USER MANUAL

www.etbinstruments.com

1   DigiDash² Introduction

The DigiDash² is easy to use and install. Most people will get the hang of the unit in a few minutes. This manual is provided as guide and reference.

> **Before cutting any holes or wires, please read through this manual.**

The DigiDash² consists of separate Datalogger and Display units. The Display allows you to configure the main parameters without the need for a PC. The Datalogger without a Display connected requires a PC to configure. The Datalogger is mounted on a flat surface inside the vehicle cockpit, whilst the Display unit can be mounted either directly on the Dashboard or on the steering wheel itself. In either mounting position, the A and B function buttons can be remotely wired using a remote button kit available from ETB Instruments. This kit comprises four buttons, two of which extend A and B, and two others that provide extra menu functions.

1.1   Datalogger Key Features

The Datalogger can be used as a stand-alone unit without a display connected, logging numerous vehicle parameters. This data can then be downloaded to a Laptop PC and analysed using the accompanying DigiTools Software.

The parameters which can be recorded are:

- Engine Revs (RPM);
- Speed (MPH or KMH);
- Engaged Gear;
- Brake %
- Oil Pressure;
- Oil Temperature;
- Water Temperature;
- Fuel Level;
- Auxiliary Pressure (Can be used for Fuel or Boost Pressure);
- Battery Voltage;
- Lap Number
- Lap Times (s)
- Split Times (s)
- Longitudinal G-Force;
- Lateral G-Force

Note: References to the Datalogger relate to the Datalogger box. The word 'Logger' is used to describe the recording of data.

1.1.1   Datalogger Front View
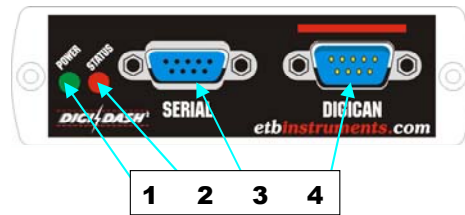
1.1.1.1   POWER Indicator

The **Green** LED illuminates when the unit is switched on, powered up and operational.

🟢	**Light On:**	**Power Supply OK. Functioning Normally**
⚪	**Light Off:**	**No Power Supply.**

1.1.1.2   STATUS Indicator

The **Red** LED has two modes of operation, which can be programmed via the DigiTools:

- Sensor **STATUS** – (Default Setting) The LED functions as an individual signal test LED for the speed sensor, tachometer (RPM) and lap trigger sensor. The LED will illuminate when one of these 3 signals is triggered. For example, this can be used to check whether the speed sensor is detecting a magnet as it passes the sensor head. Once all the sensors are checked the Status Light can be configured to show:

- Logger **STATUS** – The LED will indicate the Status of the Logger.

⚪	**Light Off:**	**Logger is switched off.**
🔴	**Light On:**	**Logger is on. (Recording Data)**
◐	**Light Flashing Slowly:**	**Logger Memory Full**
☀	**Light Flashing Rapidly:**	**Memory Error. (Contact ETB)**

1.1.1.3   SERIAL Port

Using the serial link cable supplied with the DigiDash2, the Datalogger can be connected to a laptop computer via this port in order to download / delete logged data or configure the DigiDash2 functions.

1.1.1.4   DIGICAN Port

This connection is the CAN bus link to the Display unit via the cable supplied.

1.1.2   Datalogger Rear View
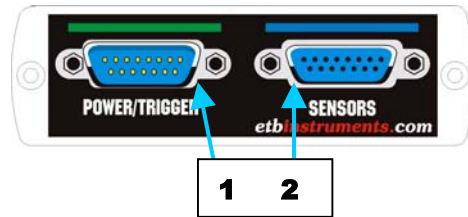
1. **POWER/TRIGGER** Port

Inputs to this connector include 12v supply, Ground, Speed, RPM and for a stand-alone ON/OFF switch for Logging data.

2. **SENSORS** Port

All major sensors and other logged inputs are connected to this port.

1.2   Display Key Features

The DigiDash² has multi-purpose displays to show a variety of vehicle parameters.

The displays include:

- Engine Revs (RPM);
- Sequential gear shift-up lights;
- Speed (MPH or KMH);
- Gear;
- 2 axis G-Sensor
- Water Temperature in °C/°F
- Oil Pressure in PSI/BAR
- Auxiliary Pressure (Can be used for Fuel or Boost Pressure)
- Oil Temperature in °C;°F
- Fuel Level;
- Battery Voltage;

- Power (BHP)
- Lap Times;
- Acceleration/Deceleration Time;
- Trip Time and Distance Display;
- Engine Hours
- Max Holds on all Key Parameters;
- Odometer;
- Alarms for 2 Pressures, Oil Temperature, Water Temperature and Fuel Level.

The DigiDash also integrates 6 Warning Lights, of which the Auxiliary (AUX) warning light can be configured using the software to display one of 3 different functions:-

- Main Beam;
- Fog Lights;
- Direction Indicator;
- Ignition/Low Battery;
- Brake Fail / Handbrake on Warning;
- Auxiliary   -   Over Speed Warning
                  -    Logger On / Off
                  -    Neutral Gear (for bike-engined vehicles)

1.2.1   Display Front View
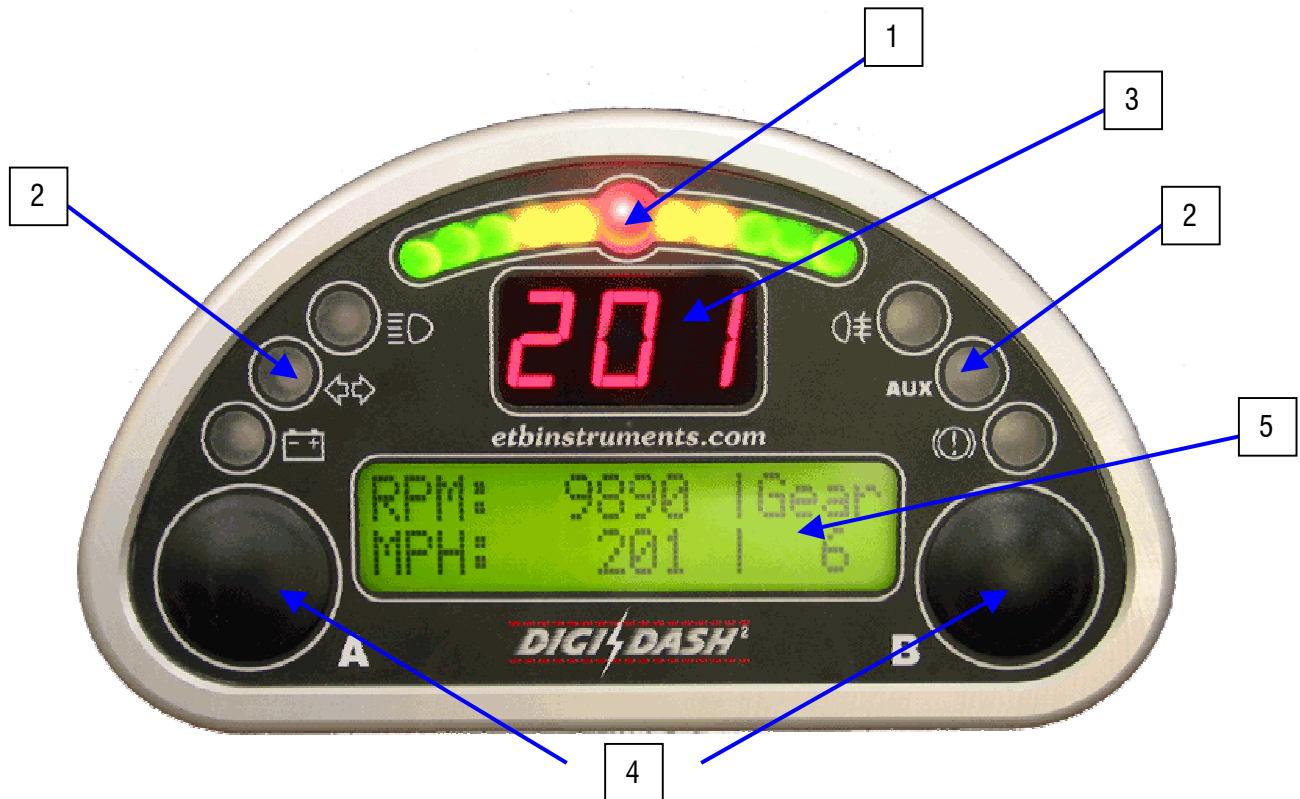
1. Sequential gear shift up lights – can be used in two different modes

2. Dashboard warning lamps

3. Large 3 digit 7 segment (Red) LED display for Speed, Gear, RPM or Warning Alarms. Decimal point on the 1st Digit can be programmed to indicate that the DataLogger is recording.

4. Simple 2 button controls, marked **A** & **B**.

5. Large backlit (Green) LCD display for sensor readouts, menus and warnings.

1.2.2   Rear View

M3x5 Mounting Holes (x8)
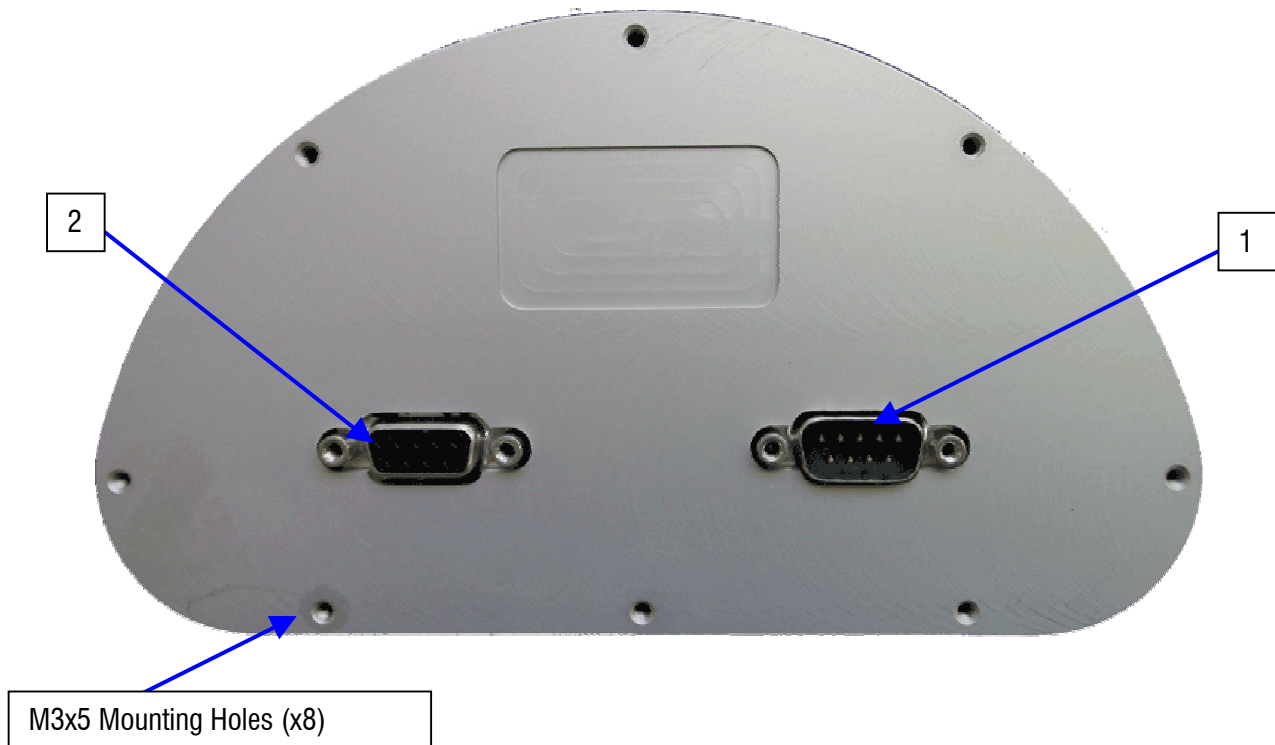
1. **DIGICAN** Connector – This should be connected to the **DIGICAN** port on the Datalogger.

2. External Button Connector – This can be used for connecting 4 external buttons – 2 duplicate buttons for A & B and 2 others, C and D, for accessing extra functions.

1.3   Packaging Checklist

Standard Items:

	Qty
Datalogger	1
Display	1
Water Temperature Sender	1
Oil Temperature Sender	1
Oil Pressure Sensor	1
Fuel Level Sender	1
Magnets for prop shaft	2
Wiring Looms (different connectors for each)	6
CDROM *(As well as this main manual it includes software for data analysis, set-up & speedometer set-up calculator)*	1
M3 Mounting Bolts	8
Quick Start Guide	1

DigiDash Installation

1.4   Mounting the Datalogger

The Datalogger incorporates a 2-axis G-Force sensor within the unit. Although these axes can be reversed using the DigiTools software to suit either longitudinal or lateral mounting positions within the vehicle's cockpit, it is essential that the Datalogger box is mounted on a <u>flat</u> surface for the G-sensor to zero correctly.

The recommended orientation of the Datalogger box as follows:-
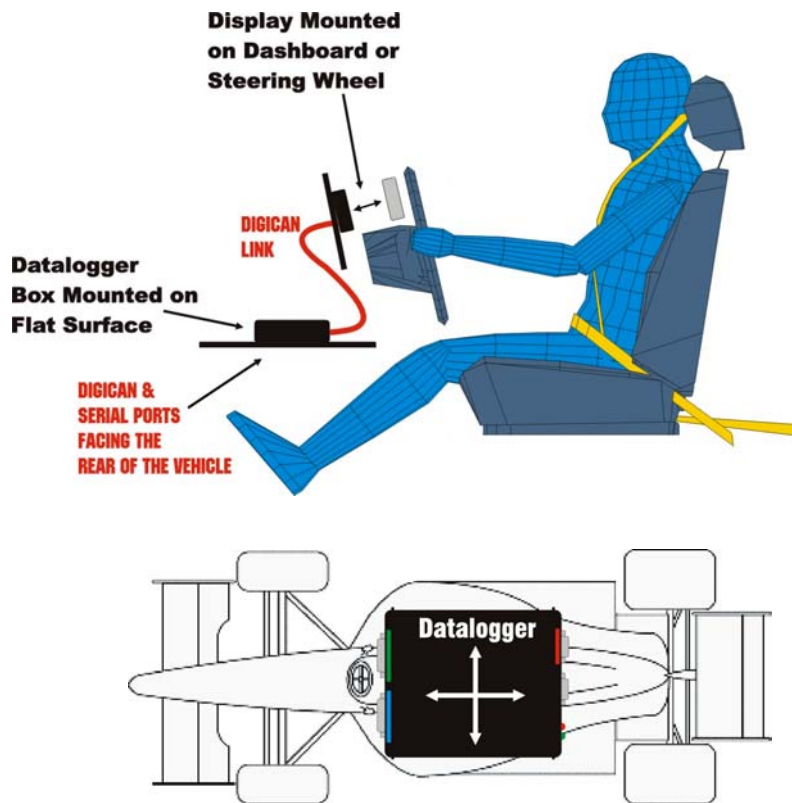
1.5   Mounting the DigiDash² Display

Before cutting any holes in the dashboard, make sure that the location of the DigiDash² is easily visible from the driver's final position. Also ensure that there is sufficient clearance behind the unit for the connectors and loom.

Note : The DigiDash² Display should be directed towards the driver. If the dash is mounted at too steep an angle the shift lights and warning lights will not be easily visible.

The DigiDash² has been designed to mount either on a flat dash panel behind the steering wheel or by using a fixing bracket, the steering wheel itself.

Templates for the fixing screw holes on the Display unit are shown in Appendix 3.

1.6   Sensor Installation

1.6.1   Speed sensor *(POWER/TRIGGER Cable)*

The DigiDash[2] is supplied with a solid state speed sensor and this <u>must</u> be used to provide the speed signal for the DigiDash[2]. The sensor consists of a hall-effect magnetic pickup housed in an M12 Nylon threaded rod.

Two magnets are provided for attachment to either a propshaft, wheel hub or drive-shaft coupling. The magnets should be fixed in position using Epoxy Resin Adhesive, sometimes known under the trade name of 'Araldite'. If you have the choice it is recommended to install the speed sensor on the propshaft as accuracy will be improved.

The magnets have small 'dots' on one face. These denote the magnet's North pole. The magnet <u>MUST</u> be mounted with the dot facing <u>down</u>. For further help in setting up the speed sensor and magnets, please refer to Appendix 2 (Section 6).

You will need to fabricate a suitable metal bracket to hold the sensor in a position such that the magnets pass in front of the sensor as they rotate in relation to the vehicle's speed. Using the threaded body and nuts supplied, the sensor should be adjusted until the gap between the sensor and magnets is approximately **1mm**

The sensor must be mounted so that this gap remains constant. This means that the sensor must be mounted such that it moves in unison with the surface upon which the magnets are mounted. Examples of this would be:-

<u>Magnets location</u>	<u>Sensor Bracket Location</u>
Differential / Propshaft Flange	Differential Casing
Propshaft – Gearbox output	Gearbox
Front wheel hub	Steering arm

(Please see Quick Start Guide or Appendix 2, Section 6 for further visual reference.)

The red **STATUS** LED on the Datalogger can be used to verify that the Speed Sensor is receiving a signal as each magnet passes in front of it. In order to do this you must first set the operation of the **STATUS** LED on the Datalogger to Sensor Mode using the DigiTools Configure software (General Settings TAB).

Simply turn the propshaft (or component on which the magnets are mounted) by hand and you should see the red **STATUS** LED illuminate.

1.6.2   Oil & Water Temperature Sensors

Oil and water temperature senders are supplied as standard. To ensure accuracy in the display it is essential that these senders are used with the DigiDash. Use of other senders is not permitted and will result in inaccurate readings.

Note : The DigiDash is calibrated to provide accurate readings over the range 40ºC to 140ºC only. If the sensor is not connected properly, then the display will show NC (Not Calibrated or No Connection).

Most engines have the water temperature sender located either in the radiator, or in the cylinder head. To maintain accuracy please use this sensor in the standard location for your engine. If the existing water temperature sensor is required by the engine management system, an alternative location will need to be found.

Oil / Water Temperature Sender 1/8" NPTF Thread	ETB Part# 470010

Thread adapters are available separately from ETB to suit the many engine variants.

1.6.3   Oil & Auxiliary Pressure Sensors

A pressure sensor is included with the DigiDash2 as standard and measures pressure to a maximum of 140 PSI, usually for oil used for engine oil pressure. The DigiDash2 is designed to work correctly with this sensor only. To ensure accuracy in the display it is essential that this sender is used with the DigiDash. Use of other senders is not permitted and will result in inaccurate readings.

Note : For motorcycle engined cars, it is essential to remote mount the oil pressure sensor rather than directly onto the engine block. This is to prevent premature failure of the sensor caused by the high frequency vibration generated by high-revving motorcycle engines. A remote mount kit is available separately from ETB – please telephone +44 (0)1702 711127 for details.

!! Important - ETB Instruments will not replace faulty oil pressure sensors under warranty unless it can be proved that the sensor was correctly remote-mounted!!

The body of the sensor must be earthed for the sensor to function correctly. If the sensor is not connected properly the DigiDash will display 'NC'.

A second pressure sensor can be purchased separately and connected to the Datalogger to measure an additional source. As examples, this could be used for fuel pressure or positive boost pressure .

Auxiliary Pressure Sender (with low pressure switch built in) 1/8" NPTF Thread	ETB Part# 38007025053

1.6.4   Fuel Level Sensor

The DigiDash2 is supplied with ETB's standard 6-hole, top-mount lever-arm fuel sender, and the default setting in the DigiTools configuration is set for this sensor.

However, alternative sensors, available separately from ETB, can be used by configuring the Digidash2 using the DigiTools software. These are:-

VDO Lever-Arm Fuel Sender
VDO Dip-Pipe Fuel Sender
Capacitive Type tube sensor (resistance range 10-180Ω)

To ensure accuracy in the display it is essential that one of these sensors is used with the DigiDash2. Use of other senders is not permitted and will result in inaccurate readings.

If the sensor is not connected properly the DigiDash will display 'NC'.

Additional Fuel level sender fitting instructions for the standard ETB lever-arm sensor can be found in Appendix 9.

1.6.5   Lap Timer Receiver (optional extra)

The Lap timer module uses an infra-red sensor similar to that used in television sets.
This is designed to be used with any common track beacon, or the optional infra-red beacon from ETB.

The lap timer receiver module is housed in a small plastic box, which has a cut-out with the sensor clearly visible. This sensor should be firmly fixed to the side of the vehicle that is exposed to the trackside beacon.

The range of the sensor is around 20 metres so should be sufficient for most tracks.

Problems with the lap timer can be diagnosed using the Datalogger red **STATUS** LED in Sensor Mode, and your TV remote control.

For further details on using the DigiDash[2] Lap timing system please refer to section 3.4.

For details on wiring please see the wiring section at the end of the document.
Please see the drawing in Appendix 5 for mounting details.

1.7   Wiring the DigiDash² Datalogger

All main connections to the DigiDash² are made via two 15-way D-type connectors on the Datalogger, marked **POWER/TRIGGER** and **SENSORS**.

These two connectors are colour-coded to match the coloured stripes on the Datalogger, and are gender specific to prevent incorrect connection.

The blue colour connector should be plugged in to the **SENSOR** connector on the Datalogger box. The **SENSOR** cable has 12 wires all of 1 metre length. These wires are intended to be joined into the existing wiring of the vehicle. The joints can be made in several ways, including ScotchLocks and soldering. Simply twisting the wires and covering with tape is NOT a good method of wiring the DigiDash and will result in unreliable joints. A well-soldered and insulated joint or crimp connectors are the best means of wiring the vehicle.

There are numerous help sites available on the Internet. Below is an example site:

www.users.globalnet.co.uk/~bunce/solderit.htm

The **POWER/TRIGGER** cable with the green connector is supplied with a suitable length of cable to suit most vehicles and does not require connection to the existing wiring loom. The cable includes the speedometer sensor, lap trigger input, the RPM input, main power 12v feed + ground wire and an optional wire for a single pole / single throw toggle switch (used for switching the data recording facility (logger) on or off).

1.8   Connecting the DigiDash² Display

The Datalogger is connected to the main Display unit via a CAN bus link cable. This is identified by the red 9-way D-type connectors, and is the same gender at each end. This means that it does not matter which way round you connect the cable.

One end of the cable is connected the Datalogger port marked with a red stripe and the word **DIGICAN**. The other end is connected to the 9-way socket on the Display unit. The Display connectors are gender specific and cannot be incorrectly connected.

Please refer to Appendix 1 for the full details of the wiring.

1.9   Ignition Systems / Tachometer Wiring

The green **POWER/TRIGGER** connector incorporates a shielded 2-core wire for connecting the tachometer input.

The DigiDash[2] RPM monitor is designed to connect directly into a variety of different ignition systems. There are a huge variety of systems used in vehicles. The feed for the RPM tachometer wire (red wire) should come from a Low Voltage Connection (e.g. the negative (-ve) side of the ignition coil). On many vehicles this will most likely be from the IGNITION COILS LT connection. On engines that feature modern ECU's (also called CDI's with bike engines) there may be a dedicated TACHO output. This is usually routed to the car's rev-counter and is the ideal position to which to connect the tachometer wire.

If you experience interference problems that are related to RPM, connect the Clear wire <u>and</u> metallic shield to the vehicle's chassis ground.

<div style="border:1px solid black">

WARNING

Under no circumstances should the tacho feed be taken from a High-Tension circuit (from the HT side of a coil, or a spark-plug).   This will DAMAGE the unit and will invalidate the product's guarantee.

</div>

The red **STATUS** LED on the Datalogger can be used to verify that the tachometer input is receiving a good signal. In order to do this you must first set the operation of the **STATUS** LED on the Datalogger to Sensor Mode using the DigiTools Configure software (General Settings TAB).

The red **STATUS** LED will illuminate on receiving a pulsed signal on the tachometer input.

Note : Some ECU's may require a pull-up resistor to 'pull-up' the output signal voltage to 12v. Please contact ETB Instruments should you experience problems with a tachometer input.

2   Configuring DigiDash²

The setup and various parameters of DigiDash² can be configured either directly using the Display or via a Laptop using the DigiTools software.

2.1   Configuration via Display

2.1.1   Selecting SETUP MODE

This mode allows the user to define all essential parameters when setting up the DigiDash² to match the vehicle's specifications. It also allows the user to turn on or off certain functions, or to set the required DigiDash² display brightness / contrast levels.

(NOTE- If you have a Windows based personal computer, you can use the software supplied to directly change all the parameters that can be normally accessed via SETUP MODE as well as a host of extra features. To do this, please refer to the section headed ''DigiTools PC Software'' on page 20 under Section 4.)

To enter **SETUP MODE:**

- Ensure DigiDash2 is turned ON;
- Hold down the LEFT (A) and RIGHT (B) dash buttons for 2 seconds.

To enter the set-up Menu, Hold Down Buttons A & B together for 2 seconds

You should see the LCD show text similar to the above. To move to the next Menu screen, press Button 'A'. To Edit the Menu displayed, press Button 'B'. Once you have finished editing a particular Menu screen, press Button 'A' (shown on LCD as 'Ok') to return the Main editing menu. For a full explanation of the button functions in Setup mode, please refer to Section 2.1.3 on the following page.

2.1.2   Exit Setup Mode
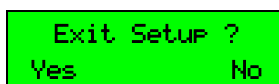
To QUIT SETUP mode, press buttons A & B together for 2 seconds and you will be asked if you wish to exit SETUP mode. Press button A ('YES') to exit.

2.1.3   Button Function (Setup Mode)

The DigiDash[2] buttons have different functions depending on whether you are in Setup (Configuration) Mode, or using the buttons during general operation (See Section 3.1).

Even more functionality is accessible when using the remote button kit (contact ETB for details) which is attached to the connector on the back of the display unit. This allows you to remote mount buttons on a steering wheel for instance. The remote button kit has 4 buttons. Two duplicate Buttons **A** and **B**, and two others, **C** and **D**.

Button **A**	Press Once	Moves to the Next **LCD** display screen
	Hold Down	No Function
Button **B**	Press Once	Press to Edit and increase (Add) numeric parameter
	Hold Down	When changing numeric parameter, number increases at a faster rate

If a remote button kit is connected, the following functions are available using Buttons **C** and **D**.

Button **C**	Press Once	Moves to the Previous **LCD** display screen
	Hold Down	No Function
Button **D**	Press Once	Decreases numeric value
	Hold Down	When changing numeric parameter, number decreases at a faster rate

2.1.4   Setup Mode Menu Detail

After selecting SETUP MODE you will see the first of the menu options on the main LCD display that the can be adjusted (Brightness). You can either continue to the NEXT menu by pressing button A, or EDIT the displayed menu by pressing button B.

The are 30 Setup menu options as shown below.

Brightness Next->Quit<-Edit	Contrast Next->Quit<-Edit	Lap Blank Next->Quit<-Edit
LED Startup Menu Next->Quit<-Edit	Reset/Clear Next->Quit<-Edit	Track Length Next->Quit<-Edit
MPH or KMH Next->Quit<-Edit	Water Temp Alarm Next->Quit<-Edit	Oil Temp Alarm Next->Quit<-Edit
Oil PSI Alarm Next->Quit<-Edit	RPM/PSI Alarm Next->Quit<-Edit	Aux PSI ALARM Next->Quit<-Edit
Fuel Level Alarm Next->Quit<-Edit	Accel Test Start Next->Quit<-Edit	Accel Test Stop Next->Quit<-Edit
Shift Mode Next->Quit<-Edit	Shift RPM Next->Quit<-Edit	Shift Delta Next->Quit<-Edit
Pulses/Cycle Next->Quit<-Edit	Speedo Cal Next->Quit<-Edit	Gear Cal Next->Quit<-Edit
Veh Weight Kg Next->Quit<-Edit	Primary Ratio Next->Quit<-Edit	Num Gears Next->Quit<-Edit
Gear 1 Next->Quit<-Edit	Gear 2 Next->Quit<-Edit	Gear 3 Next->Quit<-Edit
Gear 4 Next->Quit<-Edit	Gear 5 Next->Quit<-Edit	Gear 6 Next->Quit<-Edit

If you choose to EDIT a menu option, two alternative choices can be made:

1. Accept the value displayed, and return to the Options Menu. This is done by pressing Button A, indicated as 'Ok'.

2. Change the value of your chosen parameter. This is done by pressing button B. To increase the value in larger increments, just hold down button B.

Button-A accepts the value and returns to the menu selections

Button-B increases the value. Hold down the button to increase the value in larger step sizes.

2.1.4.1   Brightness

```
   Brightness
Ok      6      Add
```

This value sets the display brightness for the large 7-segment display, the shift lights and warning lights. The range is from 0 (very faint) to 15 (very bright). The default setting is 6.

2.1.4.2   Contrast

```
    Contrast
Ok      6      Add
```

This value sets the contrast for the main LCD display.
The range is from 0 (very dark) to 15 (very light).
The default setting is 6.

2.1.4.3   Lap Blank

```
   Lap Blank
Ok      48     Add
```

The Lap Receiver Sensor available separately from ETB for your DigiDash2 is designed to use any form of trackside infrared beacon. These are present at all tracks. For accurate results, it is important that you pick up a signal from only one beacon at a time. To do this, the DigiDash2 must be set to reject other beacons. This is done by setting the "Lap Blank" period, which is the time (in seconds) that the DigiDash2 will wait <u>before</u> it starts to look for beacons again.

For example: If you are lapping in around 1min 30secs set the Lap Enable Time to 75 (1min 15secs). In other words, after DigiDash registers a beacon, it will wait 1min 15secs before looking for a beacon again. The range is from 0 to 255 (seconds.) The default setting is 48.

*Note : If there are no beacons available or working then you can use the Lap Timer in Track Day Mode. <u>Disconnect your lap trigger module</u> and select 0 for the Lap Blank period. This will then convert external Button **D** to be a manual trigger rather than the lap reset button. See Section 3.4.1 for further information.*

2.1.4.4   LED Startup Menu

```
LED Startup Menu
Ok    SPEED    UP
```

This sub-menu allows you to select which parameter indicated on the 3-digit red LED window is shown by default when the DigiDash2 is switched on.
The choice of displays is SPEED, RPM or GEAR.

2.1.4.5   Reset/Clear

```
   Reset/Clear
Ok CLEAR LOG   UP
```

This sub-menu enables you to either directly CLEAR the Logger memory, or RESET all MAX recorded values without having to either use the DigiTools software or visiti each MAX hold screen to reset. CANCEL exits the menu.

2.1.4.6   Track Length

```
  Track Length
Ok    3120    Add
```

Track Length specifies the length in metres of the race track. The track length can be set between 0 and 10,000 metres (10Km).

2.1.4.7   MPH or KMH

```
  MPH or KMH
Ok    MPH     Add
```

Configures the DigiDash2 for either Miles per hour, or Kilometres per hour.

2.1.4.8   Water Temperature Alarm

```
Water Temp Alarm
Ok    105     Add
```

This allows the user to program a warning alarm point for the Water Temperature in °C steps. Default = 105°C. To turn off the alarm (not recommended) set the value to 0. When activated the alarm is indicated by the letters *CTA* on the 3-digit red LED display.

2.1.4.9   Oil Temperature Alarm

```
Oil Temp Alarm
Ok    110    Add
```

This allows the user to program a warning alarm point for the Oil Temperature in °C steps. Default = 110°C. To turn off the alarm (not recommended) set the value to 0. When activated the alarm is indicated by the letters *OTA* on the 3-digit red LED display.

2.1.4.10   Oil Pressure Alarm

```
Oil PSI Alarm
Ok    20    Add
```

This allows the user to program a warning alarm point for the oil pressure in 1 psi steps. Default = 20psi. To turn off the alarm (not recommended) set the value to 0. When activated the alarm is indicated by the letters *OPA* on the 3-digit red LED display.

NOTE – The ETB oil pressure sensor supplied with the DigiDash[2] has a mechanical low-pressure switch built-in should a separate dashboard warning light be required. This is calibrated to operate when oil pressure falls below 7.5 psi. If this switch is activated, the LED display will show O.I.L. on the 3-digit red LED display.

2.1.4.11   RPM/Oil Alarm

```
RPM/PSI Alarm
Ok    2500    Add
```

This allows the user to set a minimum RPM value below which the oil pressure alarm (as set in the previous menu option) will <u>NOT</u> operate. This is especially useful should you wish to set the oil pressure to a value lower than normally experienced when a hot engine is idling and not have the alarm displayed unless the engine RPM is above a certain limit. To turn off the RPM/Oil feature, set the value to 0.

2.1.4.12   Aux Pressure Alarm

```
Aux PSI Alarm
Ok    20    Add
```

This allows the user to program a warning alarm point for the Auxiliary pressure in 1 psi steps. Default = 20psi. To turn off the alarm set the value to 0. When activated the alarm is indicated by the letters *FPA* on the 3-digit red LED display.

2.1.4.13   Fuel Level Alarm

```
Fuel Level Alarm
Ok    20    Add
```

This allows an automatic warning of low fuel level, measured as a percentage (%) of a full tank. To disable the alarm, set to 0. When activated the alarm is indicated by the letters *FLA* on the 3-digit red LED display.

2.1.4.14   Acceleration/Deceleration Test Start/Stop

```
Accel Test Start
Ok    0    Add
```

```
Accel Test Stop
Ok    60    Add
```

These two options allow the setup of the acceleration timer start and stop speeds.
<u>Acceleration Timer</u>: If the start speed is lower than the stop speed an acceleration run is timed.
<u>Deceleration Timer</u>: Conversely, a higher start speed than stop speed implies a deceleration (braking) run.

2.1.4.15   Shift Mode

```
Shift Mode
Ok    1    Add
```

The sequential shift lights can be programmed to come on in two different styles.

Style	LED Pattern displayed
0	Shift Lights OFF
1	Fully sequential
2	LED's change 3 blocks at a time

2.1.4.16   Shift RPM

```
     Shift RPM
 Ok   10200   Add
```

This allows the user to program the <u>final</u> shift light LED RPM trigger point. The shift RPM is set in 100 RPM steps.

2.1.4.17   Shift Delta

```
    Shift Delta
 Ok    500    Add
```

This allows the user to set the RPM change required to light the next shift LED. The shift delta RPM is set in 100 RPM steps.
Note that this RPM setting works for each LED or set of LED's and is dependent on the shift light mode chosen.

For Example: If the user sets Shift Light Mode = 1 (fully sequential), with a final Shift Light RPM of 10,000 RPM, each of the lower shift lights will illuminate at the RPM increment below this. If the shift delta set to, for example, 500 RPM, the shift lights would illuminate at:

First LED	Green		7500 RPM
Next LED	Green		8000 RPM
Next LED	Green		8500 RPM
Next LED	Yellow		9000 RPM
Next LED	Yellow		9500 RPM
Shift Light RPM Set Value	-	Final LED Red	10000 RPM

If the final Red shift light is illuminated for more than 1 second, the entire bank of shift lights will rapidly flash.

2.1.4.18   Pulses per Cycle

```
   Pulses/Cycle
 Ok    4     Add
```

The DigiDash² will run with various different ignition systems. This menu option allows the user to tailor the system to their engine. The pulses/cycle setting effectively represents the number of cylinders the engine has. However the number of pulses generated can vary greatly depending upon the number of ignition coils on a particular engine or the output from an engine management system. The unit can be set from 1 to 8 pulses per cycle.

Note : Often the easiest way to set this parameter is to run the engine at an idle and read the RPM display. Most engines idle around 1000RPM when cold. If the reading says 500RPM then change the pulses-per-cycle to <u>half</u> of its current setting.

2.1.4.19   Speedo Calibration & Gear Calibration

```
    Speedo Cal
 Ok    1748   Add
```

```
    Gear Cal
 Ok    3266   Add
```

These are key numbers for the system and define the calibration of the speedometer, odometer and gear display. Note that for legal reasons the MPH displayed on the DigiDash reads 3% high at all speeds. If you have problems with the calculations we will be on hand to help. Before the DigiDash can be used the user must calculate and input the Pulses per mile and prop ratio figures. To do this a computer program is supplied on the floppy disk supplied. If you do not have access to a computer or need advice on the best place to measure the vehicle's speed please contact ETB Instruments for help.

> **Information you need to calibrate the unit:**
> - Wheel & tyre size
> - Differential Gear ratio (when the speed sensor is fitted to propshaft)
> - Details of the cars transmission system (RWD, FWD etc)

<u>***Note - You MUST use BOTH magnets supplied with the kit.***</u>

2.1.4.20   Vehicle Weight (Kg)

```
Veh Weight Kg
Ok   600   Add
```

This allows the user to specify the weight of the vehicle in kilograms (Kg). This is used for the BHP / Power calculation.
The valid range is 250 to 2500Kg. Default = 600Kg.

2.1.4.21   Primary (gear) Ratio

```
Primary Ratio
Ok   1500   Add
```

This is the primary reduction gear ratio of the vehicles engine. For car engines this should be set to 1000 (1:1). For Bike engines the ratio is generally around 1.5:1 – which is entered as 1500 here. Check your service manual to get the correct ratio values for your particular engine.

2.1.4.22   Number of Gears

```
Num Gears
Ok   6    Add
```

Allows the number of gears in the vehicle to be entered. The valid range is between 2 and 6.

2.1.4.23   Gear Ratios 1-6

```
Gear 1
Ok   2769   Add
```

This allows the entry of the vehicles gear ratios.
It is shown as a 4-digit number. The first digit represents the integer, whilst the others represent the three decimal places.
For example, for a ratio of 2.769 : 1 you enter 2769

2.2 Configuration Using DigiTools Software

The DigiDash2 is best configured using the DigiTools software supplied on the CD-ROM, as this allows access to all the settable features by the user.

Please refer to section 4 entitled "DigiTools PC software" for instructions on how to use the software for configuration and data analysis.

3   Using the DigiDash[2] Display

There are two main information areas on the DigiDash[2] Display. These can be cycled through various displays using the **A** or **B** buttons during normal use.

Section 3.3 – Green LCD Display

Section 3.2 – RED LED Display

Press Button **A** to change Green LCD Display

Press Button **B** to change RED LED Display

3.1   Button Functions (General Operation)

The DigiDash2 has two functions per button. A normal button press has one function and prolonged button press for more than 2 seconds has another. This allows you to switch menus, reset variables, select different modes such as configuration, all with just two buttons on the display.

Even more functionality is accessible when using the remote button kit (contact ETB for details) which is attached to the connector on the back of the display unit. This allows you to remote mount buttons on a steering wheel for instance. The remote button kit has 4 buttons. Two duplicate Button A and Button B, and two others, C and D, allow you to access extra functions.

Button **A**	Press Once	Moves to the next **LCD** display screen
	Hold Down	To Start / Stop the Logger. *(If enabled in DigiTools Configure)*
Button **B**	Press Once	Move to the next **LED** display
	Hold Down	Resets current LCD displays *(For example Max Hold Screens)*

**Holding Down Buttons A *and* B together enters Configuration Mode.
(Only possible if Speed = 0)**

Button **C**	Press Once	Moves to the previous **LCD** display screen
	Hold Down	No Function
Button **D**	Press Once	1. Acts as a Start / Stop for the Lap Timer in Track Day Mode 2. Arms Lap Timer and acts a reset in Race Day Mode
	Hold Down	No Function

3.2   RED 3-Digit LED Display

The large three-digit (7 segment) display in the middle of the DigiDash² is used to display one of five parameters:-

1.   Speed (MPH or KMH)
2.   RPM
3.   Engaged Gear
4.   Warning Alarms
5.   Logger Status *(On or Off - Configured using DigiTools Software)*

Press Button **B** to cycle between Speed, RPM and Engaged Gear:-

3.2.1   Speed

The RED LED display can be used to indicate the speed of the vehicle. This can either be in miles per hour (MPH) of kilometres per hour (Km/h) depending on the unit of measurement selected. MPH or Km/h can be selected either directly via the display using Setup mode (see 2.1) or by using the DigiTools configuration software (See 4.1). The maximum possible indicated speed in MPH is 250, or if Km/h is the selected unit of measurement the maximum is 400.

3.2.2   RPM

Engine revolutions per minute (RPM) is displayed in increments of 100, with a maximum possible indication of 25.5, or 25,500 RPM. For example, the RPM shown below is 4,200 RPM.

3.2.3   Engaged Gear

The RED LED display can also indicate engaged gear. For this display to function correctly, the correct gear ratios of the gearbox must be entered either using the Display (Setup mode) or DigiTools software. The DigiDash² then calculates from the vehicle's Speed and RPM, the gear selected.

Display	*Description*
1	1st Gear
2	2nd Gear
3	3rd Gear
4	4th Gear
5	5th Gear
6	6th Gear
C	Clutch Down
N	Neutral (*for motorcycle gearboxes*)

3.2.4 Warning Alarms

One of the following warning alarms will be indicated on the RED LED display, in the event of monitored values exceeding the parameters specified in Setup.

	Coolant Temp Alarm When this is shown the Coolant Temperature has exceeded the specified limit.
	Oil Temperature Alarm When this is shown the Oil Temperature has exceeded the specified limit.
	Oil Pressure / RPM Alarm This alarm shows the oil pressure has dropped below the specified oil pressure limit, at an engine RPM higher than the set level. (e.g. Below 20psi when RPM is greater than 2000)
	Fuel Level Alarm You can set a percentage level of fuel remaining in the tank below which this alarm will be operated.
	Fuel (AUX) Pressure Alarm This alarm shows that <u>Auxiliary</u> Pressure has dropped below the set limit.
	Oil Pressure Alarm (Mechanical Switch) The oil pressure sensor incorporates a low-pressure switch (terminal WK) that when activated will show this display. The switch will operate below 7.5psi (0.5 BAR).

Note : The Alarm '*LEV*' indicates <u>Oil Level</u> warning. This warning can be configured using DigiTools if there is an an oil level switch present on the engine you are running. (for example, some Yamaha R1 motorcycle engines have an oil level switch).

3.2.5 Logger Status

This decimal point signifies that the Logger is switched ON and recording data.

Using the DigiTools software for configuring the DigiDash², you can program this decimal point to illuminate if the logger is switched ON to record data.

3.3 GREEN LCD Character Display

This is the main display for most sensor readouts. The LCD has several different "screens" of information available. Depending on which display options are enabled (see the DigiTools Configure section (4.12) of the manual for details) there are various screens that can be displayed. These are cycled between displays by pressing the **A** button. If Button **C** is connected, this button will cycle through the available screens in the opposite direction.

3.3.1 LCD Display Screens in Detail

Display	Description
OILP: 16 |Water OILT: 86 | 86	OILP : Oil Pressure in PSI (or BAR) OILT : Oil Temperature in °C (or °F) Water: Water Temperature in °C (or °F)
Odo: 00000 |Fuel Bat: 13.2 | 11%	Odo : Vehicle Odometer (Total) Bat : Battery Voltage Fuel : Fuel Level as a percentage of full
RPM: 4295 |Gear MPH: 29 | 2	RPM : Engine revolutions per minute MPH : Miles per hour (KMH = Kilometres per hour) Gear : Engaged Gear ('N' for neutral, 'C' for clutch-down)
Engine: 0h:10m AuxPsi: 18 psi	Engine : Elapsed Engine Run Time Aux Psi : Auxiliary Pressure in PSI
Lst:002 00:49.08 Bst:002 00:49.08	Lst : Last lap number and time Bst : Best lap number and time
L:002 T:0h01m49s S:08 ----- 9.99s	L: Lap Number you are on T: Lap Elapsed Time S: Current split sector you are in (+ or – sector time from Best Lap)
Accel: 000->060 Time: 0:03.5	Accel : Start & Stop Speed (e.g. 0 – 60) (Decel = Deceleration timer) Time : Time Recorded
Power: 000 BHP Max : 043 BHP	Power : Instantaneous Estimate of Engine brake horse power (BHP) Max : Maximum recorded BHP Estimate
G Turn : +0.64 g G Accel: -0.34 g	G Turn : Lateral G-Force (+/– Indicates Left / Right Turn) G Accel: Longitudinal G-Force (+/– indicates Acceleration / Braking)
TrTime: 2h37m55s TrDist: 0005.0	TrTime : Elapsed Trip Time since last engine start (since last <u>Manual</u> Reset) TrDist : Trip Distance
Max OP: 144 psi Max OT: 149 degC	Max OP : Maximum Oil Pressure recorded (since last reset) Max OT : Maximum Oil Temperature recorded
Max WT: 149 degC Max DC: 13.6 VDC	Max WT : Maximum Water (Coolant)Temperature recorded Max DC : Maximum Battery Voltage recorded
Max RPM: 10670 Max MPH: 250	Max RPM : Maximum RPM recorded Max MPH : Maximum Speed recorded
Max Turn :+0.72g Max Accel:-0.96g	Max Turn : Maximum Lateral G-force recorded Max OT : Maximum Longitudinal G-force recorded

3.4 Lap Timing

NOTE : In order to use the DigiDash² <u>Manual</u> Lap Timing it is necessary to have extra buttons connected to the Display, as Button D functions as your start/stop button. A remote 4 button kit for attaching to the connector on the back of the Display is available for purchase separately from ETB. References to Buttons C or D assume that you have installed this remote button kit.

The Lap Timer system can be operated in two different modes:

3.4.1 Manual Lap Timing / Track Day Mode

Track Day Mode involves triggering the timer manually each time the start / finish line is passed by pressing Button D.

To set the DigiDash² to Track Day Mode, the LAP BLANK period must be set to ZERO (0). The LAP BLANK period can be set to zero either directly using the Setup Menu on the display or via the DigiTools Configure Software.

3.4.2 Infra-Red Lap Trigger / Race Day Mode

By connecting the Lap Trigger module (available separately from ETB) to the **POWER/ TRIGGER** harness, infra-red trackside beacons can be used to automatically trigger the Lap Timer.

The Lap Trigger module must be mounted at the side of the vehicle such that it will be aligned to the trackside beacon when the car passes by. Note that some tracks have their beacons on the left-hand side of the track, whilst others have it on the right. If you intend to attend many different circuits it is convenient to ensure that the mount is <u>easily</u> changed from side to side.

To ensure the unit only responds to <u>one</u> beacon on a track it is important to set the LAP BLANK period correctly in the DigiDash² Setup:

> **As you approach your beacon to start the first flying lap then press button D (or Hol-Down Button B). This will reset the lap times and arm the lap timer ready for the beacon. The symbols > > > will appear in the lap timer window indicating the first flying lap.**

> *For example:* **If you are lapping in around 1min 30secs set the Lap Enable Time to 75 (1min 15secs). This will ensure any spurious infra-red beacons detected in the first 75 seconds of a new lap are ignored.**

If you wish to purchase your own Infra-red Beacon please contact ETB for details.

3.4.2.1   Testing the Lap Trigger Module

The red **STATUS** LED on the Datalogger can be used to verify that the Lap Trigger module is receiving a signal. In order to do this you must first set the operation of the **STATUS** LED on the Datalogger to Sensor Mode using the DigiTools Configure software (General Settings TAB).
Any standard TV remote control handset can be used to test that the Lap Trigger is receiving a good signal. Simply point the remote-control at the installed lap timer module and the red **STATUS** LED should illuminate.

3.5 Acceleration Timer

This allows the measurement of different acceleration and deceleration (braking) runs.
By default the unit is configured to perform a 0-60mph run.

Using the timer is simple:

3.5.1 Acceleration runs:

Ensure the vehicle is starting below the start speed you have entered. For standing starts ensure the vehicle is stationary.

Use Button **A** button to choose the Acceleration-Timer Display. If you are overwriting a run hold down Button **B**. This will zero the stored value on the display.

The timer will start as soon as one of the magnets passes the speed sensor. The timer will automatically stop when the chosen stop speed is reached, and the time will be displayed.

3.5.2 Braking runs:

Perform the same procedure as above, making sure that your starting speed is higher than the chosen start speed. As you apply the brakes and the vehicles speed drops below the start speed the timer will be enabled. Once you have reached the desired stop speed the timer will stop and hold the deceleration time.

If you want to view the acceleration curve on a PC later, make sure you turn data logging on before you start the run. You can log multiple runs by turning the data logging on and off for each run.

Warning

The acceleration timer should be used with great care.
Do not use the timer on public roads.
Please ensure you give due consideration to the safety of other road users whilst using this feature.
Accidents resulting in the improper use of this feature invalidate the product guarantee.

3.6 Troubleshooting

Problem	Solution (try in order)
POWER LED on Datalogger is not lit	1. Check the power connections (Fused Red Wire and Single Black wire on **POWER/TRIGGER** Harness) 2. Check the Fuse
Nothing on the Display	1. Check the CAN cable connectors are plugged in 2. Check that the Datalogger is powered (**POWER** LED is lit)
Speedo doesn't work	1. Check magnets North-South orientation ('dot' must face down) 2. Check distance to sensor (1mm) 3. Check Loom Plug is tight 4. Test the Sensor using the Datalogger **STATUS** LED
Speedo is erratic or poor at high speeds	1. Distance between magnets and sensor is too great 2. Magnets are mounted on a vehicle part that has lateral movement. 3. Sensor Bracket is moving in relation to the magnets / Bracket too weak.
Gear Display does not show engaged Gear	1. Check that you have entered the Gear ratios of your gearbox using Setup Mode 2. Check that you have correct Speed and RPM input signals 3. Ensure that you have entered the correct values for the SPEED CAL and GEAR CAL using the DigiTools Calculator
I get interference when the engine is running	1. Check the connections are tight 2. Use the CDI or ECU tacho output if possible 3. If you use the LT coil tap, try connecting the tacho shield wires (clear wire <u>and</u> woven shield) to chassis ground.
Display sensors show 'NC'	1. Check wiring to sensor and connections 2. Check that there is a good ground connection for the sensor (this is made via the sensors body)
The lights are too bright	1. The brightness of the displays is variable. Use the SETUP-MODE to change the brightness

4   DigiTools PC Software

Supplied free with the DigiDash² is a comprehensive software package. This software is designed to run on any Microsoft Windows 32bit operating system (Win95, 98, ME, NT, 2000 & XP). Minimum specification for the PC is a P133 with 32MB of memory, and an 800x600 SVGA display.

(Please note that this manual does not contain information about using Windows, and assumes that are already familiar with standard Windows operations such as click, double-click, right-click, drag and drop etc. For further information on using Windows please refer to the instructions supplied with your operating software)

4.1   Connecting the Serial Cable to a PC

To configure the DigiDash², first connect the Serial cable to the port on the Datalogger labelled "**SERIAL**". This allows the user to connect to a PC computer via the built-in RS232 serial port.

(NOTE: If your computer does not have a RS232 serial port, a USB to Serial adapter is available for purchase from ETB Instruments.)

4.2   Installing the DigiTools Software

- Insert the DigiTools CD into your CD-ROM Drive.
- Using the mouse, Left double-click on "My Computer" Icon
- Right-Click on CD-ROM Drive Icon and select "Explore"
- Select all files shown on CD-ROM and by Right-Clicking on these files, drag and drop them into a suitable folder on your Hard Drive.

To start the DigiTools program, double-click using the left mouse button on the ETB icon.

Once the program is running you should see the following Menu with three main sub-programs:-
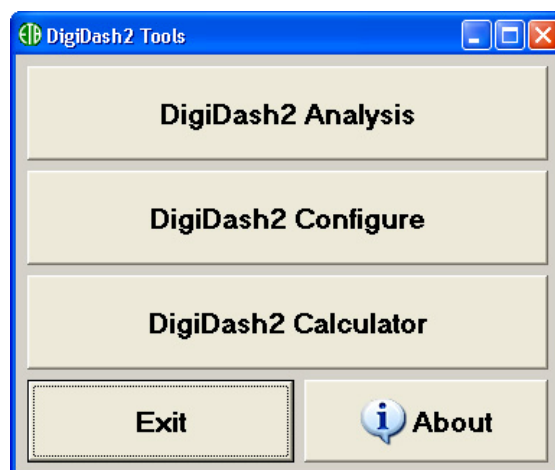

To select the program you require, left-click on the appropriate button. To exit the DigiTools click on the EXIT button.

4.3   DigiDash² Configure

For full access to all the DigiDash2 parameters and functions that can be specified by the user, you must use the DigiTools Configure program. After clicking the DigiDash2 Configure button, the box below will be displayed.

4.3.1   Version Tab
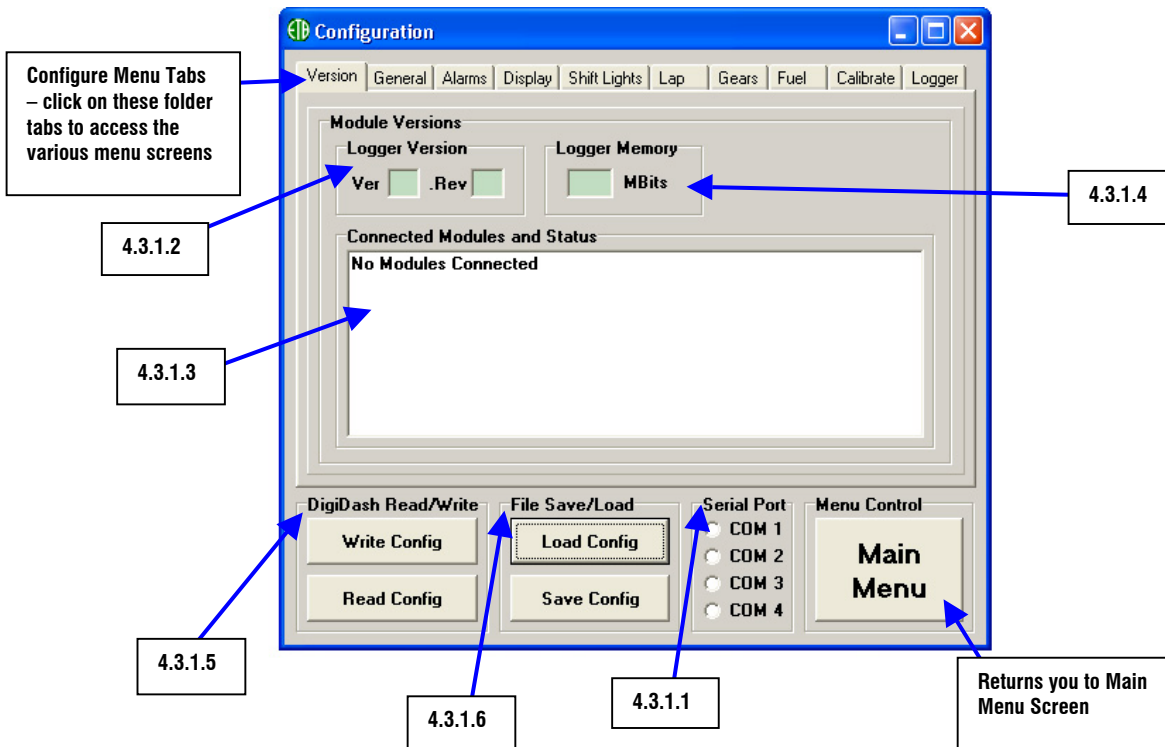
4.3.1.1   Serial Port

To automatically connect the Datalogger to a PC, you must first select the COM Port that your PC is using to connect to the DigiDash2. If you are using the RS232 serila port, this is usually set as COM Port 1. Other COM Ports can be specified if necessary (usually when using a USB port).

4.3.1.2   Logger Version

When the Datalogger is connected to the PC, the DigiDash2 Version and Revision number will be displayed in these boxes.

4.3.1.3   Connected Modules and Status

Information on any modules connected to the Datalogger via the **DIGICAN** connection (such as the Display) will be indicated here, including their version number and serial number.

4.3.1.4   Logger Memory

The maximum available memory installed in the Datalogger will be displayed here when the unit is connected to a PC. The standard logging memory is 17.3 MB.

4.3.1.5   DigiDash Read/Write

After selecting the correct COM Port (4.3.2), you can test the connection using the DigiDash "**Read Config**" buttons. The **Read Config** button is used for downloading or "reading" the current configuration of the DigiDash2 to the DigiTools.

If the Display module is connected, by clicking on the **Read Config** button you should see the following shown on the Display:

The DigiTools Configuration menus will now be set to the current settings of the DigiDash2. A box will appear confirming that the Configuration has been correctly downloaded.

Once you have accessed the menu screens in the Configuration program and changed the parameters to your desired settings, the "**Write Config**" button is used to upload or "write" your configuration to the DigiDash2. A dialog box will appear confirming that your configuration has been correctly uploaded or "written" to the DigiDash2.

4.3.1.6   File Save/Load

You can save files with a particular configuration to your hard drive by clicking on the "**Save Config**" button. These files will be saved as a ".dcf" file type. This will enable you to save different DigiDash2 configurations and upload them as desired.

To load a previously saved file, simply click on the "Load Config" button, locate the desired configuration file and click "Okay" to load the configuration to the DigiTools software. Remember that once the file is loaded, if you wish to program the DigiDash2 to the settings contained in the file, you must then click on "Write Config" in order to upload the settings to the Digidash2.

4.3.2   General Tab

The Odometer reading can only be accessed by the factory. The Odo reading indicates the vehicle's total recorded mileage.

Enter Start / Stop Values for the Acceleration / Deceleration Timer

This box allows you to swap the Lateral and Longitudinal axes of the G-Sensor. You can also swap the +/- signs for each axis.

Checking this box will automatically reset to zero all the maximum recorded values and trip / engine timers when the DigiDash[2] is switched on.

The units of measurement displayed on the DigiDash can be changed to either Metric or Imperial units.

The **RED STATUS** LED on the Datalogger can be set to either:
Sensor Status, which can be used to check that the LAP trigger, speed and RPM inputs are receiving a signal, OR Logger Status, which when the LED is lit indicates that the logger is switched on and recording data.

4.3.3   Alarms Tab

Enter set values at which the Alarms will activate. Temperature alarms are activated above these values, whereas the fuel level and pressure alarms activate when monitored values drop below these limits.

When using the built-in low Oil pressure switch on the ETB sensor, the default setting is for the display to show O.I.L.. The ETB sensor has a normally open contact (NO) that closes when pressure is below 7.5 psi.

However, you may wish to use either the original engine pressure switch, for which you can specify whether the switch contacts are normally open (NO) or closed (NC).

For engines equipped with an Oil level switch (e.g. Yamaha R1 engines), you can change the switch setting to NC, and the indicated alarm to '**LEV**', which indicates "LEVEL".

The DigiDash[2] incorporates a Speed Alarm.

Using this menu box, you can specify the speed at which the AUX warning light on the display will illuminate. (Please see Section 4.3.4 for setting the AUX warning light to Speed Alarm Mode).

a) Under – Enables you to set the pit lane speed limit, so that as you drive down the pit lane, you must ensure that this light remains <u>ON</u> in order to avoid pit lane speeding. (It is advisable to set the a value just below the pit lane speed limit !)

b) Over - You can set the AUX light to illuminate if the vehicle's speed <u>exceeds</u> the set limit, such as on a public road for example.

4.3.4 Display Tab

These boxes can be used to turn on or off display screens on the Green **LCD** display. By default, all boxes are checked and therefore all displays are shown. For example, if you rarely use the Engine runtime / Aux Pressure display, simply un-check the box and after writing the configuration to the Digidash, this screen will no longer displayed.

You can alter the brightness level of the LED's (warning lights and Red 3-digit **LED** display) by entering a value between 0 and 15 (15 is brightest).

Similarly the contrast level of the Green **LCD** display can be changed. (10 is darkest)
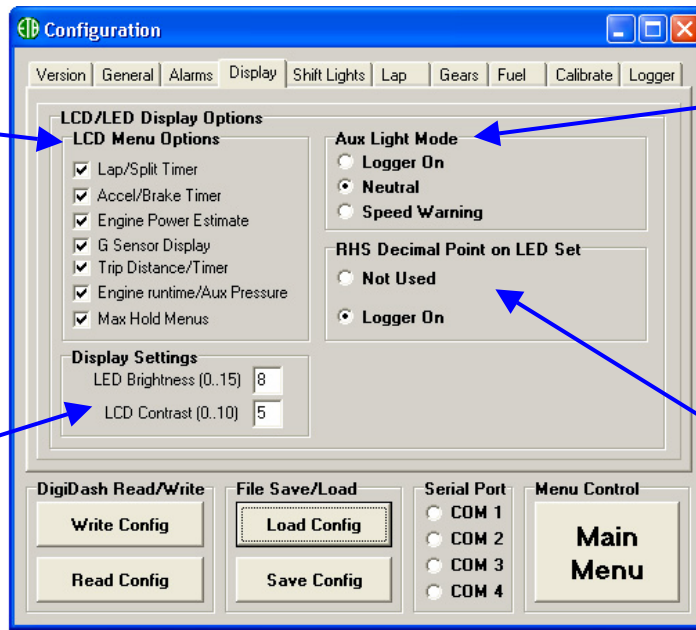
The AUX warning light on the Display can be set to show 1 of 3 modes when lit:-
Logger ON – Lights when logger is switched on and recording data.
Neutral – Indicates Neutral Gear (for bike engined cars)
Speed Warning – See the Alarms Tab described in 4.3.3.

The decimal point as shown above can be set to indicate that the Logger is switched and recording data.
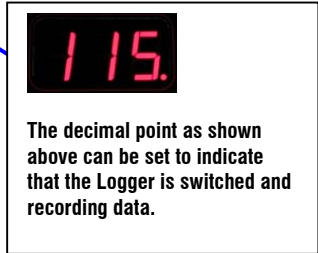
4.3.5 Shift Lights Tab

The bank of shift lights can operate in 3 modes:

Fully Sequential – (Norm) each LED will light in turn as the revs increase.
Block – The Green LED's will illuminate as one block, then the yellow LED's and finally the main Red LED.
Single RED - If you just want the main RED LED to light when peak RPM is reached, set the Delta Value to Zero.
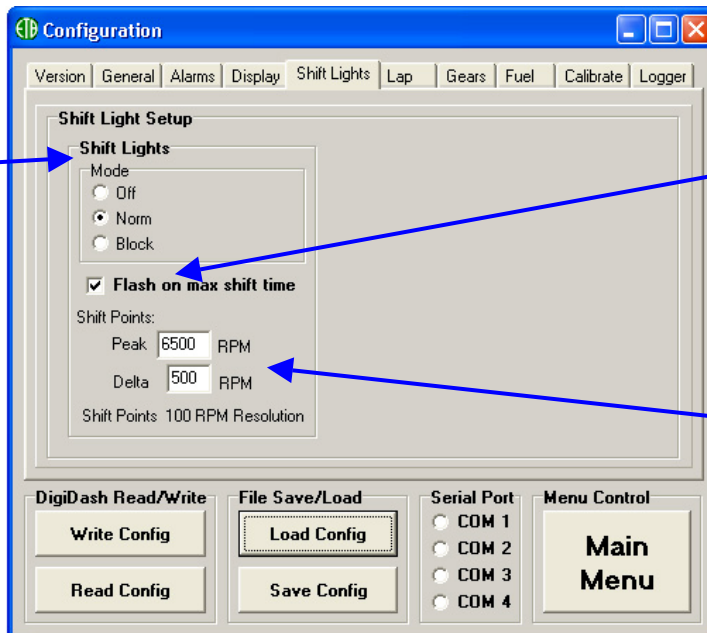
The entire bank of shift lights will flash rapidly if the RED LED remains lit for more than 1 second. Uncheck this box to turn this feature off.

This is used to set the RPM values at which the shift LED's will illuminate:

Peak – Sets value for Main RED shift LED

Delta – Sets the RPM increments between each LED. (see Section 2.1.3.17 for further details).

4.3.6   Lap Tab

Lap / Split Timer Setup.
Lap Trigger Blanking Period (LAP BLANK). – This is the period of seconds from passing your Lap Beacon that the DigiDash[2] will ignore other infra-red signals. (for example from other trackside beacons). If this value is set to zero, the DigiDash[2] assumes you require Manual Track Day mode. This is manual lap timing using button D as a start/stop button for each lap.

Lap Display Switch Back Time – After completing a lap, the Green LCD display will automatically show your last lap time and best lap time. This is the period of seconds that this information will remain on the LCD display.
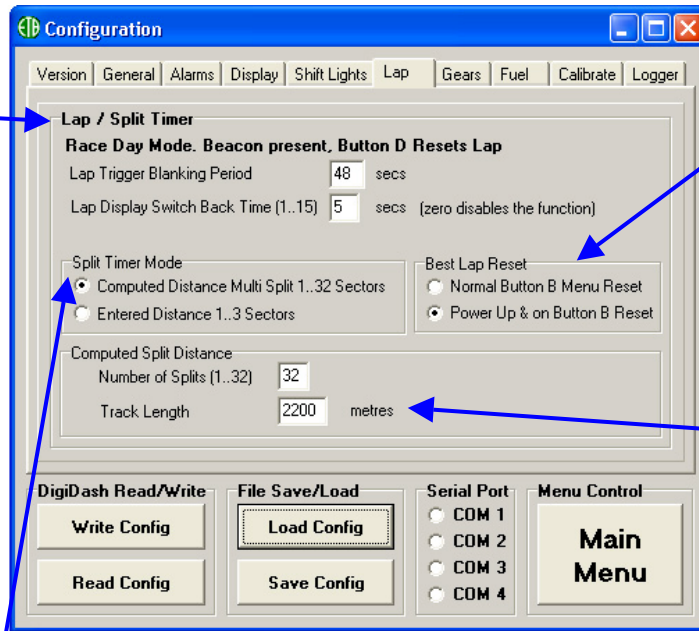
Best Lap Reset.

You can select whether you want to store the last best lap until you manually reset the display using button B, Or
Set it to automatically reset the best lap time when the DigiDash[2] is powered up.

This box will change from either Compted Split Distance to Entered Split distance depending on the Split timer mode selected.

Split Timer Mode – There are 2 modes of operation for using split times:
Computed Distance 1-32 Sectors – Depending on the number of splits required, (entered in the box below), the DigiDash[2] will divide the lap into equal segments (splits).
Entered Distance 1-3 Sectors - If you choose to manually enter the distance between splits, the box below will automatically change for entering the distance in metres for each sector.
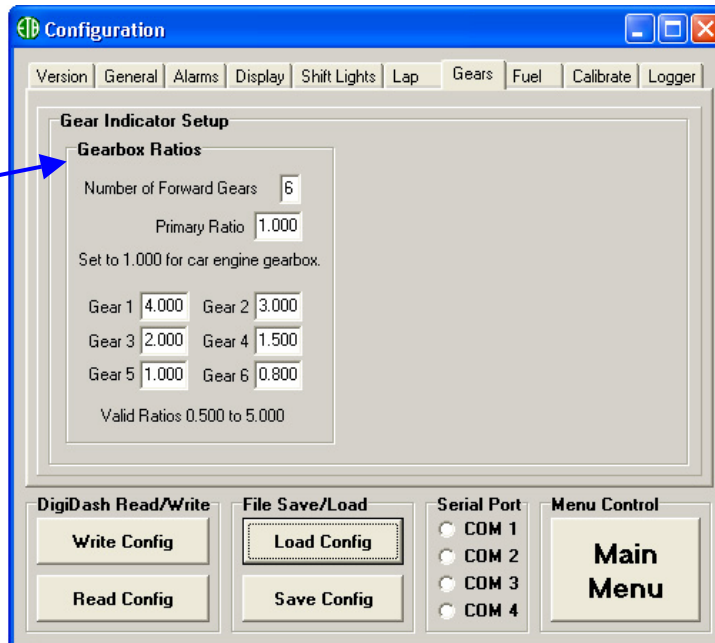
4.3.7   Gear Tab

The Gear indicator setup page is used for entering the forward ratios of your gearbox.

Input the number of forward gears in the gearbox.

Enter the primary ratio. This ratio is generally for motorcycle gearboxes that do not have a 1:1 primary ratio. For a standard road car this should remain as 1.000.

Input the gear ratio of each forward gear.

4.3.8   Fuel Tab

Use this screen for selecting the type of fuel sender that will be used in conjunction with the DigiDash^2. The ETB float arm sensor is supplied as standard and therefore the default setting is to use this fuel sensor. Alternatively you can set the DigiDash^2 to work with either VDO lever-arm float units, VDO Dip-Pipe fuel senders, or a Capacitive Type Fuel sender. All these fuel senders are available for purchase from ETB Instruments.

4.3.9   Calibrate Tab
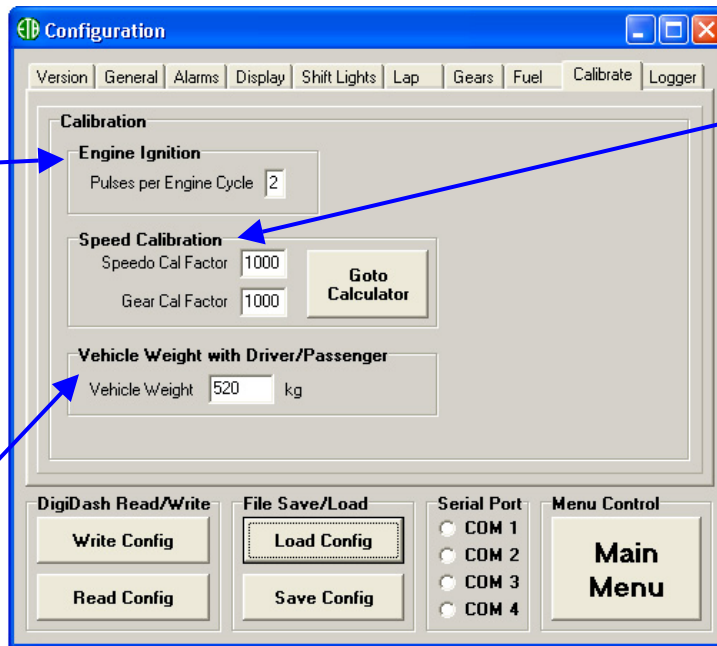
Use this box for entering the pulses for the Tachometer (RPM) input. Effectively, the number (1-8) represents the number of cylinders that the engine has. However, wasted spark systems or ECU outputs may vary the number of pulses per engine cycle, and therefore this number can be changed to accommodate.

The weight of you vehicle can be entered using this box. This is used to for estimating the brake horse power (BHP) of your vehicle.

The values entered in the Speed Calibration box are essential not only for the speed reading to be accurate, but also for the engaged gear display to indicate correctly.

Clicking on the Goto Calculator button will automatically open the DigiTools Calculator program to obtain the correct numerical factors.

4.3.10 Logger Tab

Logger Configuration
This box is used for controlling how the Logger is switched On or Off to record data.
There are 2 Modes of operation:

Display Button A can be set to turn the Logger On or Off. When you wish to start recording data, hold down Button A for more than 2 seconds and the LCD display will indicate that the Logger is switched On. Similarly, hold down Button A to switch the Logger Off.

Logger Switch. The Orange/Brown wire on the green **POWER/TRIGGER** connector can be used for switching the Logger On or Off. This wire should connected to a Single Pole Single Throw Toggle switch (not supplied) for switching to Ground.
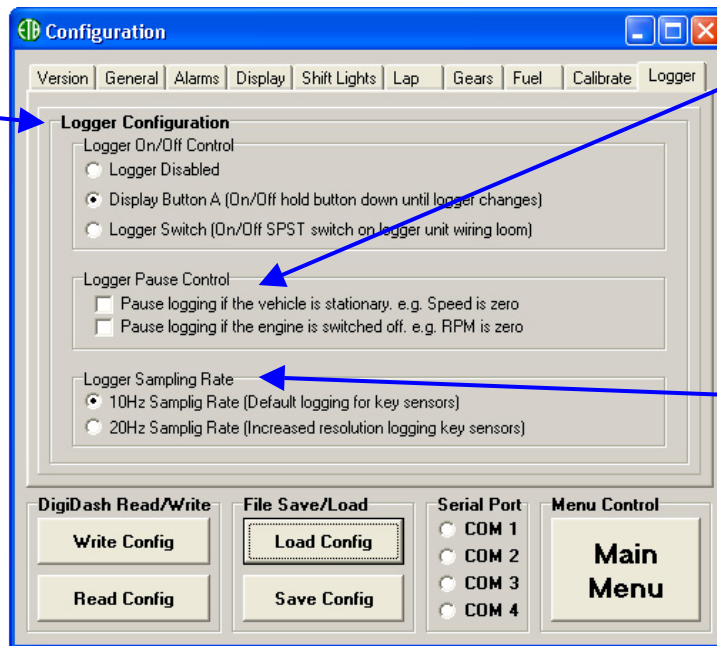
You can pause the recording of data by setting the Logger to pause when:

The vehicle is stationary (i.e. Speed = 0)
Or

The engine is switched off (RPM = 0)

The Logger sampling rate can be switched between 10Hz & 20Hz. This means that the Logger will record data values either 10 or 20 times per second. A sampling of 10Hz is usually sufficient for most applications.

Note that by increasing the sample rate to 20Hz, you will reduce the amount of time that the Logger can record data, as a rate of 20Hz increases the amount of memory used for each second of data recorded.

4.4 DigiDash^2 Calculator

The DigiDash2 Calculator is used for calculating the required Speedo and Gear Cal Ratios that are essential for the DigiDash2 to show speed and gear correctly.

You will need information concerning your vehicle, including:

Speed Sensor Location
Tyre Size
Differential Ratio (Final drive)

Once you entered the details of your vehicle, click the "Calculate" button and the yellow boxes will show the resulting values. Click "Goto Configure" to directly input the values on the Configure screen.
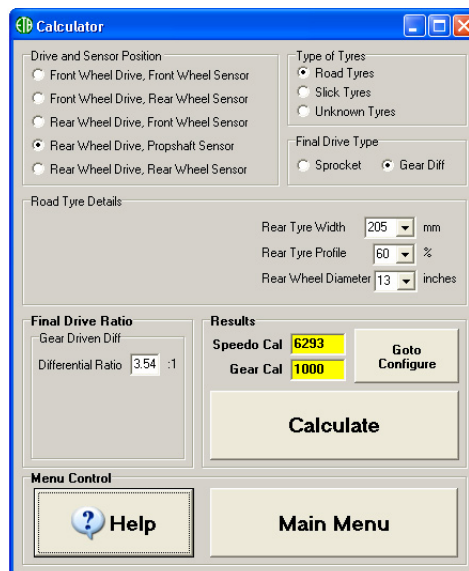
4.5 DigiDash² Analysis

The standard internal memory capacity of the DigiDash² is 17.3Mb. Each time the Logger is started the DigiDash² records data for each parameter (as listed below) until it is manually switched off (or when ignition is switched off if configured using DigiTools to do so). The DigiDash² automatically treats this as a single session or data set. You can record up to 16 sessions or data sets, providing that the memory capacity is not exceeded recording previous sessions.

For information on how to start / stop the logger, please refer to Sections 4.3.10 and 3.1, which explain how to configure the Logger and the associated button functions.

The vehicle parameters that are logged are:

- Engine Revs (RPM);
- Speed (MPH or KMH);
- Engaged Gear;
- Brake %
- Oil Pressure;
- Oil Temperature;
- Water Temperature;
- Fuel Level;

- Auxiliary Pressure (Can be used for Fuel or Boost Pressure);
- Battery Voltage;
- Lap Number
- Lap Times (s)
- Split Times (s)
- Longitudinal G-Force;
- Lateral G-Force

4.5.1 Downloading Logged Data from the DigiDash²

When you wish to analyse the logged data, you must connect the serial cable to the Datalogger and your PC and click on DigiDash2 Analysis in DigiTools. The following screen will appear:

Data Set A & B Options: These buttons allow you to load previously logged data sets from your hard drive. Once a data set has been downloaded from the DigiDash² you can click on Save Data Set (A or B) to store the file on your hard drive.
You can also save data sets in Microsoft Excel (.csv) format.
When downloading logged sessions from the DigiDash2, you can either save it to A or B Data Sets, which allows you to overlay to different sets of recorded data.

You can edit and store general information about your vehicle's set-up for each data set. For example, you can note your tyre pressures during a particular logging session and upon saving these notes, they will be added the data set file.

To download a data set from the DigiDash2, you must first select the COM port being used by your computer.

By clicking on the Download menu, a new menu screen will appear. You will see a list of logged sessions, including each file size and total memory usage. This menu is shown on the next page (Section 4.5.2)

To download a particular session, select the corresponding data set number (1-16) and select if you want it to be downloaded as a type A or B data set. Then click the "Download" button. A bar will appear showing the progress of the download process.

Once downloaded, you can click on the "View Data" button to start analysing the recorded data.
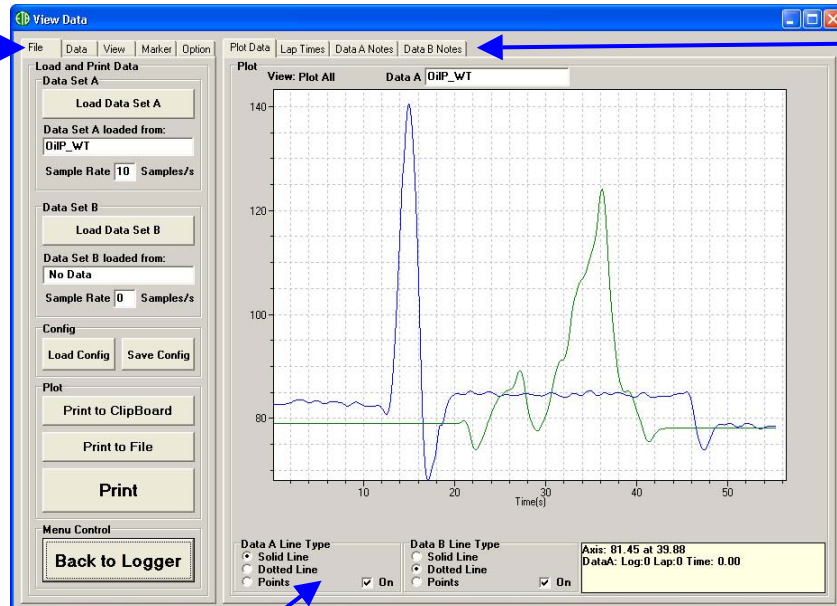
4.5.2 Download Menu Screen

4.5.3 Data Analysis

View Data Tab Menus:

- **File** - Load different Data sets or print the plot area to your printer or a file
- **Data** – Select the X and Y axis data variables for plotting on the graph.
- **View** – Zoom and pan the data plotted on the graph. You can also assign a smoothing factor to the data plotted which averages the inputs and simplifies the data plot. If you wish to plot all data and the lap overlay data, click on the Lap overlay button in the Plot box.
- **Marker** – Assign labels or markers to the data plot.
- **Option** – This tab menu allow you to change the units of measurement of the plot data, swap the G sensor axes, or modify the gridlines of the plot area.

Plot Data Tab Menus:

- **Plot Data** – After selecting the Lap Times tab, choosing the lap data you wish to overlay, you can click on this tab and the data will be plotted.
- **Lap Times** – This screen shows your total and split times of each recorded lap. You can overlay 2 sets of lap data by selecting the lap number and data set in the 'Select Laps to Overlay' boxes. To create a file compatible with Bosch LapSim analysis software, click on the Export button after selecting the desired lap.
- **Data Notes (A & B)** – These are your notes relating to your vehicle's Setup at the time the data was recorded.

You can change the line characteristics of each data set as plotted on the graph by selecting one of these options.

Note : DigiTools is able to export data that is compatible with LapSim analysis software freely available for download on the internet from BOSCH Motorsport. You can download this software from the following link:

www.bosch-motorsport.de/englisch/index.htm

The manual for using this software can be downloaded from:

http://www.bosch-motorsport.de/de/downloads/Manual_LapSim_V_2004.pdf

Should you require assistance in importing DigiDash2 files into LapSim software or require general help please do not hesitate to email ETB Instruments at info@etbinstruments.com.

APPENDIX 1 – Wiring Schematic
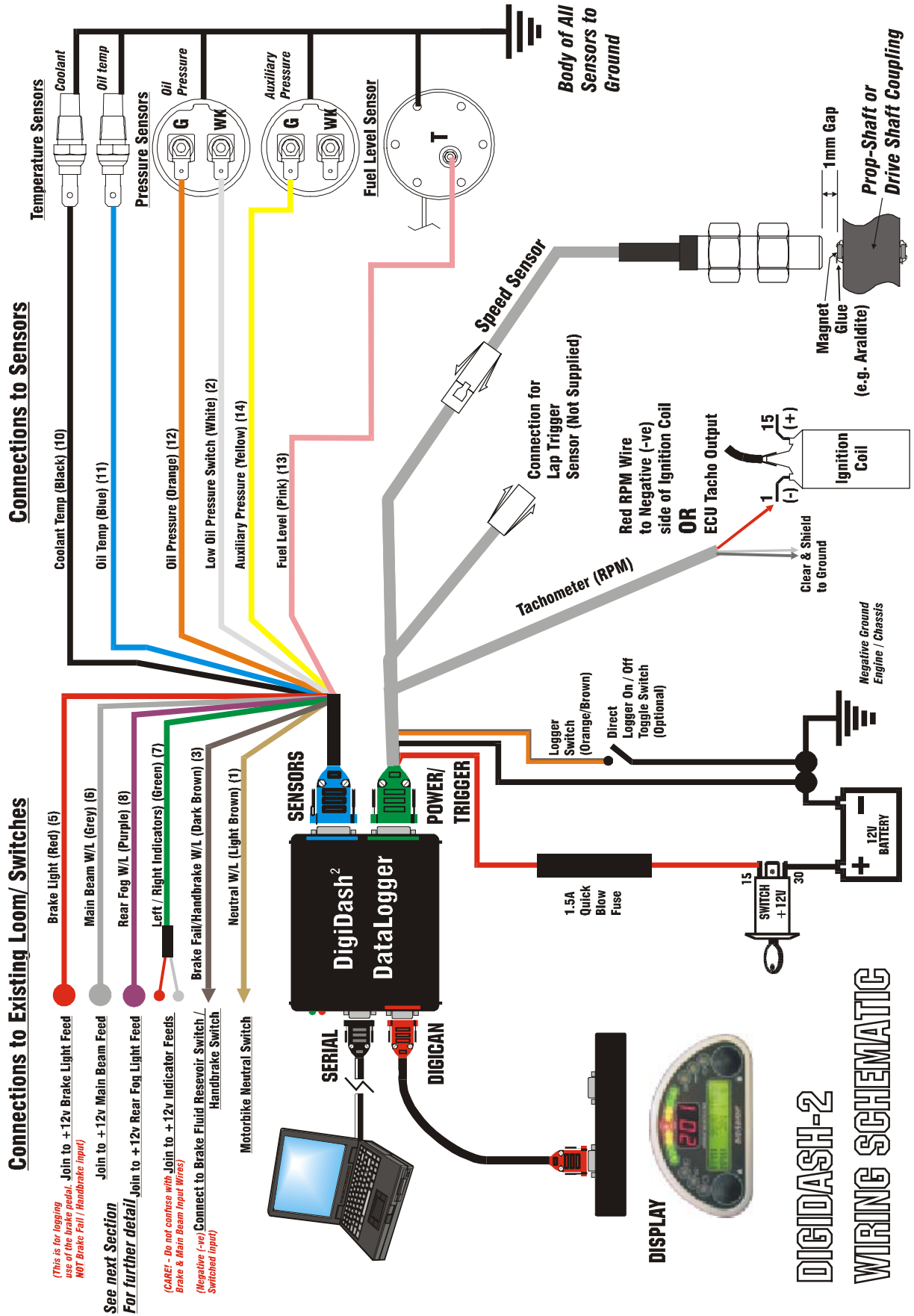
## 5.1 Connecting to an Existing Wiring Loom / Switches

The blue **SENSOR** cable has a number of input wires that should be connected to your existing wiring loom. The DigiDash2 requires that on some of these inputs, in order to operate a warning light for example, the input receives 12 volts. This is explained in more detail below:

5.1.1 SENSOR Cable Inputs that require switched +12v

There are 4 input wires on the **SENSOR** cable that require 12v applied to the input in order to operate:

- **Brake Pedal Monitor** (RED wire)– This input for used for recording use of your vehicle's brakes. When using the Logger, the length and time you depress your brake pedal will be recorded for later analysis using DigiTools. This input requires that upon operation of the brake pedal, +12 volts is supplied to the DigiDash. If the brake lights are switched to 12v in order to illuminate, a possible connection point would be to the positive switched supply to the Stop / Brake lights.
- **Main Beam** – (GREY wire) When 12 volts is applied to this input wire the blue main beam warning light will illuminate.
- **Rear Fog** – (PURPLE wire) When your rear fog lights are switched on, the warning light should illuminate.
- **Left / Right Indicators** (GREEN wire with 2 individual feeds (red and grey) – The turn indicators are wired separately. There are diodes in the cable in order to prevent a short circuit.

Simplified Wiring Example for +12v Switched Warning Light
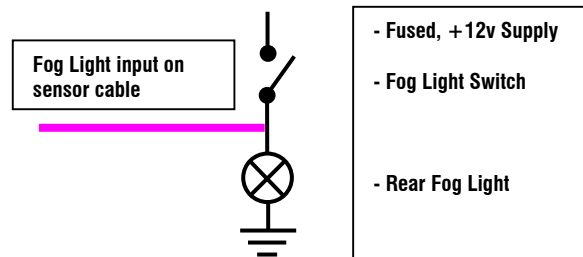
5.1.2 SENSOR Cable Inputs that require switch to Ground (-ve)

There are 2 inputs on the Sensor cable that require a switch to ground in order to operate:

- **Brake Fail / Handbrake Warning Light** – (DARK BROWN wire) – For the brake fail warning light on the display to illuminate, the input feed must be switched to ground (negative earth). This can be wired directly to the brake fluid level switch on the brake fluid resevoir, or if the handbrake is connected to to the same circuit, the handbrake switch.
- **Neutral Warning Light** – (LIGHT BROWN wire) – This is intended for motorcycle gearboxes that have an output for a dashboard Neutral indicator light. This switches to ground during operation.
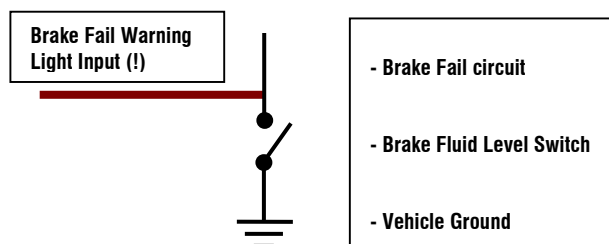
6   APPENDIX 2 - Speed Sensor Installation

There are 2 small, powerful magnets supplied with kit. These magnets are mounted on a surface that rotates in relation to vehicle speed and supply electrical pulses as they pass in front of the speed sensor to the DigiDash^2.

The **POWER/TRIGGER** harness with the Green 15-pin connector incorporates the speed sensor. The sensor can be disconnected from this harness to aid ease of installation.

You must first locate a suitable position for mounting the speed sensor and magnets on your vehicle. The speed sensor and magnets are commonly mounted in one of three locations: -

Prop-shaft (either at the differential end or gearbox end) (See Section 4.7.1)
Drive-shaft Coupling (with Sensor mounted on Gearbox)
Front Hub (with sensor mounted on steering arm)

The recommended gap between the sensor and top surface of the magnets is **1mm** and therefore you must ensure that whatever location is used, any movement in the position of the magnets is replicated in the movement of the sensor to maintain a constant gap. You will need to fabricate a strong bracket to hold the sensor in place, and bolt this bracket to a suitable mounting point.

Here are 2 examples:-

Prop-Shaft Mounting   **Front-Hub Mounting**

Important! – The speed sensor is polarity dependent. This means that the magnets must be mounted dimple-side <u>DOWN</u>.
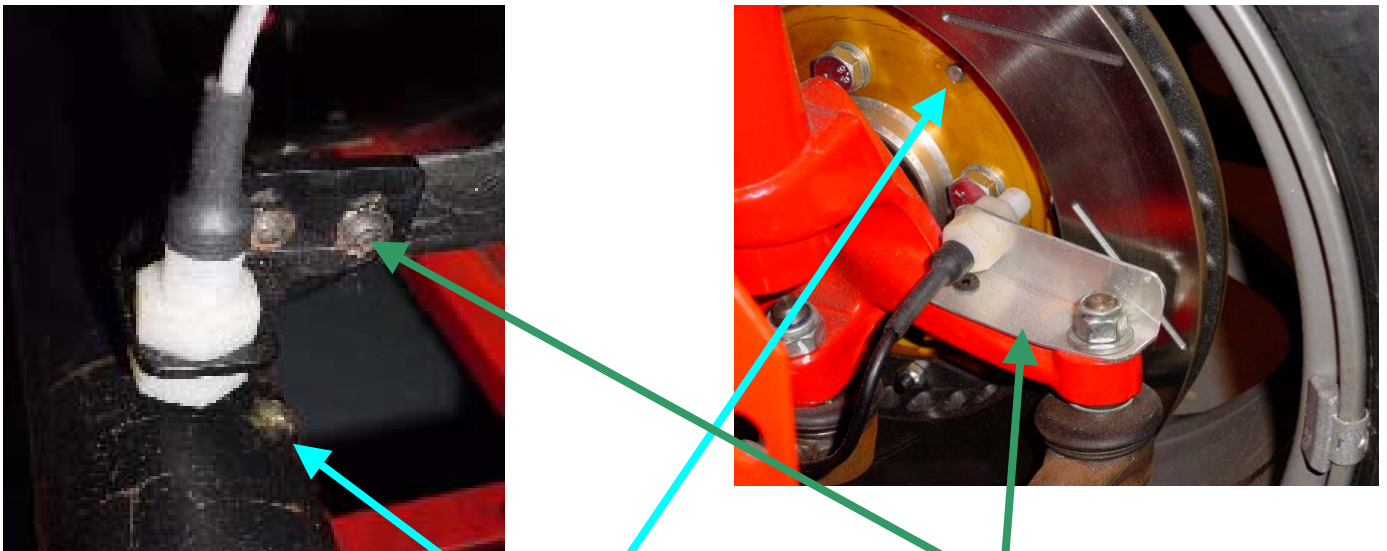
Magnets glued in position. Liberal application of a strong adhesive such as Araldite will ensure that the magnets do not become dislodged during use.

Strong mounting brackets that hold the speed sensors in position. The brackets have been mounted in positions that move in unison with the magnets.

Important! - The recommended gap between the speed sensor head and top surface of the magnets is 1mm.

6.1 Speed Sensor Alignment

magnet
With the dimple on magnet face down and araldited to the propshaft

Air gap should be 1mm

Propshaft

Side View

Section View

Propshaft

magnet 1
(make sure dimple on magnet is face down to the propshaft and secured in place with Araldite)

magnet 2
(make sure dimple on magnet is face down to the propshaft and secured in place with Araldite)

bracket

speed sensor

cable

Air gap should be 1mm

Directions:
Place the magnets with the dimple side face down to the propshaft. Place the magnets so that they are opposite each other on the prop. e.g. 180 degrees apart. Then use a fixing agent such as Araldite to secure the magnet to the prop. Try not to get any fixing agent on the top of the magnet. Only apply around the bottom face and sides. Then adjust the sensor so that there is a 1mm air gap between the magnet and sensor face.

7   APPENDIX 3 – Display Mounting Template (to scale)

There are eight M3 x 5mm threaded holes for mounting the DigiDash2 Display. This page should print to scale to enable to use the page as a template. However please check with a ruler against the dimensions shown that your printer has printed the page correctly.

Two holes are required for the connectors when mounting the Display to flat dashboard. Cut two 35mm diameter holes, using the centre of the connector cut-outs as the centre point of each hole.

8   APPENDIX 4 - ETB Fuel Sender Fitting Instructions

! ⊘ Safety Instructions

Caution: No Smoking!   No open fire or source of flame!

8.1   Fitting the sender to the fuel tank

If an installation must be made, the fuel tank must be completely drained first. Drain the fuel into an approved container. REMOVE THE TANK WHENEVER POSSIBLE.

Warning : Risk of explosion exists due to the presence of residual gases in the tank!! Make sure that the tank is aired sufficiently (at least 15 minutes)

- Choose the sensor location carefully, making sure that the float arm of the fuel sender will not conflict with any baffles, pipes or internal obstructions inside the fuel tank. Also ensure that the float unit does not come into conflict with the side walls of the tank.
- Make a preliminary hole in the installation opening using a drill and then finish the hole using a compass saw or piercing saw. Comply with the safety instructions of the tool manufacturer.
- The rubber gasket can be used as a template for marking the bolt holes. The main hole in the tank should be cut to 40mm Diameter. Six Bolt holes (diameter 5mm to 5.5mm) should be drilled around the centre of the main hole on a P.C.D. (pitch circle diameter) of 60.4mm. Pay special attention to the orientation of the float arm in relation to the bolt holes.
- Clean the tank of residue from the drilling or sawing work.
- Fix the fuel sender to the tank using M5 Bolts, washers and nuts.

8.2   Fuel Sender Adjustment

Should adjustment to the length or angle of the fuel sender be necessary, please bear in mind the following points:-

- To adjust length, **do not** remove the arm from the brass pivot point.
- Shortening can be done in two ways: either add a series of zigzag bends in the arm to shorten the length; or by cutting the arm in half and rejoining to the correct length. We have found that as long as a suitable thread-locking agent is used, (one that is insoluble in petrol e.g. Loctite 290), simple 2-way screw terminal blocks can be used:-

Terminal Blocks
Standard Screw Terminal
Polyethylene

2A   5A   (*5 amp is generally the best size*)

- To lengthen, it is suggested that a suitable gauge of brass rod be added in a similar method to above.

Important ! - Removing the float and re-bending the arm around the float is not as easy as it sounds, and therefore we recommend that the bend around the float is maintained, removing a centre section of the arm instead.

Important ! – Ensure that the fuel sender float does not reach the top or bottom the tank before the float arm has reached its full span of travel. (For example, if the fuel sender float hits the top of the tank before reaching its end stop, the fuel gauge will never read full.)

Important ! - It is advisable to allow a gap between the bottom of the tank and the lowest point of travel of the Fuel sender float unit in order to provide a reserve quantity of fuel after the gauge reads empty.

9   Appendix 5 – Lap Trigger Alignment

Lap Trigger Alignment

Directions:

The lap trigger uses an infra-red detector to sense when the lap has been completed by starting and stopping a timer when when it sees an infra-red source. The infra-red source (beacon) is commonly found at most circuits and is not supplied with the DigiDash. The DigiDash will trigger off any infra-red source. This includes other beacons at track or test days and the circuits own split-time beacon(s) if it has one.

In order to stop the lap trigger giving multiple readings due to multiple beacons a **lap timer enable time** can be programmed into the DigiDash. This stops the DigiDash, once triggered, looking for any other beacons until the preset time has elapsed.

For example

The Digidash will trigger off the first beacon on the pit wall, whether it is your beacon, another competitors or the circuit beacon. Set the lap enable time to a value less than your fastest lap so that the unit cannot trigger until you are just about to complete a lap. This stops any false triggers on split time beacons.

If people are using split time beacons then as you are about to start your first timed lap, press button 4. This will reset your lap timer to be ready for a new timed session. You only have to do this if people are using split beacons because on your first lap out your DigiDash may trigger on a split beacon and your lap enable time will prevent the DigiDash triggering at the start and finish line.

Potential Problems:

The Sun is the biggest infra-red source around and may cause the unit to false trigger if pointed directly at it. Try to keep your lap trigger pointing horizontal and if possible tilted down slightly. The problem only really occurs when the Sun is low in the sky and shining directly across the start and finish line where your beacon is situated. The lap enable time preset value will stop the Sun triggering the unit at other points on the circuit.

Beacon

Pit Wall

Try to tilt down if you are experiencing problems with the Sun shine

Lap trigger
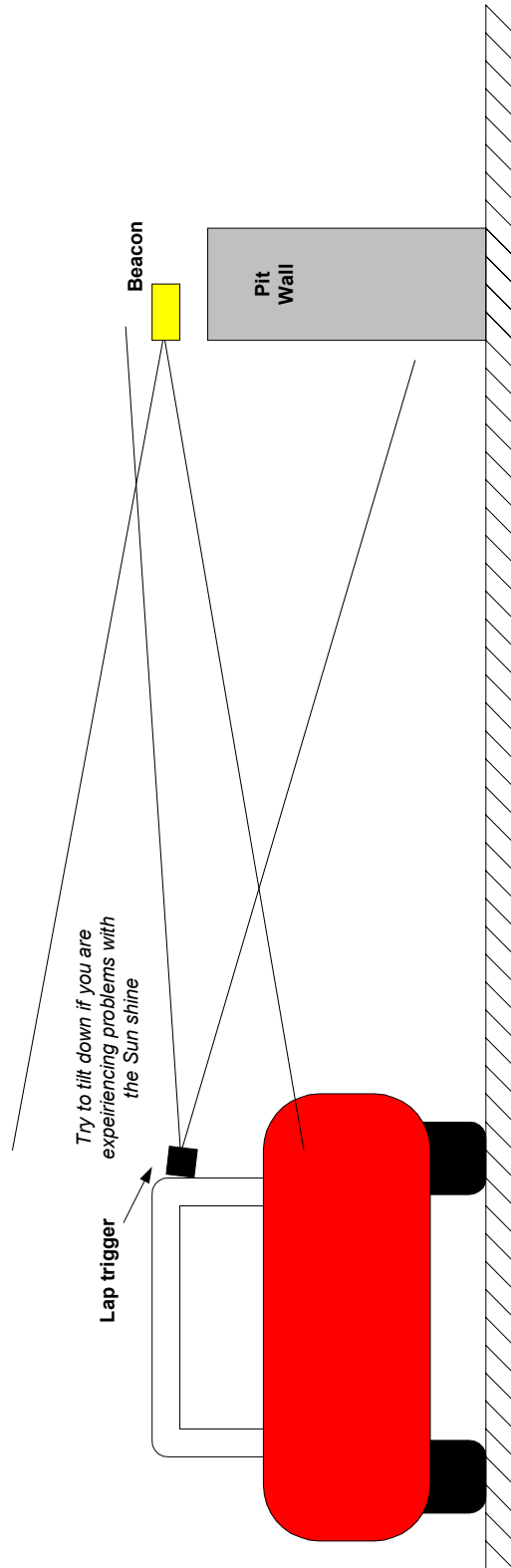
10 APPENDIX 6 – Specification

10.1.1 Power Supply

7V - 14V DC Negative Earth only
Maximum current consumption 400mA
Fuse value: 1A

10.1.2 Environmental

Ingress Protection Level - Datalogger : IP54 / Display IP54
Operational temperature range 0 °C to 40 °C
Storage temperature range -10 °C to 60 °C
Avoid contact with Oil, Petrol and other solvents.

10.1.3 Physical

Datalogger Dimensions	: 120mm x 110mm x 35mm
Display Dimensions	: 160.4mm x 90mm x 28mm
Weight (Display + Logger)	: 700g

10.1.4 Cleaning/Care

Use a damp cloth to clean the unit. Do not use abrasive cleaners or chemicals.
The unit is splash proof to water, however it is not designed for submersion.

10.1.5 Warranty

ETB Limited Warranty

ETB Instruments Limited warrants all merchandise against defects in factory workmanship and materials for a period of 12 months from date of purchase. This warranty applies to the first retail purchaser and covers only those products exposed to normal use or service. Provisions of the warranty shall not apply to an ETB product used for a purpose for which it is not designed, or which has been altered in any way that would be detrimental to the performance or life of the product, or misapplication, misuse, negligence or accident. On any part or product found to be defective after examination by ETB Instruments Limited, ETB Instruments Limited will only repair or replace the merchandise through the original selling dealer or on a direct basis. ETB Instruments Limited assumes no responsibility for diagnosis, removal and/or installation labour, loss of vehicle use, loss of time, inconvenience or any other consequential expenses. In the event of merchandise being returned to ETB Instruments Limited, The responsibility for payment of delivery rests with the customer. The warranties herein are in lieu of any other expressed or implied warranties, including any implied warranty of merchantability or fitness, and any other obligation on the part of ETB Instruments Limited, or selling dealer. Your statutory rights as a consumer are not affected.