2	Ignition Cylinder 7 Output
C13	IGN_LS8	Low Side Ignition 8	AB1	Ignition Cylinder 8 Output
C14	AV1	Analogue Voltage Input 1	CF3	Throttle Servo Bank 1 Position Sensor Main
C15	AV2	Analogue Voltage Input 2	CC4	Throttle Servo Bank 1 Position Sensor Tracking
C16	AV3	Analogue Voltage Input 3	CD1	Throttle Servo Bank 2 Position Sensor Main
C17	AV4	Analogue Voltage Input 4	CC3	Throttle Servo Bank 2 Position Sensor Tracking
C18	OUT_HB1	Half Bridge Output 1	CH4	Throttle Servo Bank 2 Motor Output
C19	INJ_PH1	Peak Hold Injector 1	AH1	Fuel Cylinder 1 Output
C20	INJ_PH2	Peak Hold Injector 2	AH2	Fuel Cylinder 2 Output
C21	INJ_PH3	Peak Hold Injector 3	AG3	Fuel Cylinder 3 Output
C22	INJ_PH4	Peak Hold Injector 4	AG4	Fuel Cylinder 4 Output
C23	INJ_LS1	Low Side Injector 1	AC1	Tachometer output
C24	INJ_LS2	Low Side Injector 2	AD2	Fuel Pump Output
C25	AV5	Analogue Voltage Input 5	BE3	Inlet Manifold Pressure Sensor
C26	BAT_POS	Battery Positive	CG3,CH3, Breakout 1,2,10	
C27	INJ_PH5	Peak Hold Injector 5	AG1	Fuel Cylinder 5 Output
C28	INJ_PH6	Peak Hold Injector 6	AG2	Fuel Cylinder 6 Output
C29	INJ_PH7	Peak Hold Injector 7	AF3	Fuel Cylinder 7 Output
C30	INJ_PH8	Peak Hold Injector 8	AF4	Fuel Cylinder 8 Output
C31	OUT_HB3	Half Bridge Output 3	CH1	Throttle Servo Bank 1 Motor Output
C32	OUT_HB4	Half Bridge Output 4	CH2	Throttle Servo Bank 1 Motor Output
C33	OUT_HB5	Half Bridge Output 5	Breakout 26	
C34	OUT_HB6	Half Bridge Output 6	Breakout 34	

M150 Connector D — 26 way

Mating Connector: Tyco Superseal 26 Position Keying 1 – MoTeC #65045

Pin	Designation	Full Name	OE Pin	Description
D01	UDIG1	Universal Digital Input 1	BJ1	Engine Speed Reference (Crankshaft) Sensor
D02	UDIG2	Universal Digital Input 2	BG1	Engine Synchronisation (Camshaft) Sensor
D03	AT1	Analogue Temperature Input 1	CF2	Coolant Temperature Sensor 1k Pull up to SEN_5V_A
D04	AT2	Analogue Temperature Input 2	CA2	Inlet Air Temperature Sensor 1k Pull up to SEN_5V_A
D05	AT3	Analogue Temperature Input 3	CB1	Exhaust Temperature Bank 2 Collector Sensor 1k Pull up to SEN_5V_B
D06	AT4	Analogue Temperature Input 4	CA1	Engine Oil Temperature Sensor 1k Pull up to SEN_5V_B
D07	KNOCK1	Knock Input 1	Breakout 11	Knock Bank 1
D08	UDIG3	Universal Digital Input 3	Breakout 25	
D09	UDIG4	Universal Digital Input 4		
D10	UDIG5	Universal Digital Input 5		
D11	UDIG6	Universal Digital Input 6		
D12	BAT_BAK	Battery Backup		
D13	KNOCK2	Knock Input 2	Breakout 12	Knock Bank 1
D14	UDIG7	Universal Digital Input 7		
D15	SEN_0V_A1	Sensor 0V A	BD3	
D16	SEN_0V_B1	Sensor 0V B		
D17	CAN1_HI	CAN Bus 1 High	BA1, Breakout 33	OE CAN Bus
D18	CAN1_LO	CAN Bus 1 Low	BA2, Breakout 32	OE CAN Bus
D19	SEN_6V3	Sensor 6.3V	Breakout 3	
D20	AV6	Analogue Voltage Input 6	BF3	Fuel Pressure Sensor
D21	AV7	Analogue Voltage Input 7	BF1	Engine Oil Pressure Sensor
D22	AV8	Analogue Voltage Input 8	BF2	Coolant Pressure Sensor
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	