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Using the GPS

Description

The GPS-L5 is a 5 Hz GPS unit, set at a fixed baud rate of 19200 and is preconfigured to suit MoTeC 'Hundred Series' and M84 ECUs.

The GPS-L10 is a 10 Hz GPS unit suitable for use only with MoTeC Dash/Data Loggers (excluding original ADLs). It is configured at a fixed baud rate of 38400.

Both are suitable for the high dynamics of motor sport applications. The units have a built in antenna and provide speed and position information, as well as altitude, heading, date, time and GPS statistics.

In circuit racing, a GPS unit can be a cost effective alternative to the traditional lap timing system. When using a MoTeC Dash/Data Logger, the position of the start/finish line can be marked either by a push button operated by the driver when passing the line or by entering the coordinates directly into the data acquisition system. This position can then be used by the Dash/Data Logger as a beacon to calculate the lap time and by the data analysis software to indicate the start of each lap.

The speed information can be used for display and logging purposes, eliminating the need for wheel speed sensors. This is particularly useful for marine applications as there are no wheel speeds available.

GPS position information can be used in MoTeC's *i2* data analysis software to show and compare the driven lines and to create track maps. The driven lines can also be plotted over a Google Earth image, allowing circuit racers and rally drivers to see the path travelled in a real life context.

Mounting

The GPS unit has an integrated antenna and should be mounted on an external horizontal surface that has a clear view of the sky. The unit should be mounted away from sources of interference including other antennas.

If mounting on a non metallic surface it may be necessary to add a metallic ground plane under the unit to improve the signal level. The ground plane should be at least 150 mm (6 in) square and may be made of aluminium or steel.

Electrical Connections

The GPS unit sends data to the logging device via an RS232 serial connection.

The wiring between the GPS connector and the logging device should be as short as possible, preferably less than 1 m (3 ft).

The following table shows how to wire the GPS unit to a number of MoTeC logging devices.

GPS Pin	GPS Name	Logging Device Pin Name	ADL3	SDL3	ACL	M84/M400/M600/M800/M880 ECU
1	Bat -	Bat -	7	4	Bat- from VIM/SVIM	15
2	TX	RX	79	34	15	18
3	RX	Not Used	-	-	-	-
4	5V	5V	18 etc	14	Requires 5V from VIM/SVIM	9

Note that the ADL3 and SDL3 logging devices only have one serial connection therefore if an ECU is to be connected then it must be connected via CAN. (Note that not all ECUs have a CAN connection)

GPS Configuration

The GPS-L10 comes preconfigured from MoTeC to suit MoTeC data loggers. The GPS-L5 comes preconfigured to suit MoTeC's 'Hundred Series' and M84 ECUs.

Software Version

The MoTeC device must be running the following software version (or higher)

- SDL3 Version 2.2 or higher
- ADL3 Version 5.2 or higher
- ACL Version 1.1 or higher
- M84 Version 1.10K2 or higher
- M400/M600/M800/M880 Version 3.51U2 or higher

M84/M400/M600/M800/M880 ECU Setup

Ensure you are using the GPS-L5 unit. In the relevant MoTeC ECU Manager software on the **Adjust** menu click **General Setup>Communications>RS232 Telemetry Setup**

- Enter Telemetry Baud Rate **19201**
- Enter Telemetry Data Set **0** to turn the dataset Off

The M84 and 'Hundred Series' ECUs only process channels with 16 bit resolution. While logging, the 32 bit channels Time, Longitude and Latitude will be split into two 16 bit values. When viewing the data, using **i2** data analysis software, the original 32 bit values will be reassembled.

ECU Data Logging Setup

In the relevant MoTeC ECU Manager software on the **Adjust** menu click **General Setup>Data Logging Setup>GPS**

- Enter GPS Latitude HW **10**
- Enter GPS Latitude LW **10**
- Enter GPS Longitude HW **10**
- Enter GPS Longitude LW **10**
- Enter GPS Speed **10**.

ADL3/SDL3 Dash Setup

In the relevant MoTeC Dash Manager software on the **Connections** menu click **Communications**.

- Select **RS232** in the list and then click **Select**
- Select **GPS - Standard RMC GGA** template and click **OK**
- Change the *Baud Rate* to **19200 (when using GPS-L5)** or **38400 (when using GPS-L10)** and click **OK**

ACL/ADL3/SDL3 Data Logging Setup

In the relevant MoTeC Manager software on the **Functions** menu click **Logging**

- Log *GPS Latitude, GPS Longitude and GPS Speed*. The other GPS channels are optional.
- The logging rate for all GPS channels should be set to 10 Hz when using the GPS-L5 or if using the GPS-L10 set the logging rate to 20 Hz in the Logger.

GPS Beacon Setup

Please refer to **CTN0003 Basic GPS Beacon Setup** for procedure to setup or change the GPS Lap Beacons in your MoTeC Dash Logger.

GPS Operation

In normal use the GPS unit should start operating within 15 to 45 seconds of power up, however during first start-up or if the GPS has been moved to a new location it may take up to 5 minutes before it gains satellite lock and starts transmitting data.

To check that the GPS is operating correctly check the number of satellites being received using the logging device Manager software.

The GPS requires a minimum of 4 satellites to function. Normally, however, the GPS should see at least 7 satellites. If the GPS sees more satellites it will improve accuracy and minimise satellite drop out.

Loss of signal may occur when the satellites are obscured by trees, buildings or a bridge. The GPS will take a second or two to recover from this situation.

Data Analysis

GPS data analysis requires *i2* data analysis software version 1.02 or higher.

All GPS channels (speed, heading, altitude etc.) can be used in the usual way including plotting on a graph.

The GPS position data (latitude and longitude) can also be used for the following:

- To plot the actual path travelled on a GPS Track component
 - On the *Add* menu select *GPS Track*
- To generate the conventional track map
 - On Tools menu select Track Editor
 - Select Generate Track and then GPS method
- To plot the path travelled over a Google Earth image
 - On the File menu select Google Earth Export

Specifications

Electrical

Power Supply Voltage	4.0 to 6.0 V
Power Supply Current	38 mA Typical

Connections

Mating Connector Deutsch DTM06-4S

Pin	Name	Description
1	Bat -	Connect to Battery Negative on the logging device
2	TX	Connect to RX pin on logging device
3	RX	Don't connect (this pin is only used for programming)
4	5V	Connect to 5 V sensor supply on the logging device

Data

Output Type	RS232
Output Levels	-5 V / 5 V (nominal)
Baud Rate GPS-L5	19200 (MoTeC default)
Baud Rate GPS-L10	38400 (MoTeC default)
NMEA Sentences	RMC, GGA (MoTeC default)

Physical

Antenna	Built into GPS unit
Size	48 mm x 41 mm x 14 mm (1.9" x 1.6 x 0.55")
Weight	106 g (3.8 oz)
Cable length	3 m (10 ft)
Operating Temp	-30 °C to +80 °C (-22 F to 176 F)
Mounting	Magnetic base

GPS Performance

Update Rate	5 Hz (GPS-L5), 10 Hz (GPS-L10)
Satellite Channels	66
Reacquisition Time	< 1 sec
Hot Start Time	2 seconds
Warm Start Time	33 seconds
Cold Start Time	35 seconds
Dynamics	4G