



# M1 GPA-DI PACKAGE



**The GPA-DI Package is a versatile and adaptable platform for the operation of direct injected engines up to twelve cylinders (hardware dependent) that use inductive direct injectors and synchronous direct injection fuel pumps, such as Bosch HDP5 or Hitachi HFS034.**

**This Package is designed for automotive aftermarket applications.**

! For race applications, refer to the GPR-DI Package (part number 23008).

Included are numerous ancillary features, such as driver switches, knock control, intercooler sprays and gearbox coolant pumps. It also caters for many systems found on road vehicles, such as air conditioning control.

The product provides pre-defined CAN messaging for full integration with other MoTeC products like Display Loggers, Video, Power Distribution Modules, Expanders, Shift Lights and more.

## ► ECU VARIANTS

The Package is available across MoTeC's M1 direct injection ECU range:

- M182 up to 12 cylinders
- M142 up to 8 cylinders
- M122 up to 4 cylinders

A pinout example for each ECU variant is provided.

## ► LICENCING

To load the Package onto the ECU, the **M1 LICENCE - GPA-DI** (part number 23453) is required.

## ► VEHICLE COMPATIBILITY

This product is a general purpose Package for engine control and does not include CAN messaging for OE vehicle systems such as power steering, ABS, starting systems and dashboards.

## ► FEATURES

- Operates gasoline direct injected engines from 1 to 12 cylinders with inductive injectors and synchronous direct injection fuel pumps (M142 suits up to 8 cylinders, M122 up to 4 cylinders). Refer to the Engine Compatibility section for known applicable engines.
- Optionally configurable secondary (port injector) fuel control with a tuneable balance table.

! Only saturated (high-ohm) secondary injectors are supported in this hardware. Peak-hold (low-ohm) secondary injectors are not supported.

- Optional alternative fuel operation for Flex Fuel using ethanol composition sensor, or Secondary Fuel operation on secondary injectors.
- Configurable engine synchronisation mode for many common engine types. Refer to the Engine Synchronisation Modes section for current details.
- Configurable top dead centre for each cylinder allows for odd-fire engines.

- Configurable ignition output pin for each cylinder allows for coil-on-plug or wasted spark and distributor ignition systems.
- Configurable on-board knock for each cylinder with up to 4 assignable knock sensors (hardware dependent) and 4 selectable centre frequencies.
- Configurable camshaft control from 1 to 4 cams, plus 1 switched camshaft.
- Configurable control of 1 or 2 synchronous direct injection fuel pumps, such as Bosch HDP5 or Hitachi HFS034.
- 5 auxiliary outputs for PWM control of added actuators:
  - Duty cycle tables using Engine Speed and Throttle or Manifold Pressure Axes
  - Activation based on inlet manifold pressure or throttle position
  - Auxiliary Output 1 includes tables for Ignition Timing Compensation, Fuel Volume Trim and Mixture Aim
- Dual bank lambda control supported; requires optional LTC with Bosch LSU4.9 sensor or LTCN with NTK sensor.
- Physical settings for engine displacement, fuel density + molar mass, stoichiometric ratio and injector characteristics allow for simplified engine start-up prior to tuning.
- Easy and fast engine tuning using engine efficiency map.
- Engine load modelling based on inlet manifold pressure and inlet manifold temperature. Alternatively, for example, when using individual throttle bodies, throttle position can be used.
- Sensor calibrations available for many common automotive sensors.
- Support for analogue and digital (frequency or duty cycle) sensors.
- Transient fuelling compensation using physical modelling of fuel film.
- Nitrous system with two activation stages and additional fuel pumps, bottle heater control and pressure sensor.
- Transmission brake control ('bump') functionality for perfect positioning of cars.
- Support of MoTeC devices: ADR, E8XX, PDM, SLM, VCS, V2, Keypad, Rotary Controller
- Test settings for most outputs, including injection and ignition outputs, for easier setup.
- Turbocharger wastegate pressure control with pressure sensor and two PWM outputs.
- Configurable boost control with single wastegate actuator. Single and dual solenoids supported.
- Configurable turbocharger bypass control.
- Supports 2 coolant fan outputs (PWM controlled).
- Configurable closed loop alternator system for PWM field winding control.
- Supports 2 switchable inlet manifold flaps with position feedback, and 1 switchable inlet manifold runner with position feedback, for variable inlet systems.
- Air conditioner support with switched output control.
- Coolant temperature compensations for engine speed limit, ignition timing, fuel volume, fuel mixture, 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 pump switched output.
- Fuel Flow Supply Sensor and Fuel Flow Return Sensor.
- Gearbox position detection via optional dual sensor or engine speed/wheel speed estimate.
- GPS acquisition and logging via CAN or RS232.
- Intercooler temperature and spray control.
- Closed loop alternator control.
- Lap distance, time and number via BR2, GPS or switched input, with split and sector options.
- Race time system with tables for ignition timing trim, fuel mixture aim, boost limit and throttle limit.
- Idle closed loop control system using ignition, drive by wire actuation or idle solenoid.
- Idle bypass control with stepper motor supported.
- Engine Load Average channel with tables for engine speed limit, ignition timing trim, fuel mixture aim, boost limit and throttle limit.
- Ease of engine start with dedicated fuel volume and idle compensations during crank and post start.
- Engine run time total for engine hour logging.
- Configurable security for multiple users with differing access options.
- Configuration of brake state using a switch or a pressure sensor.
- Configuration of clutch state using a switch, a position sensor or a pressure sensor.
- Calculation of clutch slip.
- ECU-internal G-force (acceleration) – longitudinal, lateral, 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.
- 8 configurable switches and 8 rotary switches (wired or CAN input) with each of 10 positions simultaneously mappable to Launch Control, Pit Switch, Race Time Reset, Engine Speed Limit Maximum, Throttle Pedal Translation, Ignition Timing, Fuel Mixture Aim and Boost Limit.

- Pulsed tachometer output with configurable output pin and scaling.
- Dual bank drive by wire throttle servo control.
- Configurable throttle sensor input, with 2 channel analogue or single wire digital (SENT) protocol.
- Throttle Pedal sensor with translation table. Hybrid OE pedals (for example Ford) are supported - one analogue and one digital channel.
- Use of a Throttle Pedal sensor or a Throttle Position sensor in case of a cable throttle.
- Differential pump output with differential temperature threshold and hysteresis control.
- 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), which can also be used for pit speed limiting.
- Configurable warning system with light and CAN output.
- Auxiliary time system with tables for ignition timing compensation, fuel volume trim and fuel mixture aim.
- Optional channels for additional sensors via input pin and/or CAN message, including:
  - Airbox Mass Flow, Pressure and Temperature
  - Ambient Pressure and Temperature
  - Boost Pressure
  - Brake Pressure Front and Rear
  - Brake Switch
  - Clutch Pressure and Position
  - Clutch Switch
  - Coolant Pressure and Temperature
  - Differential 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 Collector, Bank 1 and 2 Collector, and Cylinders 1 to 8 (M142) or 1 to 12 (M182)
  - Exhaust Lambda via LTC, LTCN, or PLM for Collector, Bank 1 and 2 Collector, and Cylinders 1 to 8 (M142) or 1 to 12 (M182)
  - Fuel Pressure and Temperature
  - Fuel Tank Level
  - Gear Position
  - Gear Lever Force
  - Gear Neutral Switch
  - Inlet Manifold Flap Position x 2, Inlet Manifold Runner Position
  - 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.

## ► ENGINE COMPATIBILITY

This product is suitable for 4, 5, 6, 8, 10 or 12 cylinder engines with inductive direct injectors and synchronous direct injection fuel pumps.

 *Engines of more than 8 cylinders should have injector and wiring loadings calculated prior to commencement of project. Contact MoTeC for details.*

### Engines that are suitable:

Engine Family - Four Cylinder	Engine Designation	Year	Vehicle Platform	DI Fuel Pump	Comment
Ford 1.6 Ecoboost	1.6Ti-VCT Sigma, 1.6 GTDI	2013+	Ford Fiesta ST	Bosch HDP5	
Ford 2.0 Ecoboost	2.0 GTDI	2013+	Ford Focus	Bosch HDP5	
Hyundai 1.6 Gamma	T-GDi Gamma (G4FJ)	2012+	Hyundai Veloster FS-t, Kia Pro-Ceed GT	Bosch HDP5	
Nissan 1.6 DIG-T	MR16DDT	2013+	Juke ST-S, Tiida ST-S, RenaultSport Clio		
Subaru	FA20DIT	2014+	Forester, WRX	Hitachi	This is the Direct Injected only variant of the engine.
Subaru	FA20D	2012+	Toyota 86, Subaru BRZ, Scion FR-S	Hitachi	This is the Direct Injected + Port variant of the engine. OE drive box not required.
Mazda	L3-VDT	2007+	Mazda 3 MPS	Hitachi	
GM 2.0 Ecotec Gen II	LDK, A20NFT	2014+	Opel Astra J OPC	Bosch HDP5	Variants with GM single wire digital throttle (SENT protocol) are supported.
Audi / VW TFSI / TSI	EA113	2005+	Platforms may include Audi S3, Audi TT, Golf Mk5 GTI	Hitachi	2.0 litre capacity
Audi / VW TFSI / TSI	EA111	2008+	Platforms may include Golf Mk6		Variants with 1.2, 1.4 litre capacity
Audi / VW TFSI / TSI	EA888 Gen I, Gen II	2007+	Platforms may include Audi A4, Audi TT Mk2, VW Golf Mk5 GTI, Mk6 GTI	Hitachi	Variants with 1.8, 2.0 litre capacity. Gen III with electrical wastegate is not supported.
Mini	N18		Mini R56N Cooper S		
BMW	N13B16	2011+	F20 116i, 118i, F30 316i, 320i		Same as Mini N18
BMW	N20B20	2011+	F30 320i, 328i, E89 Z4 sDrive28i,		
Mini	N20				

Engine Family - Five Cylinder	Engine Designation	Year	Vehicle Platform	DI Fuel Pump	Comment
Audi 2.5 R5 20v TFSI	CEPA, CEPB	2009+	Audi TT RS, Audi RS3	Hitachi	

<b>Engine Family - Six Cylinder</b>	<b>Engine Designation</b>	<b>Year</b>	<b>Vehicle Platform</b>	<b>DI Fuel Pump</b>	<b>Comment</b>
GM SIDI 3.0, 3.6L Alloytec V6	LLT, LFX	2008+	Holden Commodore, Chevrolet Camaro, Impala, Caprice, Traverse	Bosch HDP5	
BMW 335	N55B30 (late)	2011+	BMW 335i (F30)	Bosch HDP5	
Audi 3.2 V6 24v TFSI	06E, CAKA, CCBA	2009+	Audi S4 (B8), A8, A6, A4	Hitachi	

<b>Engine Family - Eight Cylinder</b>	<b>Engine Designation</b>	<b>Year</b>	<b>Vehicle Platform</b>	<b>DI Fuel Pump</b>	<b>Comment</b>
GM 6.2L	LT1, LT4	2014+	Chevrolet Corvette C7, Chevrolet Silverado	Stanadyne	GM single wire digital throttle (SENT protocol) is supported.
Audi 4.2 V8 32v FSI	079D, BAR, CAU, BVJ	2006+	Audi A6 Quattro, R8, S5	2 x Hitachi	

<b>Engine Family - Ten Cylinder</b>	<b>Engine Designation</b>	<b>Year</b>	<b>Vehicle Platform</b>	<b>DI Fuel Pump</b>	<b>Comment</b>
Audi / Lamborghini 5.2 V10 FSI	07L.Y / BUJ / LP560	2009+	Audi R8, Lamborghini Gallardo, Lamborghini Huracan	2 x Hitachi	Injector and wiring loadings must be calculated prior to commencement of project.

### Engines that are not suitable:

<b>Engine Family</b>	<b>Engine Designation</b>	<b>Year</b>	<b>Vehicle Platform</b>	<b>DI Fuel Pump</b>	<b>Not applicable because:</b>
Audi / VW TFSI / TSI	EA211	2012+	Platforms may include Golf Mk7		Electrical wastegate
Audi / VW TFSI / TSI	EA888	2012+	Platforms may include Golf Mk7		Electrical wastegate
Mini	N14		Mini R56	Siemens	PWM controlled continuous pump
BMW	B48	2014+			These engines use piezo injectors
BMW	N55B30 (early)	2008-2010	BMW 335i (E90)	Siemens	PWM controlled continuous pump
Subaru	FA20D	2012+	Toyota 86, Subaru BRZ, Scion FR-S	Hitachi	This is the Direct Injected + Port variant of the engine.

## ► ENGINE SPEED MODES

### As of M1 System 1.4.00.0058

- Aston Martin AJ37
- BMW M54
- BMW N55 - BMW N55 and N52 engines
- BMW S1000RR MY2015
- BMW S50 - BMW S50B32 (E36M3)
- BMW S62 - BMW E36 M3 S52B32, BMW E46 M3 S64B32, BMW E39 M5 S62B50 NOTE: not tested - please contact MoTeC before running this engine
- BMW S85 - BMW E60 M3 S85B50, BMW E90 M3 S65B40
- Bosch 140 40 - General Motors LLT, Audi BXA / Lamborghini LP560, Mazda L3-VDT
- Bosch 140 40 36M1
- Bosch 140 40 Alternate
- Bosch 60 120 180
- Camshaft One Missing Four Stroke
- Camshaft Two Missing Four Stroke
- Chrysler Pentastar
- Chrysler SRT8 2005 - Chrysler 6.1 Hemi 2005-2010 (eg Chrysler 300C SRT-8, Dodge Challenger SRT-8)
- Chrysler SRT8 2011 - Chrysler "Apache" 6.4I Hemi with variable camshaft timing 2011- (eg Chrysler 300C SRT-8, Dodge Challenger SRT-8)
- Corvette C4 ZR1 - GM LT5 (1990 - 1995)
- Crankshaft 12P15 Two Stroke
- Crankshaft One Missing Four Stroke
- Crankshaft One Missing Two Stroke
- Crankshaft Two Missing Four Stroke
- Crankshaft Two Missing Two Stroke
- Custom EJ20G - Subaru GC8 WRX and STi (EJ20G, EJ20K, EJ207 etc.) from MY95 - MY00 with the MY01 crankshaft sprocket (part number 13021AA141)
- Denso 270 90
- Denso 270 90 Magnetic
- Dodge Viper
- Dodge Viper MY2008
- Fiat TwinAir
- Ford Cosworth YB
- Ford Coyote
- Ford Duratec Synchronisation - Duratec, EcoBoost, BA cams
- Ford Sigma TiVCT
- Ford Windsor - with 'PIP' sensor in the distributor
- Gastech TX1

- Gastech TX2
- General Motors DMAX LMM - General Motors 6.6L Duramax LMM diesel engines (late 2007 - early 2011) when the eighth digit of the VIN number is 6.
- General Motors LS1 - (Gen 3 V8)
- General Motors LS7
- Gibson ZA348
- Honda Bike Synchronisation
- Honda CBR250RR
- Honda F20C (Honda S2000)
- Honda J35A
- Honda K20
- Honda K20C1 - Civic Type R 2015+
- Honda K24Z7
- Honda L15B7
- Hyundai Gamma T GDI
- Hyundai Lambda II RS GDi Engine (Hyundai Genesis V6)
- Isuzu 4JK1
- Kia G4TH
- Lamborghini V10 - Experimental mode for 5.0L port injected Gallardo 2003 - 2007
- Lamborghini LP520
- Mazda L3 - Mazda L3 VVTi (example Mazda 3 SPorts SP23, Mazda 6), Ford Duratec 23EW iVCT (e.g. Ford Fusion CD338)
- Mazda MX5 2006: Mazda LF (MZR family) in MX5 NC (2006-), Suzuki M16A VVT in Swift Sport (2012-)
- Mazda RX8 - Mazda Renesis 13B-MSP
- Mazda SkyActiv G - Mazda6 GJ 2012+, MX5 ND 2015+, Mazda3 BM 2014+, Mazda2 DJ 2014+
- Mercedes M120 - 6.0I V12 (S600 1992 - 2001)
- Mercruiser 1075
- Mitsubishi 4B11 - Lancer Evolution X
- Mitsubishi 4G63T
- Mitsubishi 6A12 - 6A12, 6A13, 6G74, 6G75
- Mitsubishi Fuso 4P10 (also Agco Sisu Power 49G)
- Mitsubishi Fuso 6M60 - 2015 Fuso TKG-FK61F
- Multi Tooth Four Stroke
- Multi Tooth Two Stroke
- Nissan MR16DDT
- Nissan RB26 - Nissan RB26 and other six cylinder engines with 360 degree optical trigger on camshaft
- Nissan SR20 - Nissan SR20, CA18DET and other four cylinder engines with 360 degree optical trigger on camshaft
- Nissan One wide slot - Nissan RB30 and other engines with 360 degree optical trigger on camshaft

- Nissan VK50VE
- Nissan VK56DE - Nissan VK56DE engine and others
- Nissan VQ35 - Nissan VQ35HR engine, Nissan VR38DETT engine as used in the R35 GTR 2007
- Nissan YS23DDT
- Porsche 997: Porsche Direct Injected engine, 2009 Porsche GT2 with 3.6 Lt engine (Variocam PLUS)
- Private 1 - Private 6
- PSA EP6DTS - Mini Cooper S Turbo (2007-2010) and Peugeot 207 RC/GTI (2006-2010)
- Rover K Series
- Scania DC16
- Scania SGL12A
- Subaru EJ207AVCS - Subaru EJ205, EJ207, EJ255, EJ257 from MY01 to MY05
- Subaru EJ20G - Subaru GC8 WRX and STi (EJ20G, EJ20K, EJ207 etc.) from MY95 - MY00
- Subaru EZ30 - EZ30D with Dual AVCS
- Subaru FA20D - Subaru EJ205, EJ207 etc. with dual AVCS (MY06-), Subaru FA20D for BRZ and FT86 (2012-)
- Subaru FA20DIT - Subaru Forester 2014, WRX 2015
- Suzuki K6A
- Toyota 1FZ FE - Toyota Landcruiser
- Toyota 1GD FTV
- Toyota 1KD FTV
- Toyota 1UZ-FE
- Toyota 2GR-FE - Lotus Evora, 3GR-FE etc, V6 with dual VVT-i.
- Toyota 2JZ GE - Toyota 6 cylinder 2JZ-GE with VVT (example Lexus IS300)
- Toyota 2UR-GSE in Lexus RC-F 2015 MY (2014/09 -)
- Toyota 2ZZ - Toyota 2ZZ, 3GS and others with VVT.
- Volkswagen EA189
- Volvo B4204T9
- Volvo B5244S
- Volvo D11C - D11C truck engine (FM450 Platform)
- Yamaha FX SHO

## ► EXAMPLE M182 PINOUT - GM LLT 3.6 V6

### M182 Connector A - 55 Way

Mating Connector: Autosport 55 Way Green - (Deutsch) AS6-16-35SD – MoTeC #65032

Pin	Designation	Full Name	OE Pin	Description
A01	INJ_D1A_POS	Direct Injector 1A +	X1-75	Fuel Cylinder 1 Primary Output +
A02	INJ_D2A_POS	Direct Injector 2A +	X1-53	Fuel Cylinder 2 Primary Output +
A03	INJ_D2B_POS	Direct Injector 2B +		
A04	INJ_D4A_POS	Direct Injector 4A +	X1-74	Fuel Cylinder 4 Primary Output +
A05	INJ_D1B_POS	Direct Injector 1B +		
A06	LA_NB2	Lambda Narrow Input 2		
A07	LA_NB1	Lambda Narrow Input 1		
A08	SEN_5V0_C1	Sensor 5.0V C		
A09	SEN_5V0_C2	Sensor 5.0V C		
A10	INJ_D4B_POS	Direct Injector 4B +		
A11	INJ_D1A_NEG	Direct Injector 1A -	X1-51	Fuel Cylinder 1 Primary Output -
A12	INJ_D1B_NEG	Direct Injector 1B -		
A13	AV11	Analogue Voltage Input 11		
A14	DIG2	Digital Input 2		
A15	RS232_RX	RS232 Receive		
A16	SEN_5V0_C3	Sensor 5.0V C		
A17	INJ_D6A_POS	Direct Injector 6A +	X1-03	Fuel Cylinder 6 Primary Output +
A18	SEN_OV_C1	Sensor OV C		
A19	SEN_OV_C2	Sensor OV C		
A20	SEN_OV_C3	Sensor OV C		
A21	DIG1	Digital Input 1		
A22	LIN	LIN Bus		
A23	RS232_TX	RS232 Transmit		
A24	CAN2_HI	CAN Bus 2 High		
A25	INJ_D6B_POS	Direct Injector 6B +		
A26	INJ_D2A_NEG	Direct Injector 2A -	X1-52	Fuel Cylinder 2 Primary Output -
A27	AV15	Analogue Voltage Input 15		
A28	AV16	Analogue Voltage Input 16		
A29	AV17	Analogue Voltage Input 17		
A30	DIG3	Digital Input 3		
A31	CAN2_LO	CAN Bus 2 Low		
A32	INJ_D3A_POS	Direct Injector 3A +	X1-27	Fuel Cylinder 3 Primary Output +
A33	INJ_D2B_NEG	Direct Injector 2B -		
A34	AV13	Analogue Voltage Input 13		

Pin	Designation	Full Name	OE Pin	Description
A35	AV12	Analogue Voltage Input 12		
A36	INJ_D6A_NEG	Direct Injector 6A -	X1-04	Fuel Cylinder 6 Primary Output -
A37	DIG4	Digital Input 4		
A38	BAT_BAK	Battery Backup		
A39	CAN3_HI	CAN Bus 3 High		
A40	INJ_D3B_POS	Direct Injector 3B +		
A41	AV14	Analogue Voltage Input 14		
A42	INJ_D3A_NEG	Direct Injector 3A -	X1-26	Fuel Cylinder 3 Primary Output -
A43	INJ_D4A_NEG	Direct Injector 4A -	X1-50	Fuel Cylinder 4 Primary Output -
A44	INJ_D5B_NEG	Direct Injector 5B -		
A45	INJ_D6B_NEG	Direct Injector 6B -		
A46	CAN3_LO	CAN Bus 3 Low		
A47	INJ_D5A_POS	Direct Injector 5A +	X1-29	Fuel Cylinder 5 Primary Output +
A48	INJ_D5B_POS	Direct Injector 5B +		
A49	INJ_D3B_NEG	Direct Injector 3B -		
A50	INJ_D4B_NEG	Direct Injector 4B -		
A51	INJ_D5A_NEG	Direct Injector 5A -	X1-28	Fuel Cylinder 5 Primary Output -
A52	IGN_LS12	Low Side Ignition 12		
A53	IGN_LS9	Low Side Ignition 9		
A54	IGN_LS10	Low Side Ignition 10		
A55	IGN_LS11	Low Side Ignition 11		

**M182 Connector B - 26 Way**

Mating Connector: Autosport 26 Way Red - (Deutsch) AS6-16-26SN – MoTeC #65034

Pin	Designation	Full Name	OE Pin	Description
B_A	OUT_HB1	Half Bridge Output 1		
B_B	OUT_HB2	Half Bridge Output 2	X2-10	Fuel Pump Output
B_C	OUT_HB3	Half Bridge Output 3	X1-73	Fuel Pressure Direct Bank 2 Pump Output
B_D	OUT_HB4	Half Bridge Output 4	X1-05	Fuel Pressure Direct Bank 2 Pump Output
B_E	OUT_HB5	Half Bridge Output 5	X1-24	Throttle Servo Bank 1 Motor Output
B_F	OUT_HB6	Half Bridge Output 6	X1-48	Throttle Servo Bank 1 Motor Output
B_G	BAT_NEG1	Battery Negative	X2-01	Power ground
B_H	BAT_POS1	Battery Positive	X2-03	ECU Battery Voltage
B_J	BAT_POS2	Battery Positive	X2-05	ECU Battery Voltage
B_K	BAT_POS3	Battery Positive	X2-06	ECU Battery Voltage
B_L	BAT_POS4	Battery Positive	X2-06	ECU Battery Voltage
B_M	OUT_HB10	Half Bridge Output 10	X1-01	Exhaust Camshaft Bank 1 Actuator Output
B_N	OUT_HB9	Half Bridge Output 9	X1-25	Exhaust Camshaft Bank 2 Actuator Output
B_P	OUT_HB8	Half Bridge Output 8	X1-02	Inlet Camshaft Bank 1 Actuator Output
B_R	OUT_HB7	Half Bridge Output 7	X1-49	Inlet Camshaft Bank 2 Actuator Output
B_S	INJ_LS4	Low Side Injector 4	X2-46	Coolant Fan 1 Output, Low speed fan
B_T	INJ_LS6	Low Side Injector 6		
B_U	INJ_LS1	Low Side Injector 1		
B_V	INJ_LS2	Low Side Injector 2		
B_W	BAT_NEG2	Battery Negative	X2-02	Power ground
B_X	BAT_NEG3	Battery Negative	X2-02	Power ground
B_Y	BAT_NEG4	Battery Negative	X2-04	Power ground
B_Z	BAT_NEG5	Battery Negative	X2-04	Power ground
B_a	INJ_LS5	Low Side Injector 5	X2-45	Coolant Fan 2 Output, High speed fan
B_b	INJ_LS3	Low Side Injector 3		
B_c	BAT_NEG6	Battery Negative	X2-01	Power ground

**M182 Connector C - 55 Way**

Mating Connector: Autosport 55 Way Red - (Deutsch) AS6-16-35SN – MoTeC #68090

Pin	Designation	Full Name	OE Pin	Description
C01	IGN_LS4	Low Side Ignition 4	X1-80	Ignition Cylinder 4 Output
C02	IGN_LS3	Low Side Ignition 3	X1-56	Ignition Cylinder 3 Output
C03	IGN_LS8	Low Side Ignition 8		Ignition Cylinder 2 Output
C04	IGN_LS6	Low Side Ignition 6	X1-81	Ignition Cylinder 6 Output
C05	IGN_LS5	Low Side Ignition 5	X1-57	Ignition Cylinder 5 Output
C06	AV8	Analogue Voltage Input 8		Airbox Mass Flow Sensor
C07	AV10	Analogue Voltage Input 10		
C08	IGN_LS2	Low Side Ignition 2	X1-79	Ignition Cylinder 2 Output
C09	IGN_LS7	Low Side Ignition 7		
C10	UDIG8	Universal Digital Input 8		
C11	AV6	Analogue Voltage Input 6	X1-36	Fuel Pressure Direct Bank 2 Sensor
C12	AV7	Analogue Voltage Input 7	X2-25	Throttle Pedal Sensor Tracking
C13	AV9	Analogue Voltage Input 9		
C14	SEN_OV_A1	Sensor 0V A	X1-13,X1-41, X1-46, X1-78	Sensor 0V for digital signals
C15	SEN_OV_A2	Sensor 0V A		
C16	IGN_LS1	Low Side Ignition 1	X1-55	Ignition Cylinder 1 Output
C17	UDIG7	Universal Digital Input 7		
C18	UDIG1	Universal Digital Input 1	X1-35	Engine Speed Reference
C19	UDIG12	Universal Digital Input 12		
C20	UDIG11	Universal Digital Input 11		
C21	UDIG10	Universal Digital Input 10		
C22	UDIG9	Universal Digital Input 9		
C23	SEN_OV_B1	Sensor 0V B		
C24	CAN1_HI	CAN Bus 1 High		
C25	UDIG3	Universal Digital Input 3	X1-07	Inlet Camshaft Bank 1 Position
C26	ETH_RX-	Ethernet Receive-		Ethernet Orange
C27	UDIG4	Universal Digital Input 4	X1-34	Exhaust Camshaft Bank 1 Position
C28	AV4	Analogue Voltage Input 4	X1-89	Throttle Servo Bank 1 Position Sensor Tracking
C29	AV5	Analogue Voltage Input 5	X1-61	Engine Oil Pressure Sensor
C30	SEN_OV_B2	Sensor 0V B	X2-11, X2-22, X2-34, X2-47	Sensor 0V Analogue signals
C31	CAN1_LO	CAN Bus 1 Low		
C32	UDIG2	Universal Digital Input 2	X1-09	Exhaust Camshaft Bank 2 Position
C33	ETH_RX+	Ethernet Receive +		Ethernet Orange/White
C34	ETH_TX-	Ethernet Transmit-		Ethernet Green
C35	AV3	Analogue Voltage Input 3	X1-90	Throttle Servo Bank 1 Position Sensor Main

Pin	Designation	Full Name	OE Pin	Description
C36	AV2	Analogue Voltage Input 2		Inlet Manifold Pressure Sensor
C37	AT1	Analogue Temperature Input 1		1k Pull up to SEN_5V_A
C38	AT3	Analogue Temperature Input 3	X1-85	Engine Oil Temperature Sensor, 1k Pull up to SEN_5V_B
C39	AT2	Analogue Temperature Input 2	X2-50	Inlet Manifold Temperature Sensor, 1k Pull up to SEN_5V_A
C40	UDIG5	Universal Digital Input 5	X1-33	Inlet Camshaft Bank 2 Position
C41	ETH_TX+	Ethernet Transmit+		Ethernet Green/White
C42	AV1	Analogue Voltage Input 1	X2-15	Throttle Pedal Sensor Main
C43	KNOCK3	Knock Input 3		
C44	KNOCK2	Knock Input 2	X1-84	Knock Cylinder 2
C45	AT5	Analogue Temperature Input 5	X1-82	Coolant Temperature Sensor, 1k Pull up to SEN_5V_C
C46	AT4	Analogue Temperature Input 4		1k Pull up to SEN_5V_B
C47	UDIG6	Universal Digital Input 6		
C48	SEN_5V0_A1	Sensor 5.0V A	X1-15, X1-45	Sensor 5V Digital signals
C49	KNOCK4	Knock Input 4		
C50	SEN_5V0_B1	Sensor 5.0V B	X1-38, X1-39, 1-40	Sensor 5V Analogue signals
C51	KNOCK1	Knock Input 1	X1-59	Knock Cylinder 1
C52	AT6	Analogue Temperature Input 6		1k Pull up to SEN_5V_C
C53	SEN_5V0_A2	Sensor 5.0V A		
C54	SEN_6V3	Sensor 6.3V		
C55	SEN_5V0_B2	Sensor 5.0V B	X2-35, X2-48, 2-49	Sensor 5V Analogue signals

## ► EXAMPLE M142 PINOUT - GM LLT 3.6 V6

### M142 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	X1-82	Coolant Temperature 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		
A04	AV16	Analogue Voltage Input 16		
A05	AV17	Analogue Voltage Input 17		
A06	INJ_D1A_NEG	Direct Injector 1A -	X1-51	Fuel Cylinder 1 Primary Output -
A07	INJ_D1A_POS	Direct Injector 1A +	X1-75	Fuel Cylinder 1 Primary Output +
A08	INJ_D1B_POS	Direct Injector 1B +	X1-74	Fuel Cylinder 4 Primary Output +
A09	INJ_D1B_NEG	Direct Injector 1B -	X1-50	Fuel Cylinder 4 Primary Output -
A10	SEN_5V0_C1	Sensor 5.0V C		
A11	LA_NB1	Lambda Narrow Input 1		
A12	LA_NB2	Lambda Narrow Input 2		
A13	KNOCK3	Knock Input 3		
A14	KNOCK4	Knock Input 4		
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	X2-35, X2-48, X2-49	Sensor 5V Analogue signals
A20	LIN	LIN Bus		
A21	RS232_RX	RS232 Receive		
A22	RS232_TX	RS232 Transmit		
A23	DIG1	Digital Input 1		
A24	BAT_NEG3	Battery Negative	X2-01, X2-02, X2-04	Power ground
A25	BAT_NEG4	Battery Negative	X2-01, X2-02, X2-04	Power ground
A26	SEN_OV_C1	Sensor 0V C		
A27	SEN_OV_C2	Sensor 0V C		
A28	CAN3_HI	CAN Bus 3 High		
A29	CAN3_LO	CAN Bus 3 Low		
A30	CAN2_HI	CAN Bus 2 High		
A31	CAN2_LO	CAN Bus 2 Low		
A32	BAT_NEG5	Battery Negative	X2-01, X2-02, X2-04	Power ground
A33	SEN_OV_B1	Sensor 0V B		
A34	SEN_OV_A1	Sensor 0V A		

**M142 Connector B - 26 Way**

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

<b>Pin</b>	<b>Designation</b>	<b>Full Name</b>	<b>OE Pin</b>	<b>Description</b>
B01	OUT_HB9	Half Bridge Output 9	X1-25	Exhaust Camshaft Bank 2 Actuator Output
B02	OUT_HB10	Half Bridge Output 10	X1-01	Exhaust Camshaft Bank 1 Actuator Output
B03	UDIG8	Universal Digital Input 8		
B04	UDIG9	Universal Digital Input 9		
B05	UDIG10	Universal Digital Input 10		
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		
B11	AV10	Analogue Voltage Input 10		
B12	AV11	Analogue Voltage Input 11		
B13	BAT_POS	Battery Positive	X2-03, X2-05, X2-06	ECU Battery Voltage
B14	INJ_LS6	Low Side Injector 6		
B15	INJ_LS4	Low Side Injector 4		
B16	AV12	Analogue Voltage Input 12		
B17	AV13	Analogue Voltage Input 13		
B18	AV14	Analogue Voltage Input 14		
B19	BAT_POS	Battery Positive	X2-03, X2-05, X2-06	ECU Battery Voltage
B20	OUT_HB7	Half Bridge Output 7	X1-49	Inlet Camshaft Bank 2 Actuator Output
B21	OUT_HB8	Half Bridge Output 8	X1-02	Inlet Camshaft Bank 1 Actuator Output
B22	INJ_D2A_NEG	Direct Injector 2A -	X1-52	Fuel Cylinder 2 Primary Output -
B23	INJ_D2A_POS	Direct Injector 2A +	X1-53	Fuel Cylinder 2 Primary Output +
B24	INJ_D2B_POS	Direct Injector 2B +	X1-29	Fuel Cylinder 5 Primary Output +
B25	INJ_D2B_NEG	Direct Injector 2B -	X1-28	Fuel Cylinder 5 Primary Output -
B26	SEN_5V0_A	Sensor 5.0V A		

**M142 Connector C - 34 Way**

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

<b>Pin</b>	<b>Designation</b>	<b>Full Name</b>	<b>OE Pin</b>	<b>Description</b>
C01	OUT_HB2	Half Bridge Output 2	X2-10	Fuel Pump Output
C02	SEN_5V0_A	Sensor 5.0V A	X1-15, X1-45	Sensor 5V for digital signals
C03	IGN_LS1	Low Side Ignition 1	X1-55	Ignition Cylinder 1 Output
C04	IGN_LS2	Low Side Ignition 2	X1-79	Ignition Cylinder 2 Output
C05	IGN_LS3	Low Side Ignition 3	X1-56	Ignition Cylinder 3 Output
C06	IGN_LS4	Low Side Ignition 4	X1-80	Ignition Cylinder 4 Output
C07	IGN_LS5	Low Side Ignition 5	X1-57	Ignition Cylinder 5 Output
C08	IGN_LS6	Low Side Ignition 6	X1-81	Ignition Cylinder 6 Output
C09	SEN_5V0_B	Sensor 5.0V B	X1-38, X1-39, X1-40	Sensor 5V Analogue signals
C10	BAT_NEG1	Battery Negative	X2-01, X2-02, X2-04	Power ground
C11	BAT_NEG2	Battery Negative	X2-01, X2-02, X2-04	Power ground
C12	IGN_LS7	Low Side Ignition 7	X2-46	Coolant Fan 1 Output
C13	IGN_LS8	Low Side Ignition 8	X2-45	Coolant Fan 2 Output
C14	AV1	Analogue Voltage Input 1	X2-15	Throttle Pedal Sensor Main
C15	AV2	Analogue Voltage Input 2		Inlet Manifold Pressure Sensor
C16	AV3	Analogue Voltage Input 3	X1-90	Throttle Servo Bank 1 Position Sensor Main
C17	AV4	Analogue Voltage Input 4	X1-89	Throttle Servo Bank 1 Position Sensor Tracking
C18	OUT_HB1	Half Bridge Output 1		
C19	INJ_D3A_POS	Direct Injector 3A +	X1-27	Fuel Cylinder 3 Primary Output +
C20	INJ_D3B_POS	Direct Injector 3B +	X1-03	Fuel Cylinder 6 Primary Output +
C21	INJ_D4A_POS	Direct Injector 4A +		
C22	INJ_D4B_POS	Direct Injector 4B +		
C23	INJ_LS1	Low Side Injector 1		
C24	INJ_LS2	Low Side Injector 2		
C25	AV5	Analogue Voltage Input 5	X1-61	Engine Oil Pressure Sensor
C26	BAT_POS	Battery Positive	X2-03, X2-05, X2-06	ECU Battery Voltage
C27	INJ_D3A_NEG	Direct Injector 3A -	X1-26	Fuel Cylinder 3 Primary Output -
C28	INJ_D3B_NEG	Direct Injector 3B -	X1-04	Fuel Cylinder 6 Primary Output -
C29	INJ_D4A_NEG	Direct Injector 4A -		
C30	INJ_D4B_NEG	Direct Injector 4B -		
C31	OUT_HB3	Half Bridge Output 3	X1-73	Fuel Pressure Direct Pump Output
C32	OUT_HB4	Half Bridge Output 4	X1-05	Fuel Pressure Direct Pump Output
C33	OUT_HB5	Half Bridge Output 5	X1-24	Throttle Servo Bank 1 Motor
C34	OUT_HB6	Half Bridge Output 6	X1-48	Throttle Servo Bank 1 Motor

**M142 Connector D - 26 Way**

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

<b>Pin</b>	<b>Designation</b>	<b>Full Name</b>	<b>OE Pin</b>	<b>Description</b>
D01	UDIG1	Universal Digital Input 1	X1-35	Engine Speed Reference
D02	UDIG2	Universal Digital Input 2	X1-09	Exhaust Camshaft Bank 2 Position
D03	AT1	Analogue Temperature Input 1		1k Pull up to SEN_5V_A
D04	AT2	Analogue Temperature Input 2	X2-50	Inlet Manifold Temperature Sensor, 1k Pull up to SEN_5V_A
D05	AT3	Analogue Temperature Input 3	X1-85	Engine Oil Temperature Sensor, 1k Pull up to SEN_5V_B
D06	AT4	Analogue Temperature Input 4		1k Pull up to SEN_5V_B
D07	KNOCK1	Knock Input 1	X1-59	Knock Cylinder 1
D08	UDIG3	Universal Digital Input 3	X1-07	Inlet Camshaft Bank 1 Position
D09	UDIG4	Universal Digital Input 4	X1-34	Exhaust Camshaft Bank 1 Position
D10	UDIG5	Universal Digital Input 5	X1-33	Inlet Camshaft Bank 2 Position
D11	UDIG6	Universal Digital Input 6		
D12	BAT_BAK	Battery Backup		
D13	KNOCK2	Knock Input 2	X1-84	Knock Cylinder 2
D14	UDIG7	Universal Digital Input 7		
D15	SEN_OV_A	Sensor 0V A	X1-13, X1-41, X1-46, X1-78	Sensor 0V for digital signals
D16	SEN_OV_B	Sensor 0V B	X2-11, X2-22, X2-34, X2-47	Sensor 0V Analogue signals
D17	CAN1_HI	CAN Bus 1 High		
D18	CAN1_LO	CAN Bus 1 Low		
D19	SEN_6V3	Sensor 6.3V		
D20	AV6	Analogue Voltage Input 6	X1-36	Fuel Pressure Direct Sensor
D21	AV7	Analogue Voltage Input 7	X2-25	Throttle Pedal Sensor Tracking
D22	AV8	Analogue Voltage Input 8		Airbox Mass Flow Sensor Voltage
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 Orange

## ► EXAMPLE M122 PINOUT - HONDA L15

### M122 Connector A — 34 Way

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

Pin	Designation	Full Name	OE Pin	Description
A01	OUT_HB2	Half Bridge Output 2		Throttle Servo Motor + Output
A02	SEN_5V0_A	Sensor 5.0V A		Sensor 5V for digital signals
A03	IGN_LS1	Low Side Ignition 1		Ignition Cylinder 1 Output
A04	IGN_LS2	Low Side Ignition 2		Ignition Cylinder 2 Output
A05	IGN_LS3	Low Side Ignition 3		Ignition Cylinder 3 Output
A06	IGN_LS4	Low Side Ignition 4		Ignition Cylinder 4 Output
A07	INJ_LS3	Low Side Injector 3		
A08	INJ_LS4	Low Side Injector 4		Fuel Pump Output
A09	SEN_5V0_B	Sensor 5.0V B		Sensor 5V Analogue signals
A10	BAT_NEG1	Battery Negative		Power ground
A11	BAT_NEG2	Battery Negative		Power ground
A12	INJ_LS5	Low Side Injector 5		
A13	INJ_LS6	Low Side Injector 6		
A14	AV1	Analogue Voltage Input 1		Throttle Pedal Sensor Main
A15	AV2	Analogue Voltage Input 2		Throttle Pedal Sensor Tracking
A16	AV3	Analogue Voltage Input 3		Throttle Servo Bank 1 Position Sensor Main
A17	AV4	Analogue Voltage Input 4		Throttle Servo Bank 1 Position Sensor Tracking
A18	OUT_HB1	Half Bridge Output 1		Throttle Servo Motor - Output
A19	INJ_D1A_POS	Direct Injector 1A +		Fuel Cylinder 1 Primary Output +
A20	INJ_D1B_POS	Direct Injector 1B +		Fuel Cylinder 4 Primary Output +
A21	INJ_D2A_POS	Direct Injector 2A +		Fuel Cylinder 2 Primary Output +
A22	INJ_D2B_POS	Direct Injector 2B +		Fuel Cylinder 3 Primary Output +
A23	INJ_LS1	Low Side Injector 1		Exhaust Camshaft Bank 1 Actuator
A24	INJ_LS2	Low Side Injector 2		Inlet Camshaft Bank 1 Actuator
A25	AV5	Analogue Voltage Input 5		Inlet Manifold Pressure Sensor
A26	BAT_POS	Battery Positive		ECU Battery Voltage
A27	INJ_D1A_NEG	Direct Injector 1A -		Fuel Cylinder 1 Primary Output -
A28	INJ_D1B_NEG	Direct Injector 1B -		Fuel Cylinder 4 Primary Output -
A29	INJ_D2A_NEG	Direct Injector 2A -		Fuel Cylinder 2 Primary Output -
A30	INJ_D2B_NEG	Direct Injector 2B -		Fuel Cylinder 3 Primary Output -
A31	OUT_HB3	Half Bridge Output 3		Boost Servo Actuator Motor -
A32	OUT_HB4	Half Bridge Output 4		Boost Servo Actuator Motor +
A33	OUT_HB5	Half Bridge Output 5		Fuel Pressure Direct Pump Output -
A34	OUT_HB6	Half Bridge Output 6		Fuel Pressure Direct Pump Output +

**M122 Connector B — 26 way**

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

Pin	Designation	Full Name	OE Pin	Description
B01	UDIG1	Universal Digital Input 1		Engine Speed Reference
B02	UDIG2	Universal Digital Input 2		Inlet Camshaft Bank 1 Position
B03	AT1	Analogue Temperature Input 1		1k Pull up to SEN_5V_A, Inlet Air Temperature Sensor
B04	AT2	Analogue Temperature Input 2		1k Pull up to SEN_5V_A, Coolant Temperature Sensor
B05	AT3	Analogue Temperature Input 3		1k Pull up to SEN_5V_B
B06	AT4	Analogue Temperature Input 4		1k Pull up to SEN_5V_B
B07	KNOCK1	Knock Input 1		Knock Cylinder 1
B08	UDIG3	Universal Digital Input 3		Exhaust Camshaft Bank 1 Position
B09	UDIG4	Universal Digital Input 4		
B10	UDIG5	Universal Digital Input 5		
B11	UDIG6	Universal Digital Input 6		
B12	BAT_BAK	Battery Backup		
B13	KNOCK2	Knock Input 2		
B14	UDIG7	Universal Digital Input 7		Brake Switch
B15	SEN_OV_A	Sensor 0V A		Sensor 0V for digital signals
B16	SEN_OV_B	Sensor 0V B		Sensor 0V Analogue signals
B17	CAN1_HI	CAN Bus 1 High		
B18	CAN1_LO	CAN Bus 1 Low		
B19	SEN_6V3	Sensor 6.3V		
B20	AV6	Analogue Voltage Input 6		Fuel Pressure Direct Sensor
B21	AV7	Analogue Voltage Input 7		Engine Oil Pressure Sensor
B22	AV8	Analogue Voltage Input 8		Boost Pressure Sensor Voltage
B23	ETH_TX+	Ethernet Transmit+		Ethernet Green/White
B24	ETH_TX-	Ethernet Transmit-		Ethernet Green
B25	ETH_RX+	Ethernet Receive+		Ethernet Orange/White
B26	ETH_RX-	Ethernet Receive-		Ethernet Orange