Dash-2

Kart Logger

Models:
ST8201
ST8202
ST8203
ST8204

User Guide

ST542038-002

Preface

Congratulations

Congratulations on choosing the *Dash-2* Kart Logger. This system will give you a wealth of information to enable you to obtain the maximum safe performance from your kart.

Registration Form

Please complete and return the registration form contained in the package. This will allow us to keep you up to date on the latest developments from STACK.

Purpose of this manual

This manual will help you install and use the *Dash-2* Kart Logger. It explains how to set up and configure the system for your kart.

Edition Notice

This edition is for all versions of the Dash-2 Kart Logger distributed to customers world wide. The units of measurement used to illustrate the use of the Dash-2 Kart Logger in this edition are for the UK version. Units used in the various versions are shown in the following table.

Parameter Type	UK	US	EC
Speed	MPH	MPH	km/h
Temperature	Degrees C	Degrees F	Degrees C
Wheel Circumference	Millimetres	Inches	Millimetres

Related Products From Stack Limited

If you need information about other STACK motor sport products, these can be obtained from STACK or from your local STACK dealer. Products available from STACK include:

- Intelligent Tachometers
- Action Replay Tachometers
- Performance Analysers
- Speedometers
- Boost Gauges
- Analogue Sensors
- Digital Sensors
- Data Logging Systems
- Display and Logging Systems
- Radio Telemetry Systems
- Display and Analysis Software

Who to Contact at STACK in Case of Difficulty

STACK and its approved distributors provide a comprehensive Technical Help service to assist with your enquiries. Contact your local STACK branch or distributor.

United Kingdom Telephone Numbers:

Sales:	+44 (0) 1869 240404
Technical Support:	+44 (0) 1869 240420
Fax:	+44 (0) 1869 245500

Contents

Preface ***i***
Congratulations i
Registration Form i
Purpose of this manual i
Edition Notice i
Related Products From Stack Limited ii
Who to Contact at STACK in Case of Difficulty ii
Contents ***iii***
1. Introducing the Kart Logger ***1***
How to Use this Manual 1
2. Getting Started ***3***
Unpacking 3
Optional Dash-2 Kart Logger Items 4
Items not included with your Dash-2 4
The Display Module 5
Wiring Harness 5
Connecting the Components 6
3. Operating the Dash-2 Kart Logger ***7***
Switches 7
Warning lights 8
Changing the display layers 8
Peak Values (Tell Tales) 11
Lap times 13
Gear shift light 14
4. Configuring the Dash-2 Kart Logger ***15***
Configuration mode 15
Setting or resetting configuration values 16
Leaving configuration mode 17
5. Using the Dash-2 Charts ***18***
All channels 18
All channels full 18
Carburettor setting 19
Corner radius 19
Driver activity 20
Driver compare 20
EGT & CHT 21
EGT & Water temperature 21
G forces 22
Gear ratio 22
Lap times 23
Rolling lap time 23
Speed & RPM 24
Speed & time compare 24
Steering 25

6. Installing the Dash-2 Kart Logger ***26***
Fitting the Display Module 26
Procedure 26
Wiring 27
Fitting the Engine Speed (RPM) Sensor 29
Fitting the Water Temperature sensor 30
Fitting the Wheel speed sensor 31
Fitting the Throttle or Brake Position Sensors 31
Fitting the Steering Position Sensor 33
Fitting the Cylinder Head Temperature sensor 34
Fitting the Exhaust Gas Temperature Sensor 35
Battery and Charger 36
Trackside Infra-Red Lap Beacon 37
7. Troubleshooting ***38***
Spares 42
8. Summary of Switch Functions ***43***
Normal Operation 43
System Configuration Mode 43
Index ***45***

1. Introducing the Kart Logger

The STACK Dash-2 Kart Logger monitors and displays a range of values, known as performance parameters, needed for effective kart and driver management in most competitive situations.

The system combines an analogue tachometer with a digital display for the following performance parameters:

1. Engine speed (RPM)
2. Wheel Speed
3. Cylinder Head Temperature (CHT) (option)
4. Water Temperature (option)
5. Exhaust Gas Temperature (EGT) (option)
6. Battery Voltage
7. Lap Times
8. Steering Position (option)
9. Throttle Position (option)
10. Brake Position (option)
11. Lateral Acceleration (option)
12. Maximum and minimum corner speeds display (option)
13. Performance Meter (option)

You can view the peak values (tell-tales) for all the parameters except lateral g, steering, throttle and brake.

The system provides a range of warning messages based on preset alarm values for the following performance parameters:

1. High Cylinder Head Temperature
2. High Exhaust Gas Temperature
3. High Water Temperature
4. Low Battery Voltage
5. Low Lithium Battery Voltage

You can enable or disable the warning system for each parameter individually.

You can redefine preset alarm values to values that are more suitable for your kart.

The system provides a gear shift warning light that is based on an RPM value that you define for your kart.

How to Use this Manual

STACK recommends that you unpack and connect the components in the system **before** you install it in your kart. This will enable you to familiarise yourself with operating the display and configuring it for the kart.

This manual starts by taking you through the process of setting up the system before installation, operating the digital display, configuring the system and setting the alarm values, and installing it on the kart. By the end of Section 2, you will have set up the system so that you will be assured that it is functioning normally. You can then read Section 3 and practice using its functions. Section 4 takes you through configuring it for your kart. Section 5 describes the graphs and charts available. Section 6 explains how to install it on the kart. Section 7 provides a set of trouble-shooting guidelines.

Please note that data interpretation advice given in this manual is given in good faith, but cannot be guaranteed to be suitable to your kart and type of racing. The best advice we can give is to watch carefully what the kart is doing, how the driver is performing and then do your best to tie this in with what you see from the Dash-2.

2. Getting Started

This section guides you through the initial unpacking and setting up of the equipment for pre-installation checks and familiarisation with its operation.

Unpacking

You should find the following components in the shipping box:

Description	8201	8202	8203	8204
Display in Composite Housing without G sensor	1			
Display in Composite Housing with built-in G sensor		1	1	1
Wiring Harness (ST872)	1	1	1	1
RPM Sensor (ST696 ST697 H.T. Pick-up)	1	1	1	1
Wheel Speed Sensor with magnets (ST669)	1	1	1	1
PCNIU Interface	1	1	1	1
Infra-red Lap Time Beacon (ST544)	1	1	1	1
9.6V NiCd Battery Pack (111410)	1	1	1	1
Charger for 9.6V NiCd Battery Pack	1	1	1	1
Software installation disks	2	2	2	2
Data Analysis Software User Guide	1	1	1	1
Dash-2 User guide (this document)	1	1	1	1
Kart logger fastener kit	1	1	1	1
Steering position sensor			1	
Pedal sensor kit			2	
CHT sensor			Option	Option
Water temperature sensor			Option	Option
EGT sensor			Option	1

Optional Dash-2 Kart Logger Items

The *Dash-2* Kart Logger can purchased for use with the following optional components:

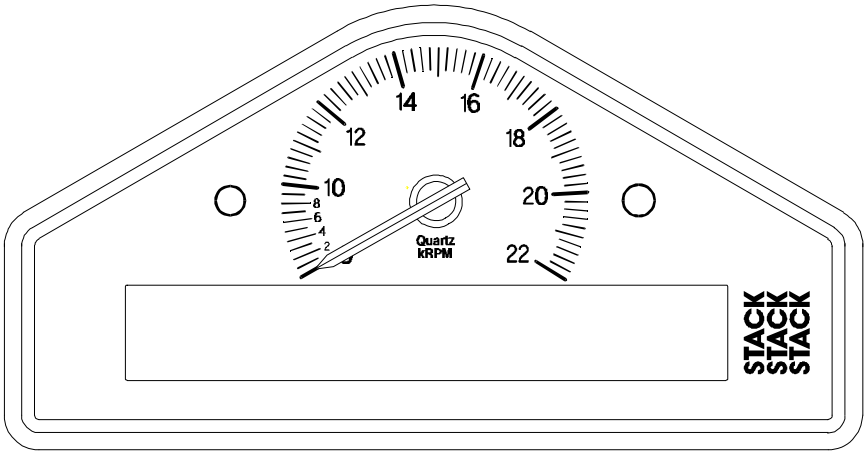
Description
Cylinder Head Temperature Sensor (ST758)
Exhaust Gas Temperature Sensor (ST759)
Water Temperature Sensor (ST760/1/2/4)
Performance Meter option. Note: The ST8108 Performance meter option is delivered prefitted in the Display Module.
Corner Speed option. Note: The ST8109 Corner Speed option is delivered prefitted in the Display Module.

Items not included with your Dash-2

- 12 volt battery for laptime transmitter
- IBM compatible Personal Computer (PC)

The Display Module

The Display Module consists of an analogue tachometer and a digital display panel mounted in a composite housing. There are a variety of dialfaces available for the product. The 0-10-22000 dialface used in this manual is just an example.



The Display Module is connected to the sensors by a wiring harness. The wiring harness has a 19-way military connector for connection to the Display Module.

Wiring Harness

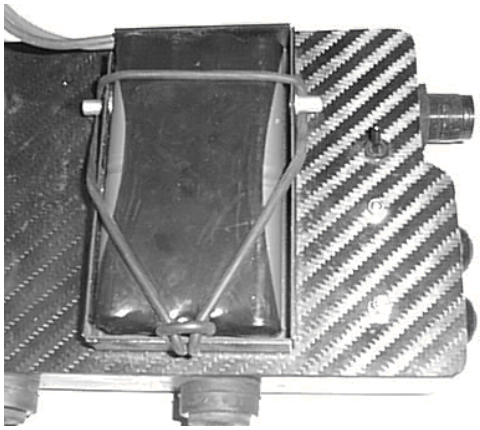
Each of the wires in the harness is labelled.

Labels on short cables	Connection To
WS	Wheel speed sensor
ES	Engine Speed (RPM)
EGT BP	Exhaust Gas Temperature or brake position sensor
TMP	Cylinder Head or Water temperature sensor
SP	Steering Position Sensor
TP	Throttle Position Sensor

Connecting the Components

1. Connect each of the sensors that you have purchased to the appropriate wire in the wiring harness, as listed above.
2. Insert a charged 9.6v battery pack into the battery tray on the rear of the *Dash-2* Kart Logger and connect the white power connections..
3. Switch the unit on by means of the switch on the rear .

You can now proceed to familiarise yourself with operating the Display Module.



Picture of rear showing battery fitting and power switch.

3. Operating the *Dash-2* Kart Logger

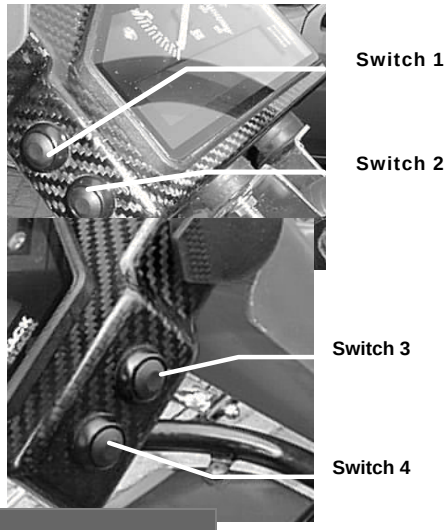
This section takes you through the operation of the *Dash-2* Kart Logger so that you can familiarise yourself with its use before you install it in the kart.

Switches

4 switches are used to control the functions of the *Dash-2* Kart Logger.

Switches 1 & 2 on the left side of the Dash-2 are used for changing the displayed channels. Press and hold switch 1 to show the recorded peaks. Press switch 2 to change the display layer. This is the only switch the driver needs to use when driving the kart.

Switches 3 and 4 are used for manual control of the Dash-2. Press switch 3 to turn logging on and off. Press switch 4 to create a lap marker.



Summary of switch functions

Switch	Functions
Switch 1 pressed	Show Peak Values
Switch 2 pressed	Change Display Layer/Clear Alarm
Switch 3 pressed	Turn Recording On/Off
Switch 4 pressed	Manual Lap Marker
Switch 1 Held Down followed by:	
Switch 2 pressed	Enter SETUP mode.
Switch 3 pressed	RESET Logger (Erase Memory)
Switch 4 pressed	RESET Peaks & Laptimes

Turning the Display System on

The power switch is on the left rear of the display unit.

When the power is first switched on, the digital display will immediately show Layer 1 display layout. The tachometer will reset itself by moving the needle until it touches the stop-pin, and then moving it back to the zero RPM position. Press Switch 2 to clear any warning message from the display. If none of these actions occurs when you switch on, switch off the power to the system and consult the section on troubleshooting in this manual.

Any time the unit is powered up for more than 10 seconds without the engine running, then the display will show the message

This ensures security of your laptime information. Press switch 2 to return the system to the normal display format.

Warning lights

The *Dash-2* Kart Logger has two built-in warning lights. The red one on the right is the gear-shift light and the left hand yellow one is for warning the driver that an alarm has been triggered.

Changing the display layers

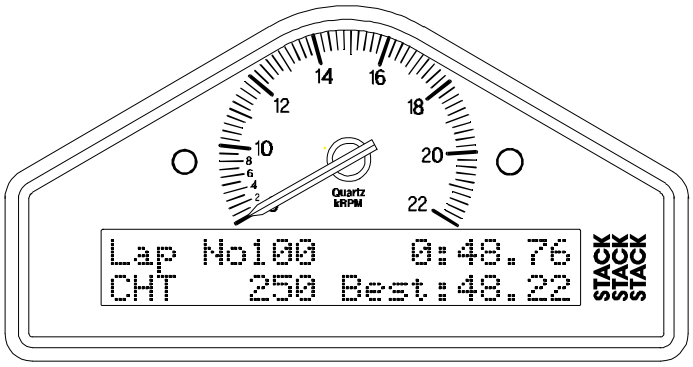
The digital display can show three separate sets of parameters and their values[1]; these are called display layers 1, 2, and 3.

If you have the Performance Meter or Corner Speed option there are additional layers, layer 4 and 5 respectively.

Each of the display layers can be displayed in turn by pressing switch 2.

[1] *The format of the values in these displays will vary for systems supplied outside the UK, as the parameters are displayed in different units.*

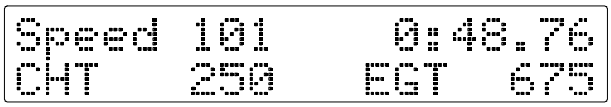
Display Layer 1 - Race



- Lap Number (Lap No100)
- Laptime (0:48.76)
- Cylinder Head Temperature(CHT 250)[2]
- Best Laptime (:48.22)

Press Switch 2 to see display layer 2.

Display Layer 2 - Temperatures



- Wheel Speed (Speed 101)
- Laptime (0:48.76)
- Cylinder Head Temperature (CHT 250)[2]
- Exhaust Gas Temperature (EGT 675)[3]

Press Switch 2 to change display to layer 3

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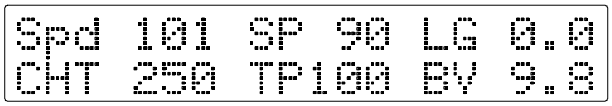
[2] *The CHT position on layer 2 may be replaced with either EGT or Water, dependant upon the sensor input type selected in the system setup.*

[3] *The EGT position is replaced by best lap time on ST8203 systems*

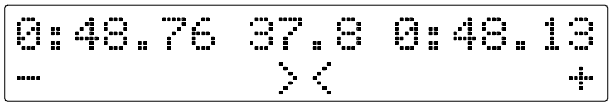
Display Layer 3 - Sensor Test



- Wheel Speed (Spd 101)
- Steering Position (SP 90)
- Lateral G Force (LG 0.0)
- Cylinder Head Temperature (CHT 250)[4]
- Throttle Position (TP 100)
- Battery Voltage (BV 9.8)

Press Switch 2 to display layer 4 if option fitted.

Display Layer 4 - Performance Meter[5]



Top Row

- Best lap time (0:48.76)
- Running time from start of lap(37.8)
- Predicted Laptime (48.13)

Bottom Row

- A graphical comparison of this lap to the previous best lap

The performance meter displays a bar growing either to the right or to the left, showing the time gained or lost against your previous best lap. When the bar goes toward the right (+) you are gaining, and when the bar goes to the left (-) you are losing time.

The predicted lap time tells you what your next lap time will be based upon your gains or losses in the current lap.

Press Switch 2 to step on to the next layer.

Display Layer 5 - Corner Speeds[6]

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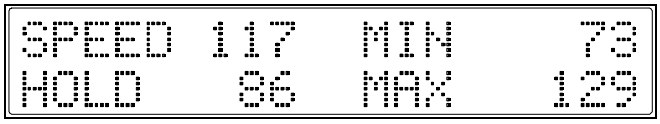
[4] *This may be replaced with Brake position on some systems.*

[5] *This feature is active only if the Performance Meter has been purchased*

[6] *This display is only available if the corner speed option has been fitted*



- Current speed (SPEED 117)
- Maximum speed on the last straight (MAX 129)
- Actual speed when Switch 1 was last pressed (HOLD 86)
- Lowest speed in the last corner (MIN 73)

Press Switch 2 to display layer 1 again.

Peak Values (Tell Tales)

The system can display the peak values (sometimes called 'tell-tales') that have been recorded during a run for most of the monitored parameters.

Peak values are updated only when the engine speed has exceeded its "gate value" for RPM *for at least one second*. This allows the values to stabilise. Blipping the engine may not be enough to update the peak values. The gate value is a predefined RPM value that is used to control when the system updates the peak values. This is to prevent abnormal peak values from being recorded when, for example, the engine is either not running, is idling, or is being warmed up.

The system stores either a maximum or a minimum value as the peak value, depending on the parameter.

Parameter	Type of Peak	Gated to RPM
Engine Speed (RPM)	Maximum	Yes
Temperature	Maximum	Yes
Battery Voltage	Minimum	Yes
Wheel Speed	Maximum	Yes

Displaying the Peak Values

Press and hold **Switch 1** to show the peak values for the parameters currently being displayed. Release the switch to return to the normal display.

Resetting the Display

You can reset all of the peak values, including the fastest lap time and Lap Count manually. All peak values are reset at the same time. If the engine is running ***at or above*** its gate value when the peak values are reset, they are set to the current value of each performance parameter.

To reset the peak values:

- Press and hold Switch 1 to display the peak values.

- While holding Switch 1, press and hold Switch 4.
- With Switch 4 held down, you will see the display revert to the current values. The new peak values that are stored are those being displayed when you release Switch 4. If the engine is running below its gate value, the peak values are not reset to the current values but are set to the following values:

Parameter	New Peak Value
Engine Speed (RPM)	0 RPM
Cylinder Head Temperature	0 Degrees C or F
Water Temperature	0 Degrees C or F
Exhaust Gas Temperature	0 Degrees C or F
Battery Voltage	26.0V
Wheel Speed	0 MPH or 0 km/h

Peak Value Memory

The peak values are stored in a memory which is powered by an internal back-up battery. They remain stored in this memory when the external power source is disconnected from the system. The internal battery needs to be changed every 4-5 years. An alarm is triggered when the power from this battery drops below a safe level and the warning "MEM BATT" is displayed.

Alarms

The *Dash-2* Kart Logger has built-in warnings to alert the driver when certain parameters either exceed or fall below their alarm values You can adjust the preset alarm levels when you configure the *Dash-2* Kart Logger. See Section 4, *Configuring the Dash-2 Kart Logger* in this manual.

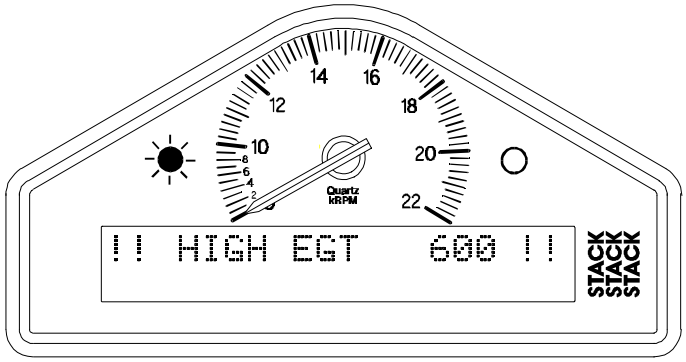
Some of the warnings (see the following table) are triggered only while the engine speed exceeds its "gate value" for RPM for at least one second. Blipping the engine may not be enough to trigger a warning. The gate value is a predefined RPM value that is used to control when the system is to trigger a warning. This is to prevent abnormal warnings from being triggered when, for example, the engine is either not running, is idling, or is being warmed up.

The *Dash-2* Kart Logger has the following built-in alarms:

Parameter	Alarm is triggered when the:	Gated to RPM
Temperature	current value exceeds the preset value	Yes
Lithium Battery Voltage	current value drops below the preset value	No
Battery Voltage	current value drops below the preset value	No

Displaying an Alarm

When an alarm condition occurs, the built-in yellow warning light turns on, and the digital display gives a warning message to show the type of alarm:



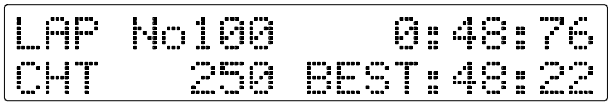
Clearing an Alarm

Press Switch 2.

Lap times

The lap time is displayed for a programmable time period of 0.04 to 40.0 seconds either when triggered by passing the lap time beacon, or on pressing switch 4.

The most recent lap time is held in display layers1 & 2. Press Switch 2 to select these display layers. Display layer 1 gives you the lap number and time of the last recorded lap.

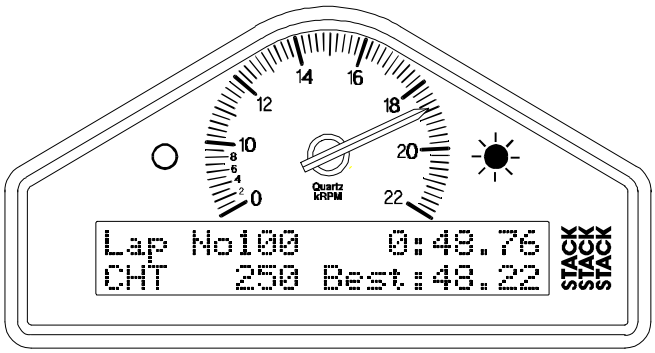


Resetting the Lap Time to Zero

Press and hold Switch 1 and then press Switch 4 to reset the lap count and lap time to zero.

Gear shift light

The gear shift light comes on when the engine RPM exceeds a predefined value. See "Configuring the Dash-2 Kart Logger" for information about setting this value.



4. Configuring the *Dash-2* Kart Logger

Configuration mode

You put the *Dash-2* Kart Logger into configuration mode by pressing Switches 1 and 2 together. You then work through the configurable parameters in a preset sequence. Press Switch 3 to display the next configurable parameter. The configurable parameters are displayed in the following order:

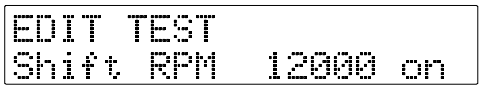
Configurable Parameter	Setting Required
SHIFT RPM	RPM at which gear shift light is to come on
Wheel Circumference	Set a value in the units of measurement indicated.
TEMPERATURE SENSOR SELECT	Select Temperature Sensor from CHT, EGT or WATER
HIGH CHT (or WATER)	Maximum cylinder head or water temperature alarm
HIGH EGT	Maximum exhaust gas temperature alarm
LOW BATT	Minimum battery voltage alarm
LAPTIME	Laptime Popup Duration
Wheel sensor pulses per revolution (W.S. PULSES/REV)	Set the value to the number of magnets you have fitted on your wheel.
Engine Speed (Cylinders)	Number of cylinders in engine (for RPM)
Logging RPM	RPM at which the logging option is automatically started.
GATE RPM	Minimum RPM for the gated peaks and warnings to operate.
BAR WIDTH	Display width of the performance meter, Standard value is 0.45 seconds
ACCEL LIMIT	Maximum acceleration expected
DECEL LIMIT	Maximum deceleration(braking force) expected

Setting or resetting configuration values

Use Switch 1 to decrease the value being configured and Switch 2 to increase it. The rate at which the value increases or decreases itself increases while the switch is being held down. Examples of the displays for each of the configuration items are shown below.

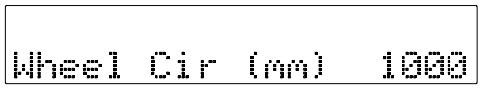
Shift RPM:

The RPM at which the shift light will come on.



Wheel circumference:

The circumference of the wheel on which the wheel speed sensor is fitted. If the sensor is fitted on the rear axle, use the size of the left wheel for clockwise tracks, and the right wheel for anti-clockwise tracks.

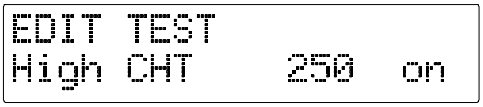


Sensor Selection

Once the option window appears use switches 1 and 2 to select the sensor type you have fitted.

CHT alarm:

The cylinder head temperature at which the alarm message will appear.

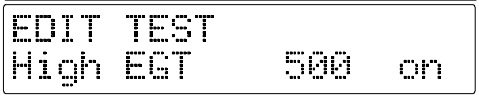


Water temperature alarm:

The water temperature at which the alarm message will appear.

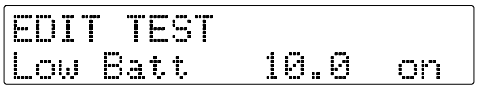
Exhaust temperature alarm:

The exhaust gas temperature at which the alarm message will appear.



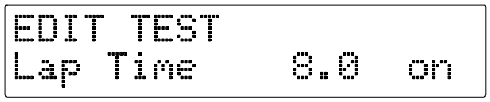
Low battery voltage

The voltage at which the alarm message will appear.



Laptime Popup

The duration that laptimes will stay on the display after the kart has passed the infrared beacon



Wheel speed pulses:

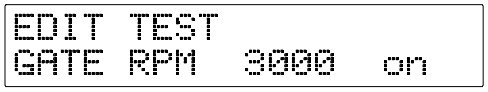
The number of magnets fitted to the wheel.

Engine speed cylinders:

Sets the number of cylinders in the engine so that the RPM is measured correctly. Most kart motors require this value set at 2, irrespective of whether they are two or four-stroke.

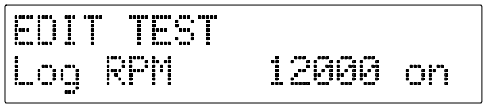
Gate RPM:

The engine speed at which the peak values start updating and alarms appear.



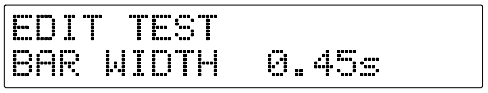
Logging RPM:

The engine speed which will cause the Dash-2 to automatically start logging.



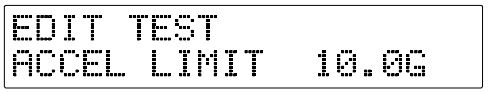
Bar Width

The width of the performance meter bar display in seconds.



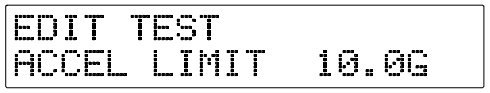
Accel Limit

Maximum expected acceleration.



Decel Limit

Maximum expected deceleration or braking force.



Switching Alarms on or off

You can enable (switch on) or disable (switch off) each of the alarm warnings by pressing and holding Switch 1 and then pressing Switch 2.

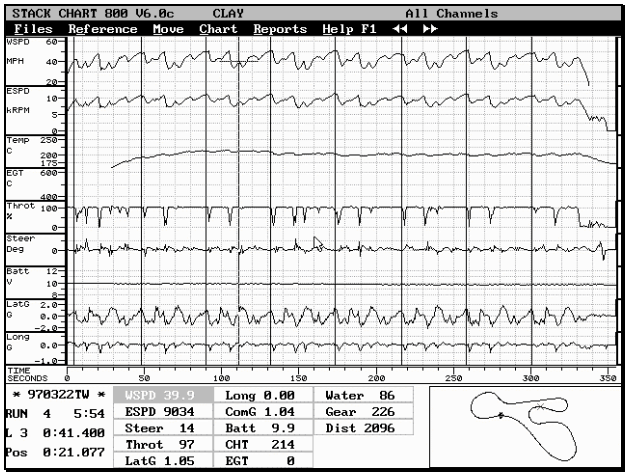
Note that you might change the preset value of the parameter slightly while pressing both switches. This does not matter if you are switching the alarm warning off and, if necessary, you can correct the preset value after you switch it on again.

Leaving configuration mode

When you wish to return to the normal display, press Switch 4.

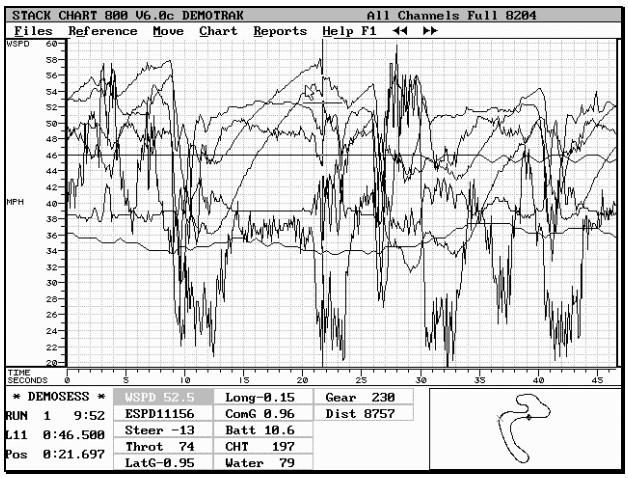
5. Using the Dash-2 Charts

All Channels



This chart displays all of the channels recorded by the Dash-2. It is useful for checking that the sensors are working correctly, and if you zoom out to a run view all of the lap markers can be seen.

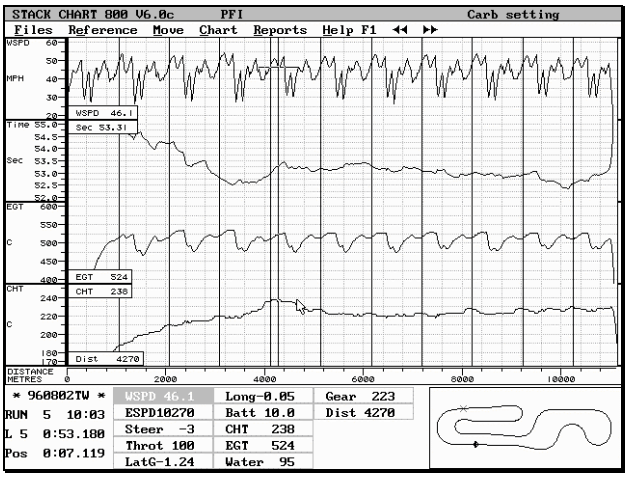
All Channels Full



This chart displays all the channels in a full screen mode.

It isn't easy to see the channels you are interested in, but some users may be more accustomed to this presentation if they have previously used other data logging systems.

Carburettor Setting



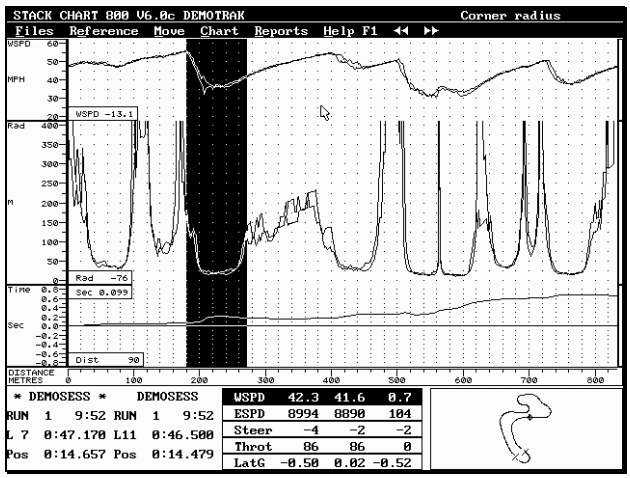
This chart displays wheel speed, rolling lap time, CHT and EGT.

The chart is best viewed at run zoom, as it is then possible to discern what effect the engine temperature has on lap times.

- Looking at the example, you can see the drop off in laptime at 4000m as the motor is overheated.

On 2-stroke motors, the combination of EGT and CHT shows how well the carburation is working. Normally EGT should increase when the throttle is open (i.e. on the straight). If EGT drops while CHT increases it indicates the onset of preignition, caused by the mixture being too weak. EGT holding level is what to aim for, but EGT increasing is safer.

Corner Radius



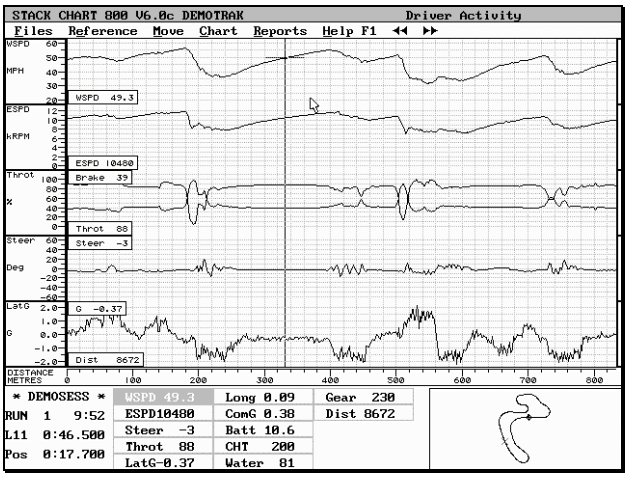
This chart displays wheel speed, cornering radius, and timeline. A high radius value corresponds to driving in a straight line and a low value indicates cornering. The lower the value, the tighter the corner.

Used in compare mode, radius is useful for seeing variations in driving style, particularly on corner entry.

Do a compare of Run 1 Lap 7 and Run 1 Lap 11 demotrak, demosess to see the detail in the example.

- The highlighted region shows how a wider entry and tighter exit from turn 3 gained 0.1 seconds.

Driver Activity

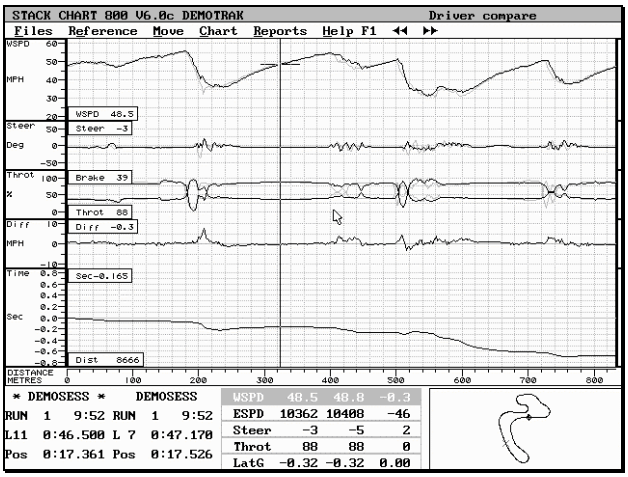


This chart shows the actions of the driver on steering, brake, and throttle.

Important things to look for are:

- Gaps between coming off the throttle and getting on the brake.
- Feathering the throttle in flat out corners. Often the driver will honestly not realise it is happening.
- Dragging the brake.

Driver Compare

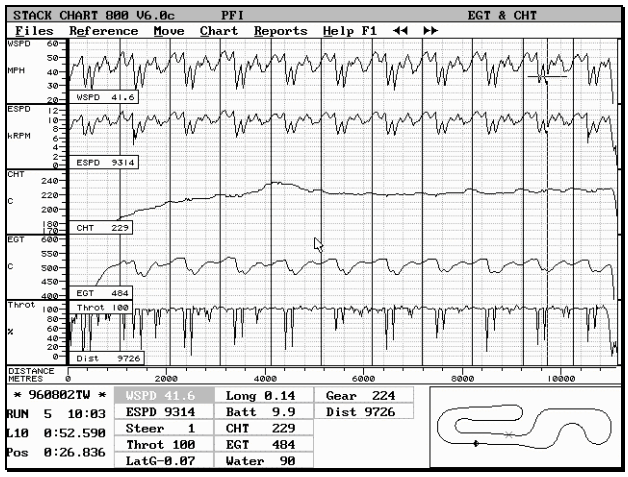


This chart displays wheel speed, steering, throttle, brake, speed difference and timeline.

With two laps overlaid, you can see what the driver did to gain time.

- Later braking
- Better corner exit speed gains time all the way up the straight
- In wet conditions slow in-fast out is frequently quickest

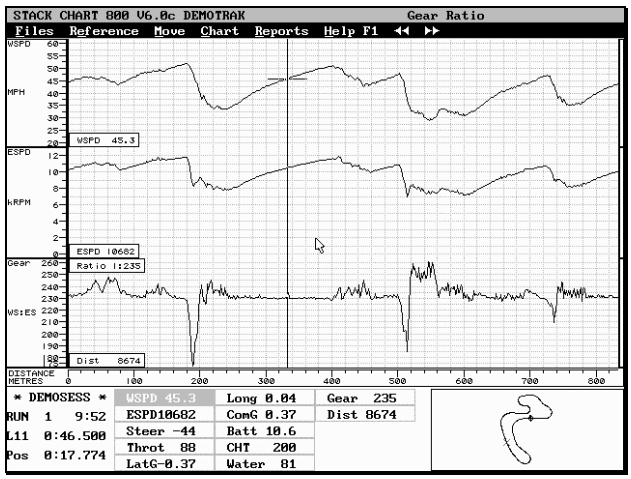
EGT & CHT



This chart displays speed, RPM, CHT, EGT and throttle.

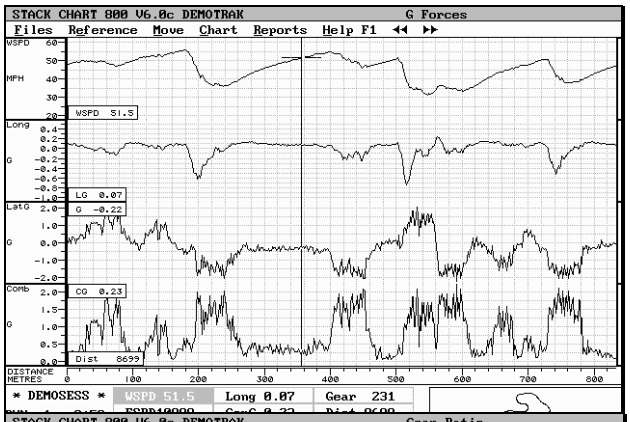
Generally, temperature charts are most useful viewed over a complete run.

EGT & Water Temperature



Watercooled karts will use this chart rather than the CHT or Carburettor setting charts.

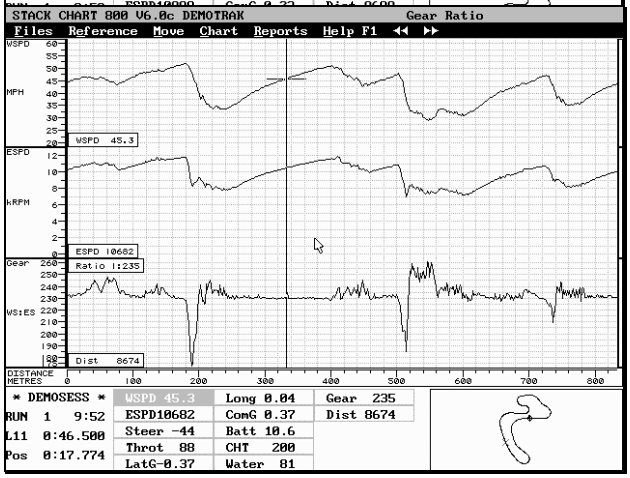
G Forces



This chart displays wheel speed, lateral g[7], longitudinal g[8], and combined g.

Combined g can be very useful to detect braking problems; you should be able to achieve roughly the same constant value from the start of the braking zone to the exit of the corner. What the value is depends upon track conditions, chassis setup and tyres.

Gear Ratio



This chart displays wheel speed, engine speed, and gear ratio.

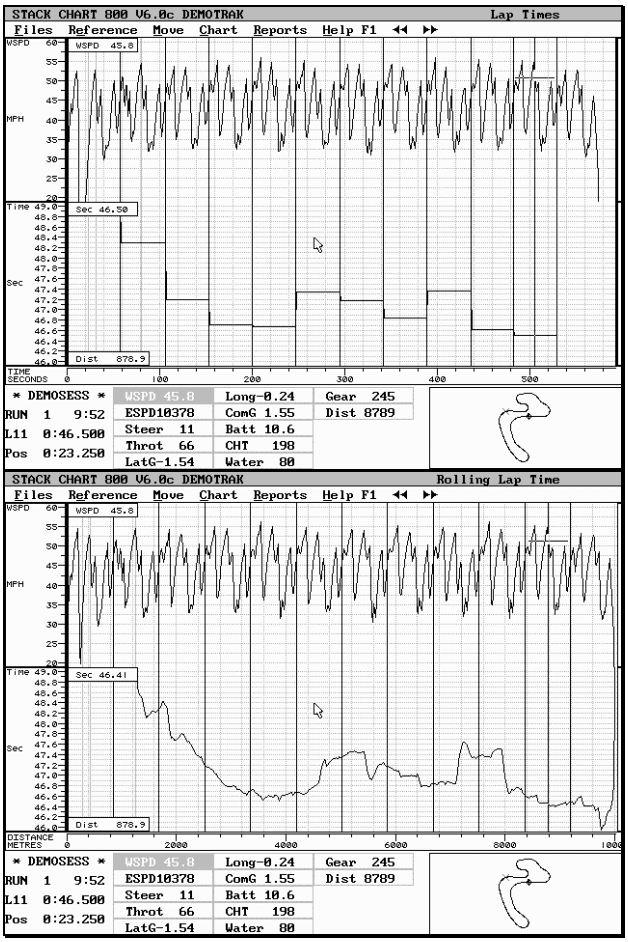
The ratio trace gives a very clear indication of wheelspin and lockup under braking. The trace goes up for wheelspin, and down for lockup.

Lockup is evident in the example, at 190 metres and 515 metres. The small upward excursions of the trace aren't wheelspin, they are caused by tyre deflections in the corners.

[7] *Side to side g-force. Left turns are positive g, right turns are negative g.*

[8] *Accelerating and braking, also known as inline g. Positive g is acceleration.*

Lap Times



This chart displays wheel speed, and lap time.

This is a nice overview of the laptimes achieved in a session, without the detail of the rolling laptime chart.

Rolling lap time

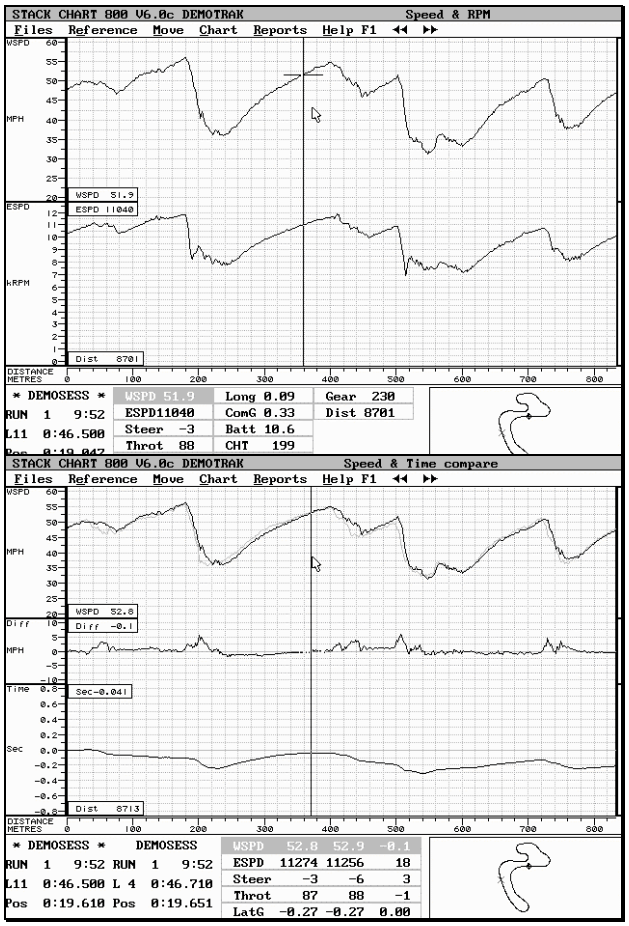
This chart displays speed and rolling lap time.

The rolling lap time is the time taken to complete a whole lap of the track at any point on the circuit.

The usefulness of this is that seldom do you achieve your best times measured from the start line.

Interesting features of this presentation are that you can easily judge the driver consistency from the amount of variation in the trace. The example shows the learning curve of a driver introduced to a track for the first time. The two "blocks" at 5000 and 7500m are where a mistake was made which took a whole lap to lose their effect on the lap time.

Speed & RPM



This chart displays wheel speed and engine speed.

With the larger screen areas than the Gear Ratio chart, more detail can be see in the traces, particularly when overlaying.

Remember that it is the wheel speed you are trying to maximise, not the RPM.

Speed & Time Compare

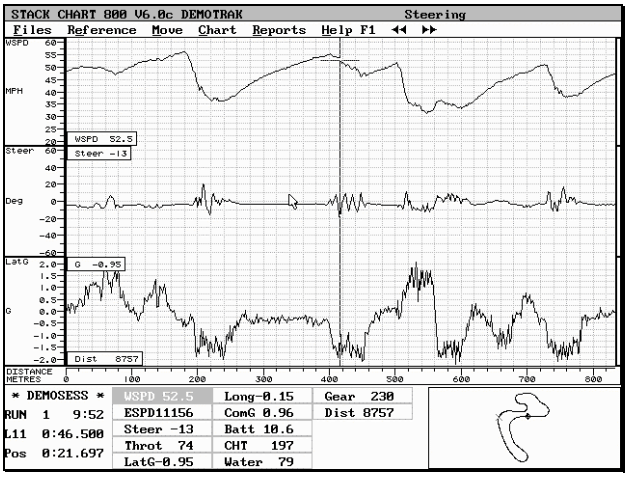
This chart displays wheel speed, speed difference and timeline.

Refer to the *Data Analysis Software User Guide* for a detailed description of the timeline.

With this chart you can easily separate differences in engine and driver performance. There are a couple of points to watch:

- Compare engine performance on the straight only for laps with the same corner exit speed.
- You can gain time by braking too late going into a corner, but lose it on the exit and all the way up the following straight. Try and maximise exit speed in corners leading onto straights.

Steering



This chart displays the wheel speed, the movement of the steering wheel, and the lateral g-force.

6. Installing the *Dash-2* Kart Logger

Fitting the Display Module

The *Dash-2* Kart Logger is fitted to the kart with the two brackets on the bottom of the unit mounting onto the steering column and the two tapped inserts take screws through the Nassau panel.

Procedure

1. Cut holes in the sides of the panel to allow the infrared receiver to see the trackside beacon, and to allow the download cable to be attached. Drill two 6mm clearance holes in the face of the panel to take the two fixing screws.

1. The lower brackets are supplied with a number of holes for the column fixing bolts. Choose the fixing hole which gives the driver the best view of the dash. Once chosen, the excess bracket may be cut off to give a neat installation.
   There must be no strain on the brackets after fitting. Take special care that the brackets are parallel with each other.

1. Using the screws and rubber washers supplied, attach the Dash-2 to the Nassau panel.

2. Lastly, centralise the unit so that it is in line with the steering wheel and then tighten the two locknuts holding it to the bottom brackets.

Wiring

The Display, sensors and switches for your System are connected together by means of the wiring supplied with the system.

This wiring has been designed so that the various branches are long enough for most Karts. Provided that you have chosen suitable locations for the sensors that you are installing, you should not need to extend any of the individual wires.

Fitting the wiring

When fitting the sensors on the kart, you should observe the following:

- All wires should be as far as possible, and not less than 50mm, from ignition HT leads and distributor caps, etc.
- When you pass any wire through a panel, fit a cable gland into the hole so that the edge of the hole cannot chafe the wire.
- Particular care is needed when passing wires through holes in carbon fibre, as the carbon can cut through cables very easily.

Electrical Interference

IMPORTANT The kart must have a suppressed ignition system for the Dash-2 to operate correctly and reliably. Solid core leads with a 5k suppressed plug cap or silicone suppressed HT leads are appropriate.

The cables from the engine speed sensor (ST697 HT pickup) and the CHT sensor (ST758) carry interference from the ignition system, and must be kept away from all the other sensor wiring until the signal has passed through the interface board located approximately 30 cm(12 in) from the connector. The engine kill switch and wiring also carries the interference, and the same rules apply to it.

The best way to achieve this is to run the HT and CHT sensor cables together along one side of a chassis tube, and the cables from any other sensors along the opposite side of the tube.

Wiring labels

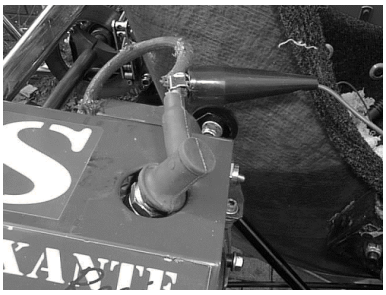
See Section 2 if you need to check the labels used to identify the individual cables in the wiring harness

Fitting the Engine Speed (RPM) Sensor

The engine speed (RPM) is normally measured by connecting the engine speed HT Pickup sensor directly onto the ignition system plug lead. The sensor consists of a signal interface wired and terminated with a Mini Sure seal connector at one end and a spring clip at the other end.

Procedure

1. Connect Mini sure seal to the main unit harness input labelled **ES**.
2. Route the interface cable down the steering column and under the drivers seat until the spring clip end can reach the plug lead. Attach to the ignition lead with the spring clip. If the cable is too long, you may shorten it by removing the spring clip and cutting a piece off.
3. In the event that the display shows poor RPM response, remove the spring clip from the wire and loop the wire round the ignition lead until good signal pickup is achieved then tape up any loose wire. Take care with the high voltages around the ignition system, as the spring clip and wire may pick up enough voltage to give you an unpleasant shock.

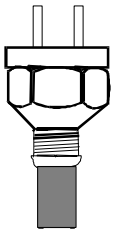


PRO-KART Installation

Remove the spring clip from the cable and strip back the insulation from the end of the wire. Connect this wire to the engine's Kill Switch bullet connector. To make a satisfactory connection, either solder this wire to this connector or crimp the wire into the bullet connector.

Fitting the Water Temperature sensor

The Display System is supplied with different sensors requested at time of ordering, according to the thread size required. Your system may be supplied with either ST 760, ST761, ST762, or ST764.



ST760 ST761 ST762 or ST764

The ST760 temperature sensor has a 1/8" BSP taper thread.

The ST761 temperature sensor (not normally used) has an M14 x 1.5 thread.

The ST762 temperature sensor has an M10 x 1 thread (UK, EC versions).

The ST764 temperature sensor has two terminals and a 1/8" NPTF thread (U.S. version)

If you find that you have a sensor with an incorrect thread, please return it unused to Stack for replacement.

Procedure

1. Mount each temperature sensor directly in the appropriate fluid line.
2. Screw the sensor into a suitable mounting boss, so that its end lies in the middle of the flow of fluid.
3. Position the sensors and their cables as far as possible from sources of intense heat and from the ignition HT leads.
4. Connect the sensor to the plug marked TMP on the Dash-2.

Fitting the Wheel speed sensor

The *Dash-2* Kart Logger is supplied with one STACK ST669 proximity sensor. This sensor is used to measure wheel speed in order to display the kart's speed in MPH or km/h. The sensor provides an electrical pulse to the system each time a magnet passes the sensor.

Generally it is best to measure the speed from an outside front wheel, as wheelspin and brake lockup affects the distance calculation. This then degrades the accuracy of the Performance Meter and multi-run overlays on the PC.

Procedure

1. It is absolutely vital that the magnets are not mounted where they may be subjected to high temperature, as this takes away their magnetic properties and renders the wheel speed channel inoperative. The areas to avoid in this respect are brake discs and hot exhaust gases.

1. Glue bond a single magnet to the flat inner rim of a wheel, (normally one of the front wheels), with the unmarked end of the magnet against the wheel rim and the red end of the magnet clearly visible once the magnet is glued in place.

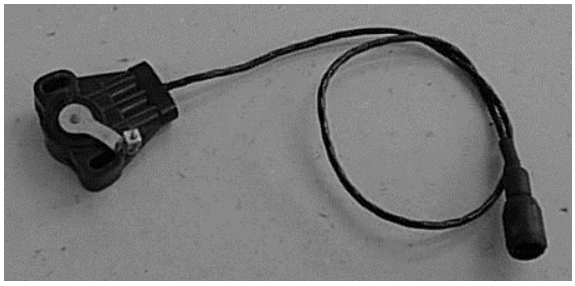
   The best way to use the adhesive is to clean the wheel with some brake cleaner or solvent thinners. Then put a thin film of activator on the wheel. Put a bead of the adhesive on the end of the magnet, and push it onto the activator. Leave for 5 minutes to cure.

2. Bolt the sensor onto the steering arm and tighten it in place with a 2 mm gap between it and the magnet.

3. The Wheel Speed sensor is fitted with a mini sure seal connector. The wire from the sensor should be routed along the floor of the kart, up the steering column or back of the Nassau panel, then plugged into the system harness connector labelled **WS**.

Fitting the Throttle or Brake Position Sensors

The sensors are in the form of a lever arm operated sensor, fitted with a mini sure seal connector. With the 120º of movement lever arm located on the top of the sensor, the arm operates in a counter-clockwise direction in normal operation.



Procedure

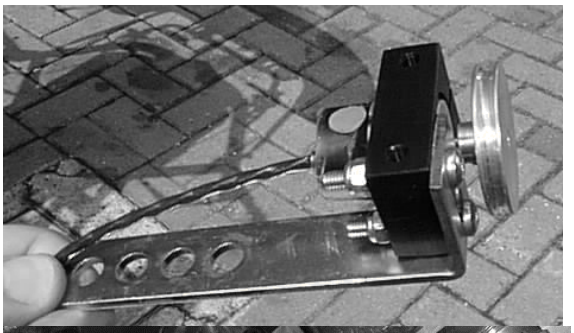
1. Mount the sensor on the floor of the kart such that is does not interfere with the drivers feet movements.
2. Once the intended location for fixing is determined, mark the positions for the two attachment hole positions for the sensor onto the floor of the kart. Drill these positions with a 4.5mm drill to provide clearance for the supplied bolts.
3. Feed the crosshead bolts through the floor of the kart and the holes in the sensor, keeping the bolt heads on the underside of the floor. Fit and tighten the supplied locknuts onto the bolts. Using the length of cable supplied, pass the end of the cable through the hole in the lever arm and attach the other end to the side of the pedal.
4. Adjust the cable tension until the lever arm is just pulled away from it's rest position. This adjustment needs to be checked regularly to remove any slack in the cable which may give rise to errors in throttle position.
5. Once the sensor is fully installed, connect the sure seal connector to the system harness input labelled **TP** for the throttle, or **EGT BP** for the brake.

Fitting the Steering Position Sensor

The steering position sensor takes the form of a rotary potentiometer mounted in a bracket clamp and is supplied with an additional L bracket to allow unit attachment to the kart by means of the steering column support bracket bolt.

Procedure

1. Assemble the sensor bracket so that it looks like the one in the picture. Ensure that the pulley wheel is secure on the sensor spindle. Ensure the pulley does not foul on any part of the sensor bracket



2. Remove the steering wheel and the steering column support. Make a double loop around the steering column with the long O ring supplied..
3. Re-attach the steering column and steering wheel.
1. Fit the sensor L bracket by means of the Steering column support bolt, using one of the 4 available attachment holes.

   When you have decided on the correct holes for your kart, you can cut the unused portion off.

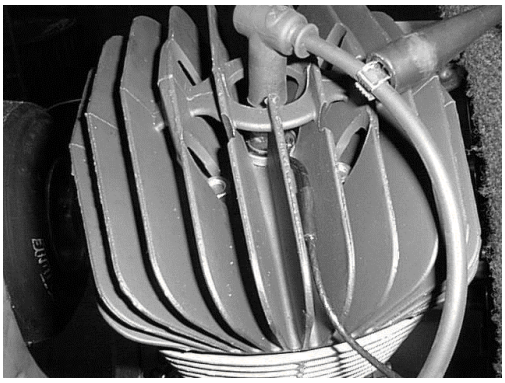
1. Loop the long end of the O ring fitted to the steering column around the pulley wheel and bring the O ring under tension by angling the L bracket downwards. Insufficient O ring tension will allow it to slip on the steering column, producing incorrect sensor data.
   If you wish to shorten the O ring, then cut it with a sharp knife and rejoin it using superglue.
2. Once the sensor is installed, connect the sure seal connector to the system harness input labelled SP.

Fitting the Cylinder Head Temperature sensor

The sensor comes in the form of a circular sensor, mounting underneath the spark plug, clamping the sensor firmly against the cylinder head.

Procedure

1. Remove the sparking plug lead and remove the spark plug.
2. Position sensor with the stepped base into the plug seat. It may be necessary to remove the washer from the spark plug
3. Refit the spark plug and reattach the plug lead.
4. Route the sensor cable towards and under the driver seat, then up the steering column.
5. Connect the sure seal connector to the system harness input labelled **TMP**.



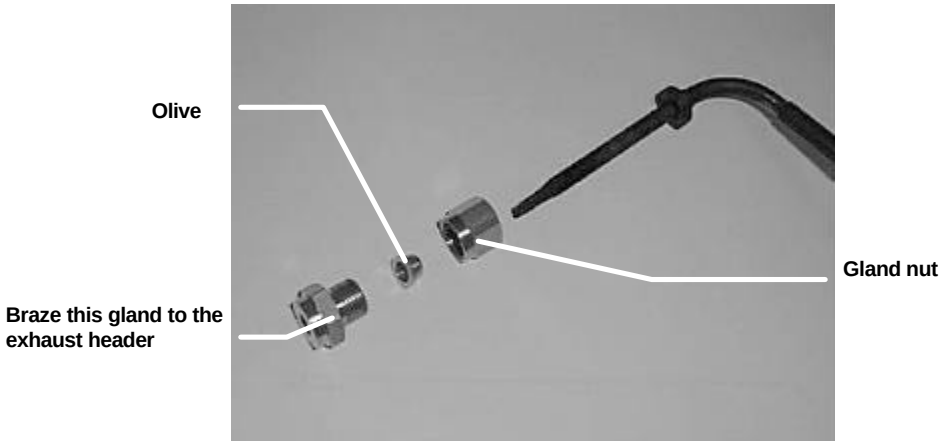
Fitting the Exhaust Gas Temperature Sensor

This sensor mounts into the exhaust system. The sensor is fitted with a shaft collar which limits the depth of insertion into the exhaust system header or expansion box.

The sensor requires clamping in place by means of the compression gland fitting supplied.

Procedure

1. Braze the gland in place to provide sensor support and exhaust system sealing.
2. Assemble the sensor in the order shown in the picture. Insert the sensor probe into the exhaust to the required depth (usually with the end of the probe in the centre of the pipe), and tighten the gland nut to lock it in place.
3. Connect the sensor to the connector marked EGT BP.



Battery and Charger

The battery pack supplied is similar in type to those used in radio control cars. Although RC battery packs will run your Dash-2 logger, the pack we supply is a higher specification than those normally encountered in stores.

A fully charged battery pack will run a Dash-2 for about 1½ hours. It is a good idea to turn the system off when not in use to save the battery.

The charger supplied will fully recharge a battery pack in about 5 hours. Disconnect the charger after this period otherwise the pack will be damaged by overcharging.

When new, the battery pack will not achieve its full capacity until it has had a number of charge-discharge cycles.

Trackside Infra-Red Lap Beacon

The ST544 infra-red lap beacon should be located as follows:

- As near to the start-finish line as possible
- At the same height as the on-kart detector
- Level, so that it emits a horizontal beam towards the left hand side of the kart.
- It must be between 2 and 30 meters (6 to 95ft) from the kart when the kart passes it.
- There must be no other Infrared beacons of any type within 4 metres.

Avoid positioning it so that the sun is directly behind it when it is being used.

Where the unit is to be used for lengthy periods in very hot, sunny conditions, it should be protected by shading it from direct sunlight.

Do not allow water to be sprayed onto the transmitter lenses. During wet conditions, fit a protective shroud over the beacon.

Power supply to Trackside beacon

The beacon operates from a 12v DC supply. A sealed lead-acid battery with a minimum rating of 2.5 Amp/hour is recommended. This provides about 15 hours of operation.

Connect the Brown wire to the positive (+) terminal of the battery, and the Blue wire to the negative(-) terminal.

The condition of the battery is indicated by the colour of the LED indicator on the front panel of the unit:

- Green: The voltage is adequate for use
- Red: The voltage is too low (replace the battery).
- No Colour: Battery exhausted or disconnected.

7. Troubleshooting

Symptom	*Possible Cause*	*Remedy*	*Notes*
Display is dead	Power switch is off	Turn on	
	Battery is dead	Recharge or replace battery	
	Power connection is faulty	Check if battery is connected correctly. Check power lead continuity	
!! LOW BATT !! warning on display	Battery is almost dead	Recharge or replace battery	
	Power connection is faulty	Check power lead continuity	
Display flashes and dial pointer resets or vibrates	Battery is almost dead	Recharge or replace battery	
	Power connection is faulty	Check power lead continuity	
Display gives a fixed temperature reading	Temperature sensor has failed	Replace sensor	Disconnect sensor.
	Faulty sensor connections	Check continuity of sensor leads	Check harness for short circuit
Display gives a fixed reading of 0° C or 0° F when temperature is above 70° C or 160° F	A temperature sensor has failed	Replace sensor	
	Faulty sensor connections	Check continuity of sensor leads for open circuits.	
All sensors show fixed high values	Switch 1 (Peaks) faulty	Return unit for repair	
Peak values not updated	Gate value set too high	Change Gate RPM in the display configuration menu	
	Internal memory battery dead	Return unit to Stack for new battery service	Display shows !!MEM BATT!! warning on power up

Symptom	Possible Cause	Remedy	Notes
Switch 1: Show peak values does not work	Switch 1 faulty	Return unit for repair	
Switch 2: Clear last alarm function does not work	Switch 2 faulty	Return unit for repair	
Switch 2: Change display layer function does not work	Switch 2 faulty	Return unit for repair	
Switch 4: does not set or display pop-up lap times when no automatic receiver in use	Switch 4 faulty	Return unit for repair	
Lap time is not displayed automatically	Lap marker receiver faulty	Return unit for repair	
	Lap beacon is not switched on	Connect the 12 battery. Check that the green light comes on.	
	Beacon is too close to other transmitters	Ensure it is 4m away from other beacons	
	Beacon not aligned correctly	Check that it is pointed directly across the track, and at the correct height.	
Display values and messages unclear or unreadable (poor contrast)	Display too hot or too cold	Ensure that the display is operated within the specified temperature range	Operating temperature is –20° C (+5° F) to +70° C (+158° F)
No RPM speed reading	Incorrect wiring	Check the connection of the engine speed wire to the ignition system (or sensor, if used)	
Displayed RPM value too high or too low by a constant %-age amount.	System configured with wrong number of engine cylinders.	Reconfigure system to correct number of cylinders.	2-stroke motors need to be set with 2 cylinders

Symptom	Possible Cause	Remedy	Notes
	Ignition system pulses per revolution not same as number of cylinders	Reconfigure system to correct number of pulses per revolution.	
Displayed speed value too high or too low by a constant %-age amount.	System configured with wrong number of targets per wheel revolution	Reconfigure the system with correct values	
	System configured with wrong circumference.		Typical wheel circumference is 900mm / 35” for a kart
No speed reading Speed reading erratic, value jumps high or low	Faulty sensor and/or wiring	Rotate the wheel by hand and check the speed display on Layer 2	
	Incorrect sensor gap	Check that the gap is approximately 2 mm	
Speed reading dies after a short time	Ambient temperature too high	Shield the sensor from radiated heat from brakes and bearings. Insulate sensor from conducted heat with fibre washers. Duct cooling air around the sensor	Maximum temperature for correct operation of the wheel speed sensor is +80°C (175°F)
No alarms for (temperatures) being displayed	The alarms have been switched off	Switch on the required alarms	Alarms only operate when the engine is running above the gate value.
	The engine RPM gate value is set too high	Reset the RPM gate to a lower value.	
	The wiring is too close to HT leads, or HT leads tied to isolated metal work to which Dash-2 wiring is also tied.	Run Dash-2 wiring away from HT leads	Recommended Minimum spacing 75mm (3.0”)

Symptom	Possible Cause	Remedy	Notes
Displayed RPM value too high or too low by a constant %-age amount.	System configured with wrong number of engine cylinders.	Reconfigure system to correct number of cylinders.	Ignition systems may either: -produce "waste" sparks giving double the number of cylinders per revolution
	Ignition system pulses per revolution not same as number of cylinders	Reconfigure system to correct number of pulses per revolution.	
Display and alarm light flash when the engine is running	Intermittent alarm caused by a parameter with its alarm level set too close to the normal operating value	Either change the value for the alarm or turn the alarm off	Press Switch 2 to see which sensor is causing the alarm.

Spares

Spare parts are available from your STACK distributor or direct from STACK.

Please quote the following part numbers when ordering:

Part #	Description	Qty
ST697	HT (RPM) sensor	
ST669	Wheel speed sensor kit (includes sensor, fixings, magnets and adhesive)	
ST913026	Magnet kit (includes 6 magnets and adhesive)	
ST758	Cylinder Head Temperature sensor	
ST759	Exhaust Gas Temperature sensor	
ST940001	Spare gland for EGT sensor	
ST760	Water Temperature sensor 1/8" BSP	
ST761	Water Temperature sensor M14	
ST762	Water Temperature sensor M10	
ST764	Water Temperature sensor 1/8" NPTF	
ST779	Kart Pedal sensor for throttle or brake	
ST778	Kart Steering sensor	
ST890	High Speed download PCNIU interface	
ST544	Trackside beacon	
ST111410	Dash-2 rechargeable battery	
ST180034-003	Bottom Bracket (1)	
ST8108	Performance Meter upgrade - requires return of Dash-2 unit to STACK	
ST8109	Corner Speeds upgrade - requires return of Dash-2 unit to STACK	
ST921006-006	Version 6.0 PC Analysis software	

8. Summary of Switch Functions

Normal Operation

Function	Press
Show Peak Values	Switch 1
Change Display Layer	Switch 2
Clear Alarm	Switch 2
Start / Stop Recording	Switch 3
Reset Logger	Switches 1 & 3 together
Manual Lap Marker	Switch 4
Reset Peak Values	Switches 1 & 4 together
Reset lap count and lap time to zero	Switches 1 & 4 together
Put system into configuration mode	Switches 1 & 2 together

System Configuration Mode

Function	Press
Decrease the value of the parameter being displayed	Switch 1
Increase the value of the parameter being displayed	Switch 2
Enable or disable an alarm for the parameter being displayed	Switches 1 & 2 together
Display the next configurable parameter	Switch 3
Quit configuration mode and return to normal mode	Switch 4

Index

Alarm
  battery voltage, 13
  CHT, 13
  clearing, 13
  EGT, 13
  lithium battery, 13
  Water temperature, 13
Alarms, 13
  switching on or off, 18
Analogue tachometer, 5

Battery, 39
Beacon, 40
  power supply, 40
Brake
  sensor fitting, 34

Chart
  All channels, 20
  All channels full, 20
  Carburettor setting, 21
  Corner radius, 21
  Driver activity, 22
  Driver compare, 22
  EGT & CHT, 23
  EGT & Water temperature, 23
  G forces, 24
  Gear Ratio, 24
  Lap times, 25
  Rolling lap time, 25
  Speed & RPM, 26
  Speed & time compare, 26
  Steering, 27
CHT
  display, 9
  sensor fitting, 37
CHT sensor
  wiring label, 5
Clearing
  alarms, 13
Configurable parameters, 15
Configuring the display system, 15
Corner Speed
  option, 4
Corner speeds, 10

Digital display panel, 5
Display
  corner speeds, 11
  layer 1, 9
  layer 2, 9
  layer 3, 10
  layer 4, 10
  layer 5, 11
  layers, 8
  module, 5
  peak values, 11
  performance meter, 10

EGT
  sensor fitting, 38
Engine speed
  cylinders, 15
  sensor fitting, 31
  wiring label, 5

Fitting the display module, 28

Gate
  RPM, 15
  value, 11, 13
Gear
  shift light, 14
  shift RPM, 15

High CHT
  alarm, 15
High EGT
  alarm, 15
HT pickup. *See* Engine Speed

Infra Red Beacon, 40
Installing the *Dash-2* Kart Logger, 28
Interference, 30

Kill switch, 30

Labels on wiring, 5
Lap number, 9

Laptime, 9
  best, 9
  popup duration, 14
  predictive, 10
Laptimes, 14
  popup duration, 15
Low batt, 15

Maximum cylinder head temperature alarm, 15
Maximum exhaust gas temperature alarm, 15
Minimum battery voltage alarm, 15

Operating the *Dash-2* Kart Logger, 7
Optional components, 4, 47

Peak value memory, 12
Peak values, 1
  resetting, 12
Peak values (tell tales), 11
Performance meter, 10
  option, 4
Performance parameters, 1
Power supply, 6

Resetting the peak values, 12
RPM
  gate value, 11, 13
  shift light, 15

Shift light, 16
Standard components, 3
Steering
  sensor fitting, 35
Steering sensor
  wiring label, 5
Switches, 7
  summary of functions, 49
Switching the system on, 8

Tachometer, 5
Temperature sensor selection, 15
Throttle
  sensor fitting, 34
Throttle sensor
  wiring label, 5

Unpacking, 3

Warning lights, 8
Warning messages, 1
Water
  temperature sensor fitting, 32
Wheel
  circumference, 16
  magnet fitting, 33
  magnets, 17
  sensor fitting, 33
Wheel circumference, 15
Wheel sensor
  pulses per revolution, 15
Wiring Harness, 5
  installation, 29
EGT sensor, 5
Water temperature sensor, 5
Wheel speed sensor, 5

Zeroing
  lap count, 14
  laptimes, 14