TRANS AM TA2 KIT

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DESCRIPTION

This is the MoTeC ECU kit allowed for use in the Trans Am TA2 series. It includes a MoTeC M1 ECU with the appropriate licensing, a MoTeC Lambda to CAN module, Bosch LSU 4.9 Lambda Sensors, a MoTeC Pro Fuel Pressure Sensor, a MoTeC Pro Oil Pressure Sensor, and a M 25-7225 Air Temp Sensor. These pieces are used in conjunction with the TA2 spec chassis harness for MoTeC and TA2 spec sensors to control all aspects of the engine.

KIT CONTENTS

- **M130 –** M130
  - Licensed with TA2 Spec Firmware
  - Logging Level 2
- **M LTC-D –** MoTeC Lambda to CAN Dual
- **M 0258 001 (X2) –** Bosch LSU 4.9 Lambda Sensor
- **M KP41 150G –** Fuel Pressure Sensor
- **M KP41 150G –** Oil Pressure Sensor
- **M 25-7225 –** GM Style Air Temperature Sensor

COMPONENT LOCATIONS

The **M130 MoTeC ECU** and **Lambda to CAN** (LTC) module will both need to be mounted inside the chassis of the vehicle. They should be mounted using **vibration isolation on the mounting brackets**. Failure to do so could lead to internal damage on the devices. ECUs commonly use vibration damping studs and LTCs use hook and loop Velcro. An example of vibration damping studs to use can be found here: https://www.mcmaster.com/9232K11/. Place the modules in a way where they will ***NOT*** be in direct contact to hot surfaces (ex. Firewall Surface). Both modules should be installed in a location with sufficient air circulation and be shielded against thermal emissions from surrounding components.

- The **LTC maximum** ambient temperature is 100 degrees Celsius (**212 degrees Fahrenheit**).
- The **M130 ECU maximum** operating temperature is 85 degrees Celsius (**185 degrees Fahrenheit**).
- Logging can monitor:
  - "**Exhaust Lambda Bank 1 Collector Internal Temperature**"
  - "**Exhaust Lambda Bank 2 Collector Internal Temperature"**
  - "**ECU Internal Temperature**"

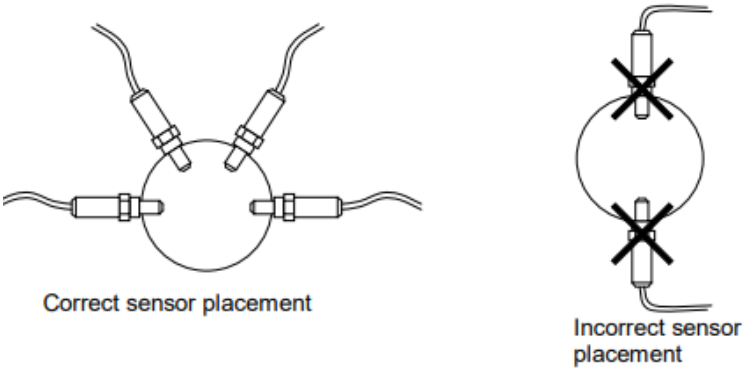
Fuel and oil pressure sensors should not be stressed at any time while in operation. The sensors should be **remotely mounted and *NOT* hard mounted** in a fixed location i.e. engine/chassis. If this is not done, the sensor could be damaged both internally and externally. The sensors should not reach a temperature higher than 125 degrees Celsius (**257 degrees Fahrenheit**) during operation.

Bosch LSU 4.9 Mounting Recommendations

The Lambda sensor should be fitted to the exhaust system with the sensor tip protruding into the exhaust gas flow. The following considerations should be considered when fitting the sensor.

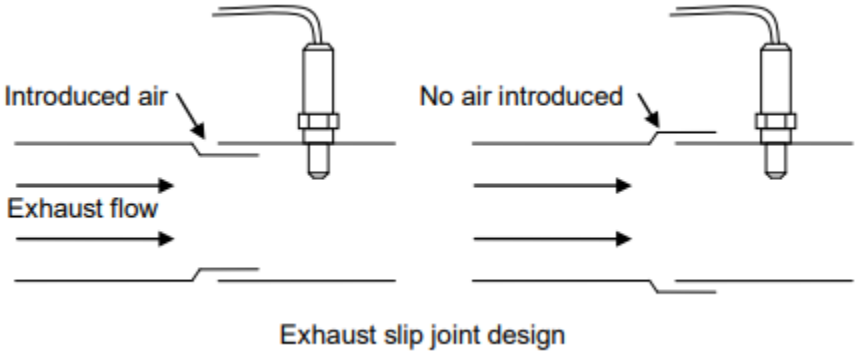
- Place the sensor on an angle between 10 and 90 degrees to the vertical with the tip of the sensor point down to prevent condensation build up between the sensor case and the sensor ceramic.
- Do not place the sensor in a vertical position; excessive heat soak will prevent proper operation.
- Place the sensor at least 1 metre from the exhaust ports to avoid excessive heat (recommended).
- Place the sensor at least 1 metre from the open end of the exhaust system to avoid incorrect readings due to outside oxygen (recommended).
    - Where necessary for shorter exhaust systems the sensor could be place closer to the engine.
- Place the sensor away from the flame front coming out of the cylinder head and away from areas where one cylinder may have more effect than another.

Figure 4: Mounting recommendation for Bosch LSU 4.9 sensors



- If possible do not place near slip joints; some designs allow air to enter resulting in incorrect readings. If the sensor must be placed near a slip joint, reverse the slip joints to reduce the influence of introduced air.

Figure 5: Mounting recommendation for Bosch LSU 4.9 sensors



Connecting Lambda Sensors

When using the **Lambda to CAN** module, the legs can be routed out of the vehicle through an additional bulkhead connector or by use of grommets through the bulkhead. The module is labelled with A and B corresponding to an A and B leg to plug the sensors into.

- The **Bank 1** sensor that has Cylinder 1 **MUST** plug into the **A leg**.
- The **Bank 2** sensor that has Cylinder 2 **MUST** plug into the **B leg**.

REQUIRED SOFTWARE

MoTeC's M130 ECU will require the most up to date software of *M1 Tune* to make changes to the ECU. The latest software of *M1 Tune* can be found at the following link: MoTeC M1 Tune

- The download can also be found by going to https://www.motec.com.au/home, 'Downloads > Latest Releases > M1 Tune'.

MoTeC's *i2* data analysis software will be needed to analyse the data logs obtained from the M1 ECU. The latest software of *i2 Standard* can be found at the following link: MoTeC i2 Standard

- The download can also be found by going to https://www.motec.com.au/home, 'Downloads > Latest Releases > Data Analysis > i2 Standard'.

  Note: Depending on the ECU being used, Pro Analysis could be enabled. This will determine if the data in the ECU can be opened in i2 Pro. Additional licensing can be purchased for ECU or computer for opening standard i2 files in i2 Pro. Please contact MoTeC USA for further information.

WEBINARS

MoTeC has a large list of webinars that are a good resource for beginners in any MoTeC hardware:

https://www.motec.com.au/webinars-view/webinararchive/

A suggested list of webinars to watch for using the ECU in TA2 are below. These webinars are for generic use of MoTeC ECU's and data analysis. Specific TA2 restrictions or topics are not covered.

M1 Tune - Part 1

M1 Tune - Part 2

How to Download the Logging in an M1 ECU

How to Send an M1 Log via the Internet

M1 Tune Warning Alarms

What is the Difference Between i2 Standard and i2 Pro?

How to Analyse Temperature Data

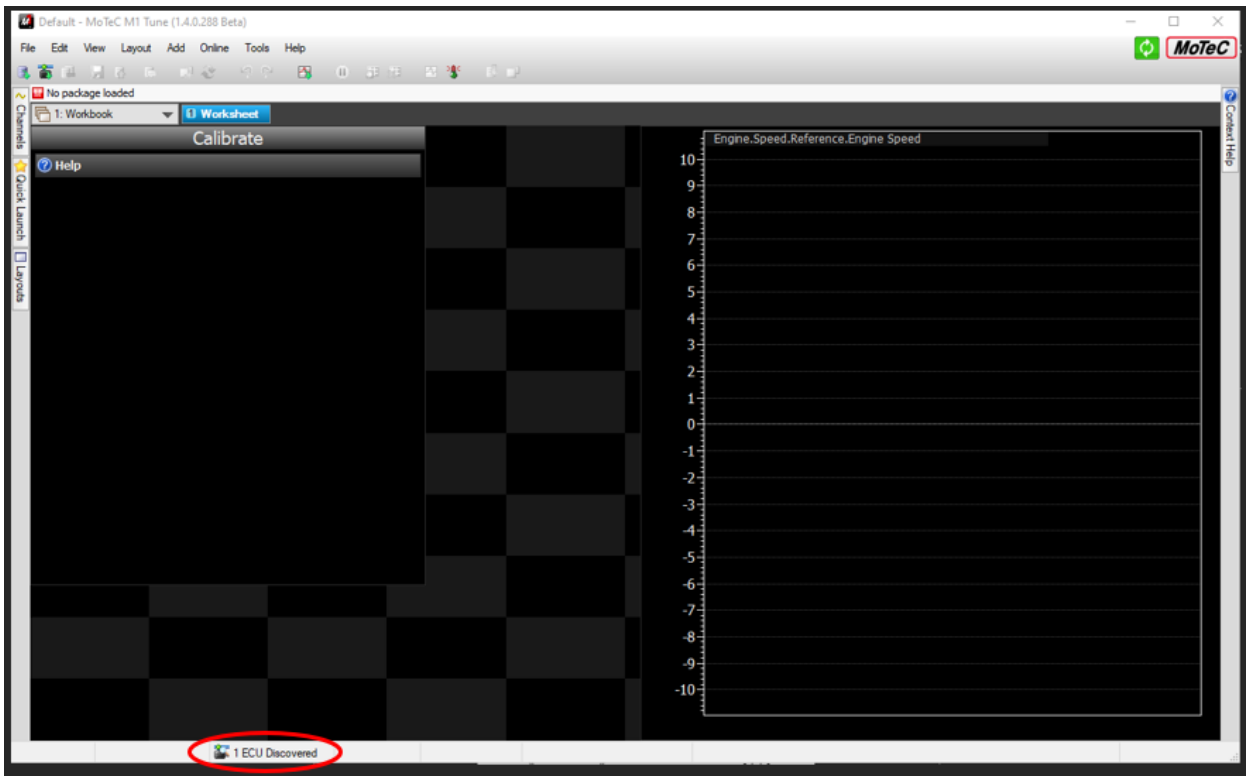
Synchronising VCS Video with Data

i2 Data Analysis: How to Insert Beacons

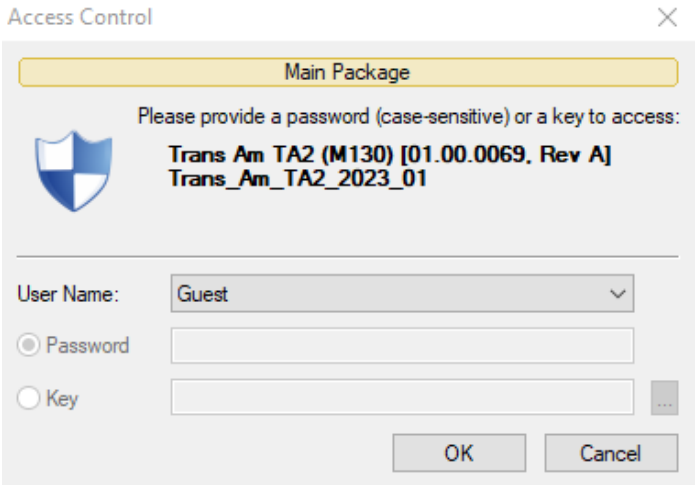
i2 Data Analysis: How to Create Overlays

GETTING CONNECTED

Once M1 Tune has been installed on the user's computer, the user may connect to the ECU. Make sure that the ECU has adequate power before trying to connect to the ECU. Connect the ethernet cable into the main harness of the vehicle and connect this into the computer being used. Make sure the IPv4 and IPv6 are enabled on the Ethernet Properties for the given ethernet port on the PC. Open M1 Tune and the following should be shown.



- The ECU should be seen by the software in the bottom of the screen shown above.
- Navigate to 'File > Open ECU' or quick key is 'F8'. This will allow the user to 'Open' the ECU and see the package within M1 Tune.
- The following 'Access Control' menu will appear, see picture below. Depending on the user (Guest, Advanced, Tech, Admin), a different password/key will be needed to access the package. Once the correct password/key has been entered, the ECU will allow the user to see the package and make the allowed changed based on the user's login conditions.



- Teams can access Guest and Advanced. The **Advanced** user name **password** is "**Advanced**", same as the user name.
- You can change users by selecting 'Tools>Switch Security User'.

SETTING VEHICLE ID

Setting Vehicle ID in the ECU to the car number allows for identifying what ECU is in a car. This will make it easier to identify an ECU associated to a Packages or datalog.

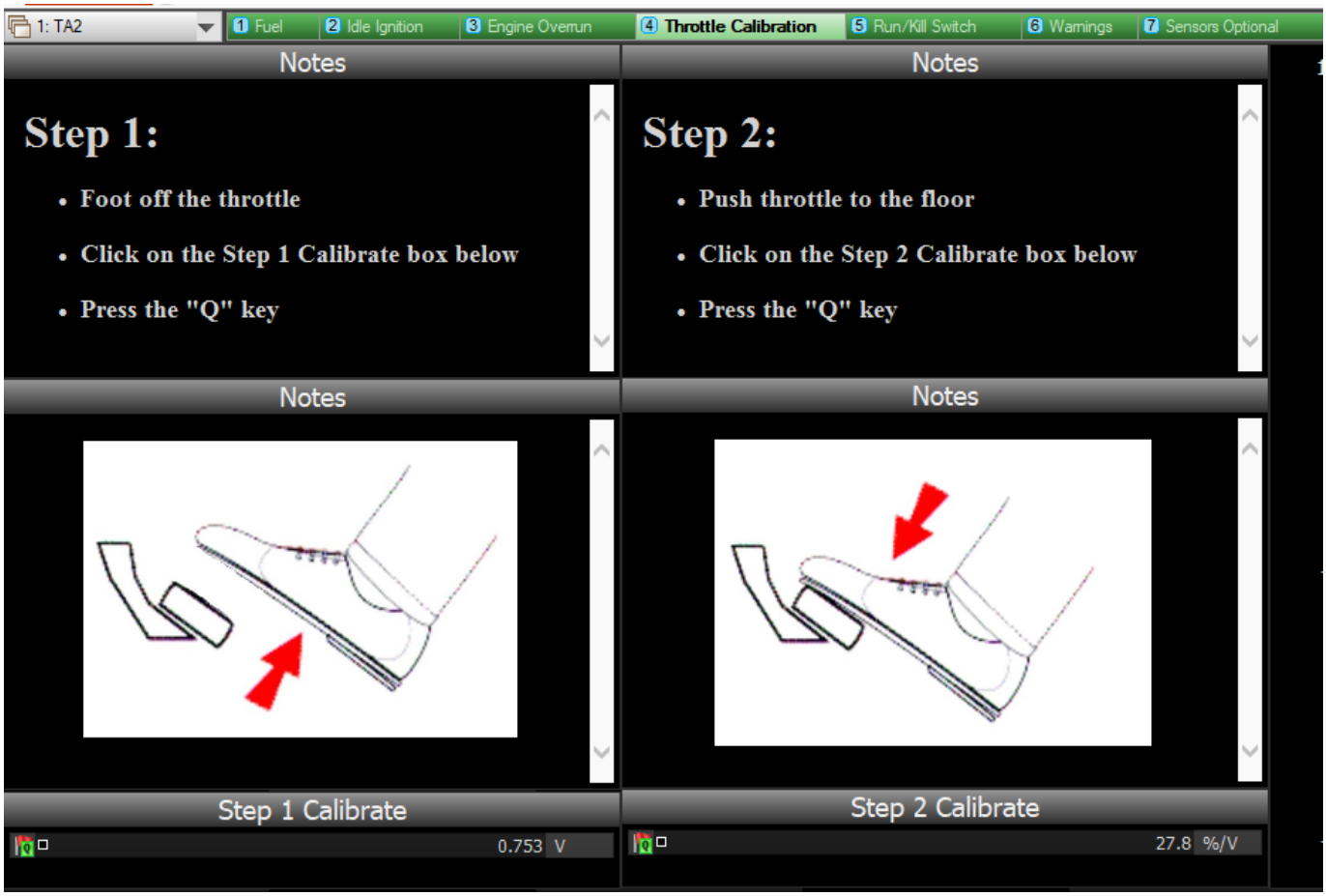
- Open ECU and login to the Advanced user.
- Select 'File>Edit Vehicle ID…'.
- Set to the car number.

ECU THROTTLE CALIBRATION

Any time the minimum or maximum position of the throttle has changed, the throttle needs to be recalibrated. Not doing so can cause the ECU to misunderstand 100 throttle and can cause power loss. There can also be issues with idle control and Engine Overrun (decel fuel cut) if the minimum position does not go below 1%.

The Throttle Pedal Position of the car can be calibrated with the following steps:

- ECU has been opened, 'File > Open ECU'.
- Select the 'TA2' workbook and select the 'Throttle Calibration' worksheet as seen below.
- Follow the calibration steps shown in 'Notes'.
- After Calibration a red bar will show at the top signifying you need to File > Save to commit the changes.
    - This will prompt you to reset the ECU.



APPENDIX

Specifications

M130 ECU

Supply Voltage:	8v – 32v
Typical no-load supply current:	0.34 amps at 13.8v
Operating Temp:	-40°C to 85° C
Size:	107.5 mm x 127.5 mm x 38.7 mm
Weight:	290 grams
Mounting:	3 x M5 or 3/16 bolts (vibration isolation recommended)
CAN Communications:	Design Standard: ISO 11898-2
	Message Format: 2.0A (11-bit identifier)
	Message Layout: MoTeC or AEM (DBC available)
	Baud Rate: 500 kbit/sec Default (Selectable)
	Internal CAN Termination Resistor: No
	CAN Outputs: 1

Figure 1: MoTeC M130

MoTeC Lambda to CAN Module

Voltage:	11v – 16v
Current:	Up to 4 amps on startup
CAN communications:	Design Standard: ISO 11898-2
	Message Format: 2.0A (11-bit identifier)
	Message Layout: MoTeC LTC Format
	Baud Rate: 500 kbit/sec
	CAN Termination Resistor: No
	CAN Outputs: 1
Ambient temp:	Up to 100° C
Size:	38 mm x 26 mm x 14 mm
Weight:	62 grams
Mounting:	2X 3mm bolts or double-sided Velcro or similar (vibration isolation recommended)
Harness:	175 mm wire lead

Figure 2: MoTeC Lambda to CAN Module

150 PSIG MoTeC Pro Fuel and Oil Pressure Sensor

Voltage:	5 +/- 0.5 vdc
Current:	< 10 mA
Operating temp:	-40°C to 125° C
Total Error:	0.8% of F.S. Pres
Proof Pressure:	2X F.S. Pres
Burst Pressure:	5X F.S. Pres
Size:	1.94in X 1.45 in X 0.64 in
	49.5 mm x 36.8 mm x 16.3 mm
Weight:	70 grams
Mating Connector:	M 15-7275K

Note: Sensors should be mounted remotely to avoid engine vibration damage

Figure 3: MoTeC Pro Pressure Sensor

Wiring

M130 ECU Pinout

C1A ECU M130

Pin	Size	Description
A1	20	Stepper 2A
A2	20	5v Vref A
A3	20	Ignition 1
A4	20	Ignition 2
A5	20	Ignition 3
A6	20	Ignition 4
A7	20	Ignition 5
A8	20	Ignition 6
A9	20	5v Vref B
A10	20	Ground (-)
A11	20	Ground (-)
A12	20	Ignition 7
A13	20	Ignition 8
A14	20	TPS AV1
A15	20	MAP AV2
A16	20	Fuel Pressure AV3
A17	20	Oil Pressure AV4
A18	20	Stepper 1A
A19	20	Injector 1
A20	20	Injector 2
A21	20	Injector 3
A22	20	Injector 4
A23	20	Tach Signal Output
A24	20	Cooling Fan Control
A25	20	CCP AV5
A26	20	Battery (+)
A27	20	Injector 5
A28	20	Injector 6
A29	20	Injector 7
A30	20	Injector 8
A31	20	Stepper 1B
A32	20	Stepper 2B
A33	20	Fuel Pump Control
A34	20	MIL Light

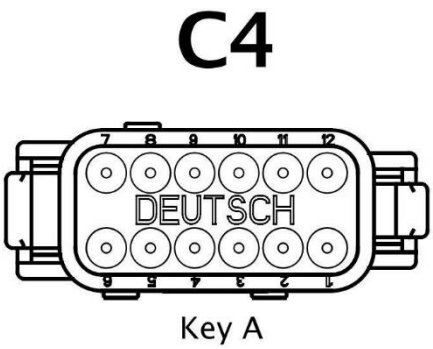
C1B ECU M130

Pin	Size	Description
B1	20	Crank VR+
B2	20	CAM Sync +
B3	20	Coolant Temp
B4	20	Intake Air Temp
B5	20	Oil Temp
B6	20	n/c
B7	20	n/c
B8	20	Kill Switch
B9	20	n/c
B10	20	n/c
B11	20	n/c
B12	20	n/c
B13	20	n/c
B14	20	n/c
B15	20	0v A
B16	20	0v B
B17	20	CAN 1 HI
B18	20	CAN 1 LO
B19	20	n/c
B20	20	Coolant Pressure
B21	20	Steering Angle Sensor
B22	20	Front Brake Pressure
B23	20	Ethernet TX+
B24	20	Ethernet Tx -
B25	20	Ethernet Rx+
B26	20	Ethernet Rx -

Auxiliary Connector

On the TA2 Chassis Harness, Connector 4 (C4) is the Auxiliary or AUX Connector. A mating 6" flying lead AUX (DTM04-12P) is supplied with the chassis harness that connects to the ECU. The following will describe each AUX input/output function and how the M130 ECU will interact with each signal/output:

Wire Entry View of Connector



C4 AUX		
Pin	**Size**	**Description**
1	20	5v Vref
2	20	0v Sensor GND
3	20	Tach
4	20	Kill Switch
5	20	Fuel Pump Control
6	20	Cooling Fan Control
7	20	MIL Output
8	20	Steering Angle
9	20	Brake Pressure Front
10	20	Ignition Switch
11	20	GND
12	20	12v+

Power/Grounds:

Pin 1 (5v Vref) and **Pin 2 (0v Sensor GND)** are voltage reference for use with sensors.

Input/Output Functions:

Pin 3 (Tach): A **LOW SIDE OUTPUT** that generates a signal for a tachometer to display Engine Speed. Some tachometers require a **1kΩ** pull-up resistor to a +12v source so they can achieve the correct digital voltages.

Pin 4 (Kill Switch): A **DIGITAL INPUT** that the ECU receives and shuts off fuel and ignition events to kill the engine without power cycling the ECU. This input can be wired as a **MOMENTARY BUTTON** or a **TOGGLE SWITCH**. This **MUST** connect to **Pin 2 (0v Sensor GND)** to activate**.**

Pin 5 (Fuel Pump Control): A **LOW SIDE OUTPUT (Half Bridge)** that is used to control a fuel pump **relay**. This **MUST** be wired to **Pin 85**.

Do not wire this pin directly to the fuel pump (-) terminal.

Parasitic ground feed is possible via this output. Ensure the relay is not powered when the ECU is off.

Fuel Pump Relay Control Positive should ONLY have 12v+ when the Ignition Switch is ON

Pin 6 (Cooling Fan): A **LOW SIDE OUTPUT** that is used to control a cooling fan **relay**. This **MUST** be wired to **Pin 86** of the relay.

Pin 7 (MIL Output): A **HALF BRIDGE OUTPUT** that is used to control an engine malfunction indicator light. The functions of the MIL Light can be found in the M1 Tune Trans Am TA2 Firmware Help. This can be configured to go to Battery Positive or Negative.

Parasitic ground feed is possible via this output. Ensure the relay is not powered when the ECU is off.

Pin 8 (Steering Angle) and Pin 9 (Brake Pressure): An **ANALOG VOLTAGE INPUT** that requires **5v Vref (Pin 1)** and **0v Sensor GND (Pin 2)**. Ensure that the correct calibration is setup in the ECU.

Pin 10 (Ignition Switch): +12v signal input to turn on the Main Relay and power the ECU.

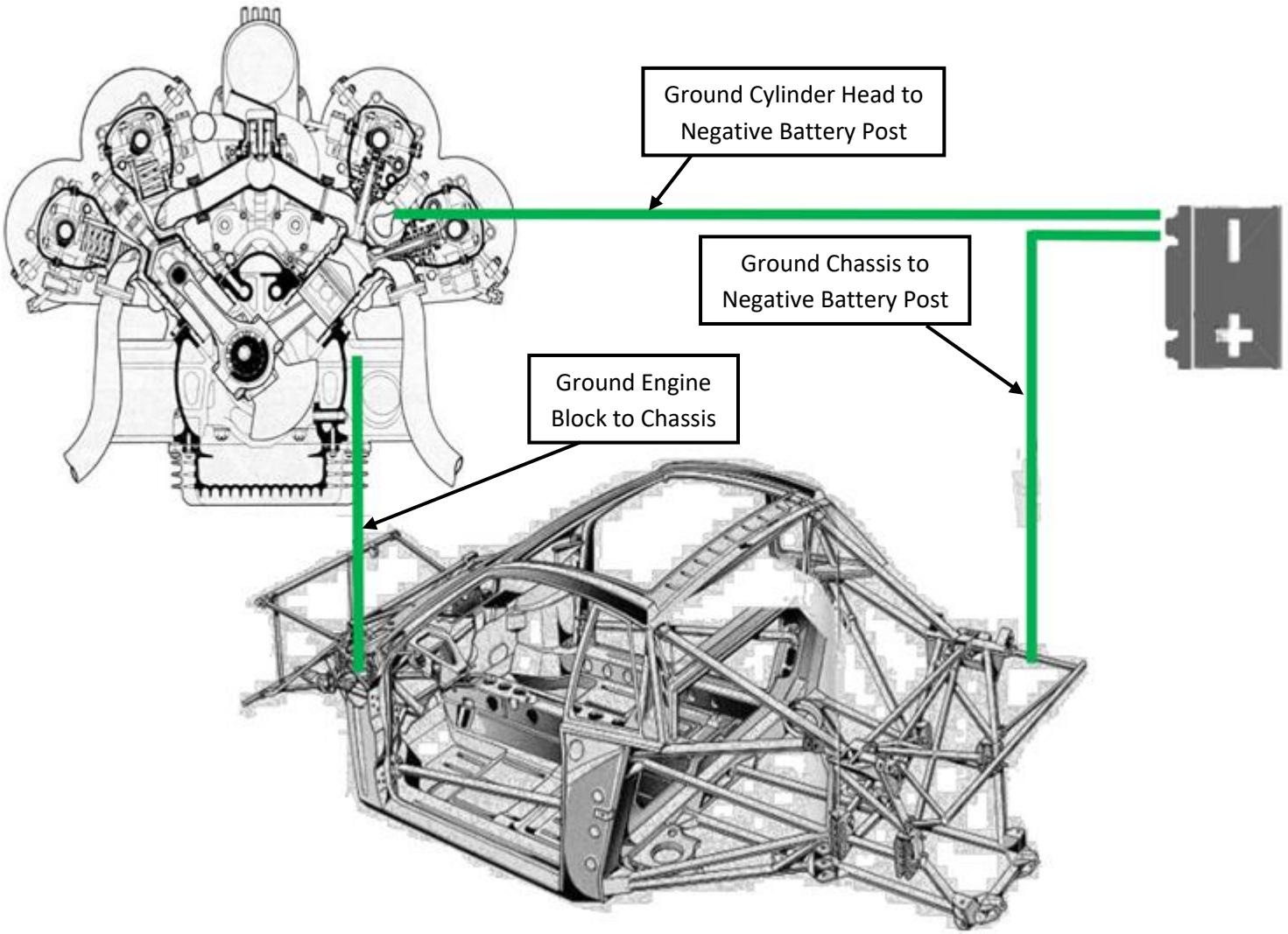
When this is OFF (not connected to +12v) Half Bridge Outputs can provide parasitic ground. Ensure devices connected to these outputs are only powered when the ECU is powered (Ignition Switch connected to +12v)

Pin 11 (GND) and **Pin 12 (12v+)**: These are for powering low current components that connect to the AUX connector.

Engine and Chassis Grounds

Grounding is important for the ECU and electrical system to operate properly. Engine performance, sensor readings, and harness integrity can all suffer if a minimum grounding below is not followed.

Minimum size of 2AWG Battery Cable should be used. Optional choice: 2 AWG BATTERY CABLE, BLACK, PER FOOT



GPS Laps In ECU

The ECU can receive GPS data over CAN and use it to generate lap timing in the ECU for easier data analysis. The setup is explained in the help menus of the ECU Package.

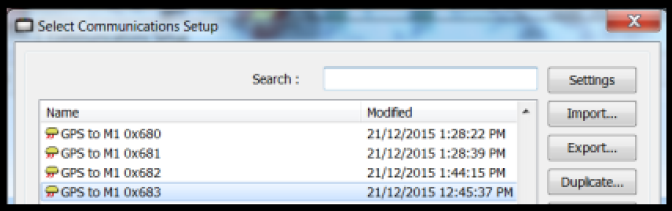
When receiving GPS information via CAN (typically from a MoTeC dash) this address must match the first transmit address used in the sending device.

GPS CAN Communications via Dash

For MoTeC Dash Manager releases after April 2016 templates are provided using addresses 0x680, 0x681, 0x682, 0x683.

Setting Dash Manager to use the supplied templates

- Open your existing dash file.
- Select **Connection | Communications**.
- Select the tab for the CAN bus you wish to connect to the M1 ECU.
- Use the **Select** button to add in turn, each of the templates shown below:



- Save the file and send to the dash.

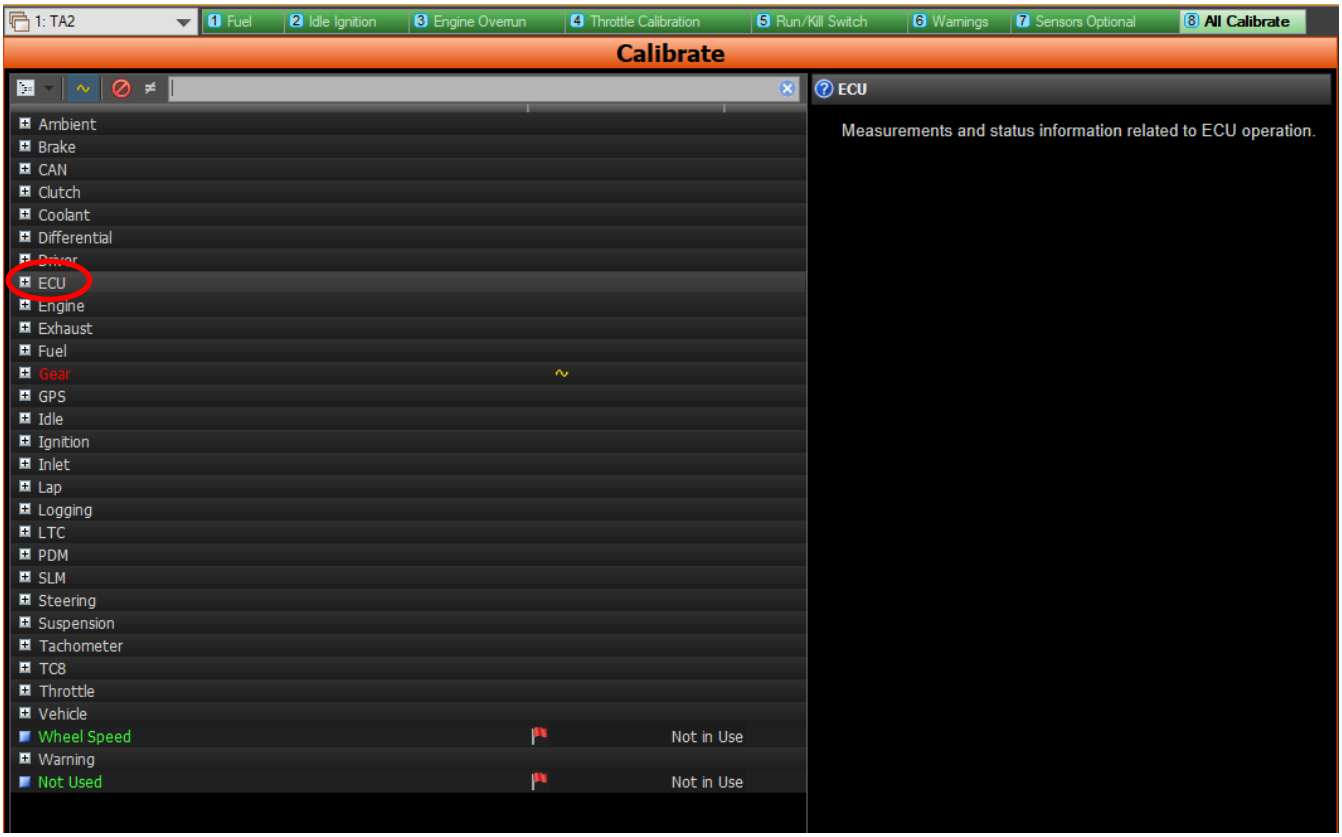
M1 Settings

- Set the GPS Interface to CAN Bus N Decode.
- Set the GPS CAN ID Base to 0x680.
- Set the GPS Fault Delay to 2000ms.
- Set CAN Bus N Mode to match the bus speed from the dash.

CAN Transmit Functions

The TA2 Package will allow the user to transmit a fixed set of channels from the M130 to another external device. If the user would like to use these channels, the transmit for the CAN Bus must be setup under the ECU. Once the ECU is opened in the M1 Tune software:

- navigate to 'TA2' workbook and select 'All Calibrate' worksheet.
- The following menu will be opened:



- Select 'ECU' shown circled in red. This will open another drop-down menu.
- At the bottom of the drop-down menu, there will be two Transmit Tabs: 'Transmit' and 'Transmit AEM'.

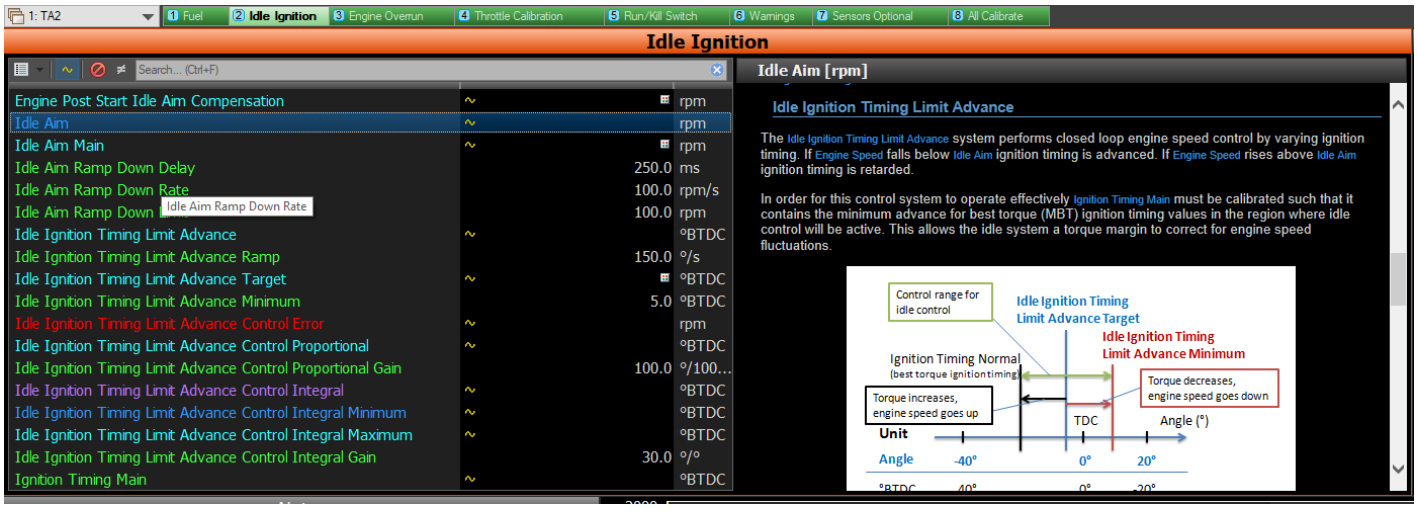
- The standard 'Transmit" will send on the standard MoTeC CAN IDs for a few important channels.
  - Selecting 'Transmit' and pressing 'F1' will show the help Menu with the general MoTeC CAN messages.
- 'Transmit AEM' are channels being sent from the M130 to emulate what the previous AEM ECU
  - 'Transmit AEM' is in place to help aid the 'Plug n Play' solution of the M130 with the vehicle and will allow other devices (Logger, Dash, etc.) to not have to change CAN Templates for the new M130. These devices will still function correctly with the 'Transmit AEM CAN Bus' set to 'CAN Bus 1'. Set to 'Not in Use' if you only need the standard MoTeC CAN transmit.

Fuel Tuning

For fuel tuning below 3000 RPM, there is a table provided (Engine Efficiency Compensation Main) to adjust the main fuel map. This table will automatically fade trims to 0.0 from 3000 RPM to 3500 RPM.

Idle Control

The Idle Ignition Tab in Tune is where you can adjust settings for Idle Control and Idle Aim. Selecting each item in the list will display help explaining their function.



CONTACT INFORMATION

For technical support please use the following information:

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Email

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