ST8302 and ST8360 Video-Logger System

Users Guide

Part No./Issue No. ST542075-001

Preface

Thank you!

Thank you for purchasing the Stack Video-Logger system. Whether you have opted for the Standalone ST8302 or the Expansion ST8360 package, it will give you a wealth of information that will help you get the maximum safe performance from your vehicle.

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.

This manual

This manual will help you install and use the Stack ST8302 and ST8360 Video-Logger systems. It explains how to set up and configure each system for your vehicle.

Edition Notice

This edition is for all versions of the ST8302 and ST8360 Video-Logger systems distributed to customers world wide. The units of measurement used to illustrate the use of the system in this edition are for the UK version. Units used in the other versions are shown in the following table.

Parameter Type	UK Version	US Version	EC Version
Speed	MPH	MPH	km/h
Temperature	Degrees C	Degrees F	Degrees C
Wheel Circumference	Millimetres	Inches	Millimetres
Pressure	PSI	PSI	Bar
Distance	Metres	Feet	Metres

Getting Help

Stack and its approved distributors provide a comprehensive Technical Help service to assist with your enquiries. Contact your local Stack branch or distributor. A current list of distributors can be found on the Stack websites at **www.stackltd.com** or **www.stackinc.com**

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
- Analog Sensors
- Digital Sensors
- Data Logging Systems
- Display and Logging Systems
- Radio Telemetry Systems
- Display and Analysis Software

United Kingdom Telephone Numbers:		United States Telephone Numbers:	
Sales:	01 869 240404	Sales:	888-867-5183
Tech Support:	01 869 240420	Fax:	888-364-2609
Fax:	01 869 245500	Email:	sales@stackinc.com
Email:	sales@stackltd.com	Web site:	www.stackinc.com
Web site:	www.stackltd.com		

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Chapter 1. Introduction

The Stack VCR Video-Logger system transforms your in-car video recorder into a powerful data-logging system without the need for a PC. Using video overlay technology, real-time performance data is superimposed onto the video picture along with engine parameters and driver activity channels.

The Video-Logger System can:

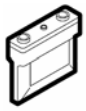
- Be used with most race PAL or NTSC video systems
- Connect to dedicated sensors and an existing Stack display, steering wheel or logging device
- Start and stop video recording automatically based on RPM
- Display peak values for all parameters at the end of recording
- Display user-configured alarm messages for engine temperatures and pressures on the video screen, with rapid navigation between alarms

Product Versions

Standalone Video-Logger System

The Standalone Video-Logger comprises a sensor and harness for use with an existing race video system.

ST8302VS VCR Video-Logger



ST8302VSM VCR Video-Logger 'Max'

Expansion Video-Logger System

For vehicles with a STACK ST8100/ST8102 display and existing race video system.

ST8360V Video-Logger Expansion

ST8360VM Video-Logger Expansion 'Max'

Standalone system (ST8302VS and ST8302VSM 'Max')

The Video-Logger system connects between the remote-mounted video camera and the video recorder.

The video recorder **must** have an A/V-in connecter (4W 3.5mm Jack socket) for use with a CCTV-type remote camera.

Many of the Stack Video-Logger's ease-of-use features rely upon the recorder having a 'LAN-C' control connector (3W 2.5mm Jack socket). Although the LAN-C connection is not essential for operation, it is highly recommended and ensures that the best possible video quality and reliability is achieved (see p.7-8).

External sensor inputs:

- RPM
- Speed
- Oil temperature
- Water temperature
- Brake pressure or brake switch
- Oil pressure
- Fuel pressure
- Throttle angle
- Lap times

Internal channels:

- Distance
- Lateral-G and longitudinal-G
- Min/Max corner/straight speed
- Gear
- Predictive lap timer
- Alarm count
- Battery Voltage

Expansion system (ST8360VS and ST8360VSM 'Max')

The Expansion system connects to the harness of an existing Stack display, steering wheel or logging device.

The harness provides power for the system and access to data from the existing sensors. This saves duplicating sensors and makes for a simpler installation overall.

Inputs from Stack display system:

- RPM
- Speed
- Oil temperature
- Water temperature
- Oil pressure
- Fuel pressure
- Battery volts
- Lap times

External sensor inputs (require additional harness):

- Throttle angle
- Brake pressure (option) or brake switch

Internal channels:

- Distance
- Lateral-G and longitudinal-G
- Min/Max corner/straight speed
- Gear
- Predictive lap timer
- Alarm count
- Battery Voltage

How to use this manual

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

In *Chapter 2 – Getting Started*, we'll show you how to do this. By the end of Chapter 2, you will have set up the system, proved that it is functioning correctly and become familiar with its operation.

In *Chapter 3 – Configuration*, we'll show you how to configure the system for your own particular vehicle.

In *Chapter 4 – Installation*, we'll talk you through the process of installing the configured system 'for real' in your vehicle.

Finally, in *Chapter 5 – Troubleshooting*, we'll look at any problems you might have when using your equipment and suggest ways of resolving them.

The Appendices provide supplementary information that may prove useful.

Please note: This manual does not attempt to explain how to interpret or use the data from the Video-Logger system, as this will be specific to the type of vehicle in which it is installed and the type of competition in which it is engaged.

Chapter 2. Getting Started

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

Initial Checks

Check that you have the right components for your system before attempting to put it together. Please refer to the packing list that was included in your product shipment.

Optional Items

Optional Items for ST8302 Standalone System

The ST8302VS and ST8302VSM Video-Logger systems can be used with the following optional components:

Quantity	Description
2	ST747 10 Bar / 150 PSI Pressure Sensor
2	ST991 -20°C - 150°C Fluid Temperature Sensor
1	ST970 / ST979 / ST483 Throttle Sensor
1	ST749 Brake Pressure Sensor

Optional items for ST8360 Expansion System

The ST8360V and ST8360VM Video-Logger systems can be used with the following optional components:

Quantity	Description
1	ST546 Infrared Lap-Timing System
1	ST5097 Manual Lap Timer
1	ST549 Brake Pressure Sensor
1	ST970 / ST979 / ST483 Throttle Sensor
1	ST892V Brake/Throttle Harness

The Video Camera and Video Recorder

These are not supplied with the system, so you should provide your own suitable equipment.

Although most 'camcorders' consist of both camera and recorder in one unit, you must use a separate camera, often called a 'lipstick' or 'bullet' camera, to obtain the image.

Your video recorder must:

- Be either NTSC or PAL format (you needed to specify which when you purchased your Video-Logger system, because each format requires a different V/VS Module). Typically, NTSC format is used in the USA and PAL in Europe.
- Have an A/V input to connect an external camera.
- Have a display screen which is clear and not too small, so that the configuration menus are readable. The camera's viewfinder could be used in exceptional circumstances.
- Ideally have a LAN-C port, which is required for automatic operation.

To facilitate fully-automatic operation, your camera should have a LAN-C port. This allows the system to start and stop recording when the engine speed reaches a specified RPM

With a LAN-C port the camcorder can be put into 'standby' mode, to preserve battery life. In addition, the LAN-C port is required to report the true recording status of the camera.

The following table shows the recommended operational differences between LAN-C and non LAN-C recorders:

V	VS	LAN-C	Non-LAN-C
	✔	RECORD switch = Toggle log + Reset Peaks, Laps and PLT	RECORD switch = Reset Peaks, Laps and PLT
	✔	RECORD switch = Reset Peaks, Laps and PLT (if Memory Card or Tape is full)	Must turn off "Start RPM" test to prevent a reset every time the Engine Speed goes through 3000rpm
✔		Must use Display System (ST8100) switches to Reset Peaks, Laps and PLT	
✔	✔	Turn on "Peaks MPH" test only if the vehicle has its ignition off on the grid. This will prevent peak values being shown as the race starts	
✔	✔	Recorder automatically stops recording when V/VS module is switched off	Recorder may or may not stop recording when V/VS module is switched off
✔	✔	Relies on Engine Speed exceeding the "Start RPM" test value to start recording	Recorder must be started manually

PLT = Predictive Lap Timer ("Max" systems only)

Table 1 – LAN-C and non LAN-C Video Recorders

The Sensor Wiring Harness

The sensor wiring harness carries data from the sensors to the VS Module. Each of the wires in the harness is labelled to show which sensor it should be connected to. See Appendix B for a full diagram of this harness.

Labels	Connects To
WS	Wheel speed sensor
LAP	Lap timing sensor
SL	Gear shift warning light
AL	Alarm warning light
ES	Engine speed (rpm)
OT	Oil temperature sensor
WT	Water temperature sensor
OP	Oil pressure sensor
FP	Fuel pressure sensor
BP	Brake pressure sensor or switch
TP	Throttle position sensor
B +	Battery positive
B -	Battery negative (earth)

Table 2– Sensor wiring harness

The Video Wiring Harness

The video wiring harness connects the VS (ST8360) or V (ST8302) module to the video system and is identical for both the Standalone and Expansion systems.

Connect the video harness as shown in Table 3.

Labels	Connects to
AV	Audio/video input of recorder
L	Left (L) microphone line input level
R	Right (R) amplified microphone
CAM	External camera
12V	2 x 12v power supply (for camera, microphone, etc)
LANC	Lan-C connector on recorder
VC	Video controller

Table 3 – Video harness connections

Putting the System Together

The ST8302 Standalone System

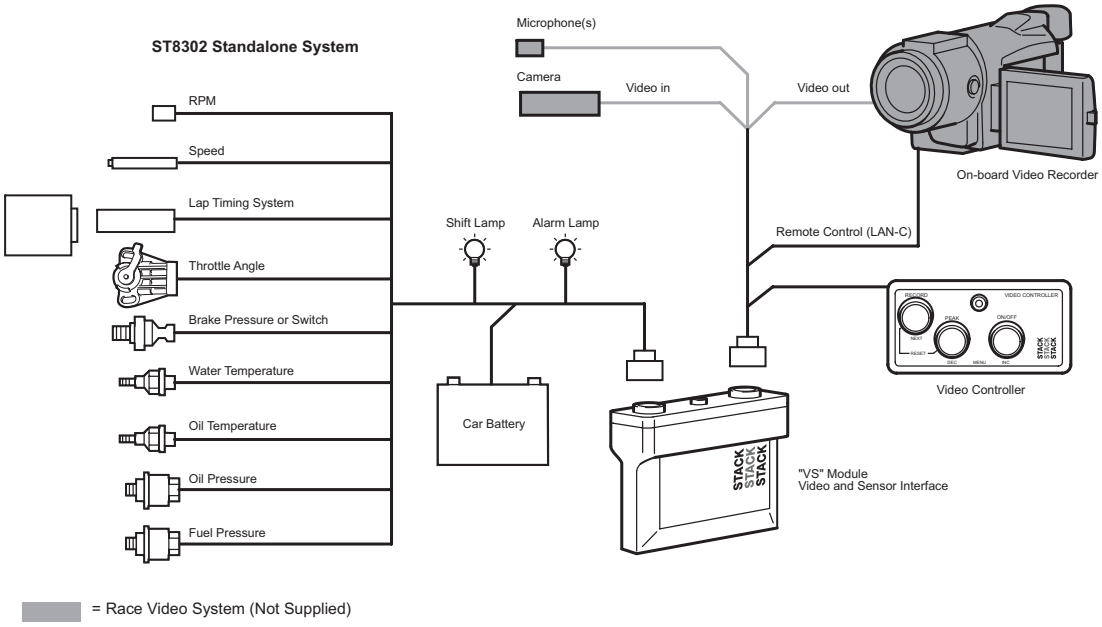


Diagram 1 – The ST8302 Standalone system

The Standalone system comprises:

- The **VS module** video and sensor interface
- Various **sensors** (including those provided with the system and others purchased separately)
- A **sensor wiring harness** with a 19-way connector, providing the VS module with data from the sensors
- A **video camera, microphone and recorder** set-up (not included as part of the system)
- A **video wiring harness** with a 15-way connector, which carries video, sound and the data from the VS module for overlay onto the video display

Connecting the ST8302 Standalone System

1. Connect each of the **sensors** to the appropriate cable in the **sensor wiring harness**, as shown in Table 1 above.
2. Connect a **12v DC power supply** to the **power input cable**.
3. Connect the VS Module to the video system using the **video harness**, as described in Table 3 above.

If you do not have the correct connectors for your video recorder, camera or microphones, adapters can be purchased from your local electrical supplier.

Components of the ST8360 Expansion system

The Expansion system comprises:

- The **V module** video interface
- A **Stack Display device** (such as the ST8100 Display system shown in the diagram) receiving input from various sensors attached to it by a wiring harness
- A **CANBus** cable with a 4-way connector which connects the **V module** to the existing harness on the **Stack Display device**
- A **video camera, microphone and recorder** set-up (not included as part of the system)
- A **video wiring harness** with a 15-way connector, which carries the data from the V module for overlay onto the video display (see Table 3)

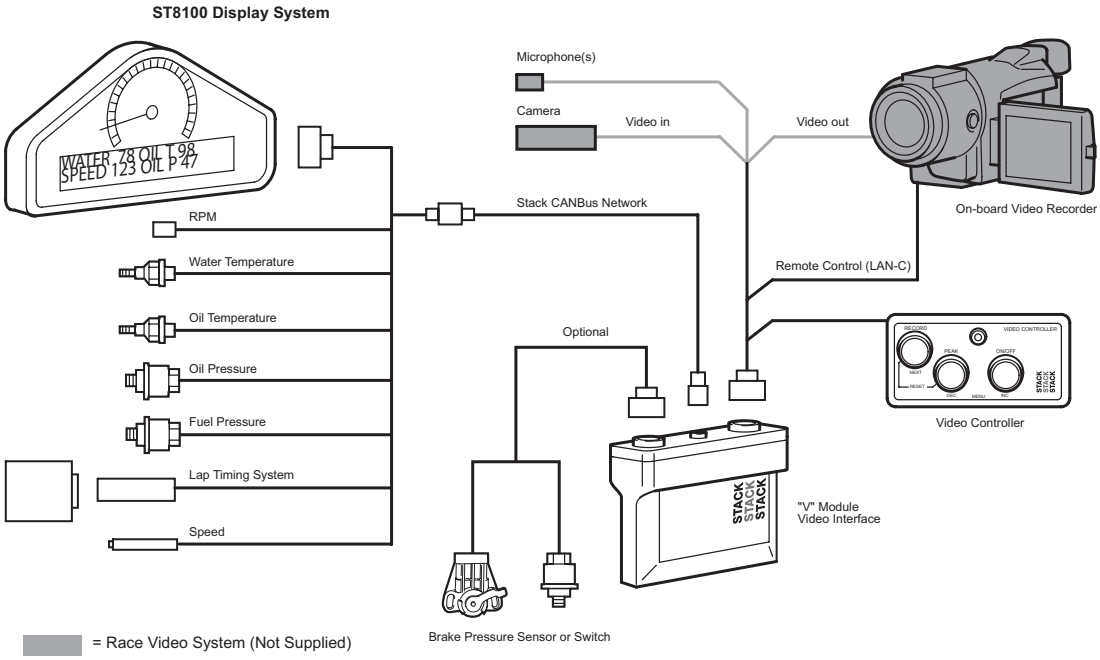


Diagram 2 – The ST8360 Expansion system

Connecting the ST8360 Expansion System

1. Connect the **V module** to the **Stack device** with the **CANBus cable**
2. Connect a **12v DC** power supply to the **Stack device**
3. Connect the V Module to the video system using the **video harness**, as described in Table 3 above.

The Power Supply

We suggest that you set up the system outside of the vehicle initially, to familiarise yourself with its use. You will need to connect a 12v DC power supply. Once the system has been installed in a vehicle, then the vehicle's own battery will supply the power.

The Display

The Stack Video-Logger system overlays data on the video image received by your camera. This data comes either directly from the sensors (in the Standalone ST8302 system), or from another Stack device (in the Expansion ST8360 system).

Diagram 3 – The Stack Video-Logger display

The Stack Video-Logger system is capable of overlaying 21 items of data.

What each of these items mean and how they can be configured to suit your vehicle, will be explained in Chapter 3.

By default, these readouts are aligned along the bottom of the display, but can be moved up and down it as required. See Chapter 3 for instructions on how to position this text elsewhere on the screen.

Lap Data

Diagram 4 – Lap data

- Lap Counter ('Lap')
- Lap Time ('T')
- Best Time ('B')
- Predicted Lap Time ('P') – based on current progress, predicts the lap time. Its value is constantly updated.
- Performance Meter ('PM') – a negative value indicates an improvement over the previous best lap, a positive value signifies a worse performance. The reading is updated continuously. Requires the Performance Meter.
- Distance (in metres or feet)

See Chapter 3 – Configuration for a more detailed explanation of lap data.

The Predictive Lap Timer and Performance Meter are only available with the "Max" system.

Lateral and Longitudinal G

Diagram 5 – Lateral and Longitudinal G

Lateral and Longitudinal G readings are only available with the "Max" system.

Speeds

Diagram 6 – Speeds

- Engine speed ('RPM')
- Wheel speed ('MPH' or 'km/h')
- Maximum speed in straight ('Max')
- Minimum speed in corner ('Min')
- Gear

Minimum, Maximum and Gear readings are only available with the "Max" system.

Engine Temperatures and Pressures

Diagram 7 – Temperatures and pressures

- Water Temperature ('WT') – °C or °F
- Oil Temperature ('OT') – °C or °F
- Oil Pressure ('OP') – PSI or Bar
- Fuel Pressure ('FP') – PSI or Bar

Throttles and Brakes

Diagram 8 – Throttles and brakes

- Throttle Position (TP) – as a percentage of the total allowable movement in the throttle pedal.
- Brake Pressure (BP) – shows the status of the brakes if a brake switch or sensor is installed.

  With the **brake switch**, the display will show 'BRAKE' when the driver applies pressure to the pedal and 'brake' when that pressure is released (note: if the switch provides power to the brake lamps and earths them, the states will be reversed).

  With the **brake pressure sensor** the display shows the brake pressure in PSI or Bar.

Alarms

Diagram 9 – Alarms

- Alarm Counter (Ac) – so alarm occurrences can be easily found during playback.
- Alarm Message (!!) – signifying which alarm condition has been met.

See Chapter 3 – Configuration for a more detailed explanation of alarms.

The Alarm Counter is only available on the "Max" systems.

Battery Voltage

Diagram 10 – Battery voltage

- Battery voltage

The Video Controller

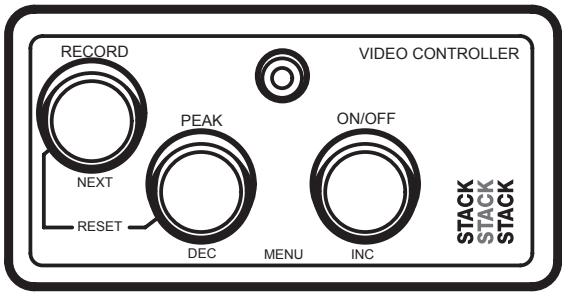


Diagram 11 – The video controller

The Video Controller allows the user to switch the video recorder on and off, display peak values and configure the various parameters (which will be explained in Chapter 3).

Each button on the video controller has two functions, depending on whether the system is in Normal (operational) mode, or Configuration mode (as described in Chapter 3).

Normal Mode Functions

RECORD/NEXT:

Press RECORD to start and stop recording remotely. If your camera has a LAN-C port the 'record' light will be illuminated while the camera is recording.

PEAK/DEC:

Press and hold down the PEAK button to display peak values.

ON/OFF or INC:

Press ON/OFF to switch the video recorder on and off.

The ON/OFF and RECORD functions of the video controller connect to your video recorder via a LAN-C port. If your recorder does not have a LAN-C port, you will be unable to use those functions to control the video recorder.

Configuration Mode Functions

RECORD/NEXT:

This button acts as the NEXT button, moving from one menu item to the next.

PEAK/DEC:

This button is used to DECREMENT the value of a parameter.

ON/OFF or INC:

This button is used to INCREMENT the value of a parameter.

Switching the Camera On and Off

A suitable recorder (i.e. one which has a LAN-C port), can be put on standby by the driver using the video controller ON/OFF button as above. Note that the recorder can be switched off even during recording.

Other recorders will need to be switched on and off manually.

When using a recorder with a LAN-C connection, if the car ignition is turned off before the video recorder has been put on standby the recorder will be switched off and remain off when the car is re-started.

Starting and Stopping Recording

Recording can be started and stopped by either:

- The driver, using the RECORD button on the video controller
- Automatically, depending on the engine speed, by setting the **Start RPM** and **Automatic Stop** parameters in the Configuration menu (see Chapter 3)
- Manually, in the case of a recorder which does not have a LAN-C port

If the recorder is powered off, then pressing the RECORD button will cause it to simultaneously power on and begin recording.

Peak Values

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

Peak values are displayed when:

- The driver **presses and holds down the PEAK button** on the video controller
- At the **end of a run**, when the wheel speed drops below a preset value (see Chapter 3 – Configuration, "Peaks RPM"). In this instance, peak values will be displayed automatically for *at least five seconds or until the engine is switched off, whichever is longer*.

If the peak values are being displayed at the end of a run, press the PEAK button and release it to show the normal values.

A different value is stored for each peak as shown in Table 4:

Parameter	Min/Max Peak Value?
Battery Voltage	Minimum
Brake Pressure	Maximum
Engine Speed (RPM)	Maximum
Fuel Pressure	Minimum
Lap Count	Fastest
Lap Time	Fastest
Oil Pressure	Minimum
Oil Temperature	Maximum
Throttle Position	Maximum
Water Temperature	Maximum
Wheel Speed	Maximum

Table 4 – Peak values

Update of Peak Values

Peak values are updated only when the engine speed has exceeded its **Gate RPM** value for *at least one second*.

The Gate RPM value is the level of RPM at which 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 warming up.

The Gate RPM value must be exceeded by at least one second to allow the values to stabilise. Blipping the engine may not be enough to update the peak values.

Displaying the Peak Values

Press and hold the **PEAK** button on the remote control to show the peak values for the parameters currently being displayed.

The display changes, to show "PEAKS" instead of "STACK" while you are in this mode.

Release the switch to return to the normal display.

Resetting the Peak Values

Peak values are reset automatically on a recorder with a LAN-C port, when recording starts. On other types of recorder, you will need to reset the peak values manually.

To reset the peak values hold down the PEAK button on the Remote Control Unit and press RECORD. All peak values are reset at the same time.

If the engine is running **at** or **above** its Gate RPM Value (see Chapter 3 – Configuration) when the peak values are reset, they are set to the current value of each parameter.

If the engine is running **below** its Gate RPM Value, the peak values are not reset to the current values but are set to the values shown in Table 5 instead:

Parameter	New Peak Value
Battery Voltage	26.0V
Brake Pressure	'brake'
Engine Speed (RPM)	0 RPM
Fuel Pressure	999 PSI or 99.9 Bar
Lap Count	0
Lap Time	0:00:00
Oil Pressure	999 PSI or 99.9 Bar
Oil Temperature	-99
Throttle Position	-12
Water Temperature	-99
Wheel Speed	0 MPH or 0 km/h

Table 5 – Peak values when reset

Peak Value Memory

The peak values are stored in a memory which is powered by an internal back-up battery and remain there when the external power source is disconnected.

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 a warning is displayed.

Changing the battery is not a user operation. You should return the unit to Stack for service.

Alarms

Note for ST8360 Expansion System Users: Your Stack Display device may have different alarm settings to the Video-Logger. To avoid alarms firing under different conditions, synchronise the settings.

The Video-Logger system monitors various parameters and can trigger an alarm to alert the driver if a parameter either exceeds or falls below a certain value.

For example, one alarm will be triggered if the fuel pressure falls *below* its alarm value. Another will be triggered if the oil temperature rises *above* its alarm value. The values at which the alarms go off are specified in the Configuration Menu option for the parameter (see Chapter 3 – Configuration).

The alarms are updated only when the engine speed has exceeded the **Gate RPM** value for *at least one second*.

The Gate RPM value is the level of RPM at which the system tests for the alarm conditions. This is to prevent abnormal alarms from being triggered when, for example, the engine is either not running, is idling, or is warming up.

Table 6 lists the various alarm parameters and the conditions under which they are triggered.

Parameter	Alarm is triggered when the:
Oil Temperature	current value **exceeds** the preset value
Water Temperature	current value **exceeds** the preset value
Oil Pressure	current value drops **below** the preset value
Fuel Pressure	current value drops **below** the preset value
Engine Speed (RPM)	value above “shift” value
Battery Voltage	current value drops **below** the preset value

Table 6 – Alarm triggers

Displaying an Alarm

When an alarm condition occurs, a warning message is shown on the display.

The alarm message displays for four seconds, except for the ‘Shift RPM’ alarm which remains on-screen for as long as the vehicle is being ‘over-revved’ and (on the Standalone system) illuminates the shift light on the dashboard.

Every time an alarm is triggered, the Alarm Counter is incremented by one. This makes it easy to find the alarm when playing back the video.

Lap times

The lap time is only displayed if the vehicle is fitted with an infra-red lap timing sensor (such as the ST543 Stack Infrared Lap Timing Receiver) or a manual lap timing switch (such as the ST5097 Manual Lap Timer). ST8302 'Max' versions include an infra-red lap timing kit.

When the vehicle passes the the lap timing beacon, or the driver presses the manual lap timer switch, the Lap Counter is incremented. If the lap just completed is the fastest yet, the Best Lap Time field is also updated.

If the Predictive Lap Timer is installed, the Video-Logger also displays the estimated time to complete the lap, based on the current speed.

Resetting the Lap Time to Zero

Lap counts and times and the Predictive Lap Timer (included in the 'Max' versions) are reset automatically when recording starts.

To reset the peak values manually, hold down the PEAK button on the video controller and press RECORD.

In the Expansion system, the lap data is reset when the times and counts on the display device are reset.

Gears

The Video-Logger shows which gear the vehicle is expected to be in. This information does not come from a sensor but depends on the current engine and wheel speeds.

Chapter 3 – Configuration describes how the system calculates the gear and explains how to calibrate this setting for your own vehicle.

Chapter 3. Configuration

Entering Configuration Mode

To enter configuration mode, hold down the **DEC** button and then press **INC** on the Video Controller.

While the buttons are depressed, the software version information is displayed.

If you need to contact the Stack helpdesk, they will often ask you to confirm which version of the software you are using. Use the DEC and INC buttons as above and make a note of the details.

When the buttons are released, you'll see the exit menu:

```
EXIT MENU

DEC Exit  NEXT Next
```

Diagram 12 – The exit menu

To move to the first configuration setting, press **NEXT** on the Video Controller.

To exit the menu, press **DEC**.

Navigating the Configuration Menu

Use the Video Controller to navigate through the various configuration options:

- **Press DEC** to DECREMENT (reduce) the value for a particular setting. Hold the button to decrement continuously
- **Press INC** to INCREMENT (increase) the value for a particular setting. Hold the button to increment continuously
- **Hold down DEC and press INC** to toggle a setting between ON and OFF
- **Press NEXT** to move to the next menu option

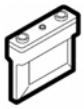
Configuration Menu Items

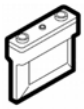
The menu items available to you depend on the product you are using. The tables on these pages show which items are available for each product.

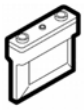
Each configuration setting may have a value which you can either increment or decrement, or a toggle (to turn that setting on or off), or both.

See the instructions above for navigating through the menu items and changing their status and values.

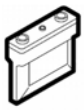
The default values shown correspond to the UK version of the product.

Menu Text				
EXIT MENU DEC Exit NEXT Next	✔	✔	✔	✔
EDIT SCALE Wheel Circ 1000 mm	✔	✔	✔	✔
W.S. Pulses/Rev 10	✘	✘	✔	✔
E.S. Cylinders 4	✘	✘	✔	✔
EDIT TEST Gate RPM 3000 on	✔	✔	✔	✔
EDIT TEST Start RPM 3000 on	✔	✔	✔	✔
EDIT TEST Automatic Stop on	✔	✔	✔	✔

Menu Text				
EDIT TEST Shift RPM 7000 on	✓	✓	✓	✓
EDIT TEST Peaks MPH 20.0 on	✓	✓	✓	✓
EDIT TEST High WaterT 105 on	✓	✓	✓	✓
EDIT TEST High Oil T 130 on	✓	✓	✓	✓
EDIT OPTION 150PSI Fuel P Sensor	✓	✓	✗	✗
EDIT TEST Low Fuel P 10 on	✓	✓	✓	✓
EDIT TEST Low Oil P 35 on	✓	✓	✓	✓
EDIT TEST Low Batt 10.0 on	✓	✓	✓	✓
EDIT OFFSET Zero Lat G 0.00	✗	✓	✗	✓

Menu Text				
EDIT OFFSET Zero Long G 0.00	✗	✓	✗	✓
Press DEC+INC to cal Throttle Pedal *[See Throttle Calibration Submenu]*	✗	✓	✗	✓
EDIT GEAR Press DEC+INC to cal *[See Gear Calibration Submenu]*	✗	✓	✗	✓
EDIT SCALE Accel Limit 10.0 G	✗	✓	✗	✓
EDIT SCALE Decel Limit 10.0 G	✗	✓	✗	✓
EDIT VALUE Display Offset 139	✗	✓	✗	✓

Throttle Calibration Submenu

Menu Text				
`Press DEC+INC to cal Throttle Pedal`	✗	✓	✗	✓

Press and hold **DEC** then press **INC**

```
Throttle Pos.   0%
Reading     0
```

Press **NEXT**

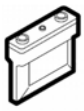
```
Throttle Pos.  100%
Reading     0
```

Press **NEXT**

```
Press DEC to Cancel
Press INC to Save
```

Press **INC** to save the new settings or **DEC** to ignore them and retain the existing calibration. Then returns to main menu.

Gear Calibration Submenu

Menu Text				
EDIT GEAR Press DEC+INC to cal	✗	✓	✗	✓

Press and hold **DEC** then press **INC**

```
GEAR 1 at 5000 rpm
Speed         0 MPH
```

Press **NEXT**

```
Press DEC to Cancel
Press INC to Save
```

Press **INC** to save the new settings and return to the main menu or **DEC** to calibrate the next gear

```
GEAR 2 at 5000 rpm
Speed         0 MPH
```

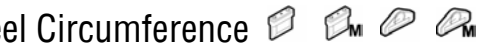
Press **NEXT**

```
Press DEC for Next
Press INC to Save
```

Continue until all 7 gears have been calibrated or **INC** is pressed

Configuration Menu Items Explained

Wheel Circumference



```
EDIT SCALE
Wheel Circ       1000mm
```

The system uses this measurement to calculate vehicle speed and lap distance. The more accurate your measurement, the more accurate the speed and distance data will be.

W.S Pulses/Rev

```
W.S. Pulses/Rev     10
```

The wheel speed sensor (see Chapter 4 – Installation) generates an electrical pulse whenever a ferrous target, such as a wheel bolt, passes it. This setting determines how many such pulses make up one complete revolution of the wheel. This is often as simple as specifying how many wheel bolts there are.

E.S. Cylinders

```
E.S. Cylinders       4
```

This represents the number of cylinders in the engine, unless it is a 'wasted spark' or 'multiple-coil' engine, in which case the setting may be a multiple of this figure. See Chapter 5 – Troubleshooting.

Gate RPM

```
EDIT TEST
Gate RPM          3000 on
```

Specifies the engine speed above which peak values are updated. The engine speed must exceed this value for *at least one second* in order for the update to occur.

Switching off the Gate RPM test will disable ALL alarms. To disable the Gate RPM test only, set it to a small value.

Start RPM

```
EDIT TEST
Start RPM         3000 on
```

Specifies the engine speed at which the recorder will start recording automatically (which it can only do with a LAN-C port). This should be turned ON for LAN-C recorders and OFF for other types of recorder.

Automatic Stop

```
EDIT TEST
Automatic Stop         on
```

When turned on, this setting will stop the recorder when engine and wheel speeds are zero. This option is only available when the recorder has a LAN-C port.

Note that the Wheel Speed must have remained below 'Peaks' (see 'Peaks Speed' setting below) for 5 seconds before the recorder switches off.

Shift RPM

```
EDIT TEST
Shift RPM        7000 on
```

This is the engine speed above which the car is being 'over-revved'. When this speed has been exceeded, the alarm is triggered and (on ST8302 Standalone systems) the shift light on the dashboard is illuminated. This alarm will only disappear once the engine speed dips below the threshold. This test can be turned ON and OFF.

Peaks Speed

```
EDIT TEST
Peaks MPH        20.0 on
```

This setting specifies the wheel speed above which peak values are displayed. The wheel speed has to remain below this speed for two or more seconds before peak values are displayed. They will be displayed for however long the vehicle remains below this threshold. This setting can be turned on or off.

High Water Temperature

```
EDIT TEST
High WaterT      105  on
```

The water temperature above which the 'High Water T' alarm is triggered. This test can be turned on and off by setting the ON/OFF flag.

High Oil Temperature

```
EDIT TEST
High OilT        130  on
```

The oil temperature at which the 'High Oil T' alarm is triggered. This test can be turned on and off by setting the ON/OFF flag.

Fuel Pressure Sensor

```
EDIT OPTION
150PSI Fuel P Sensor
```

The default configuration for the video-logger system is to interpret an input signal from a high range (0-150 PSI/0-10 Bar) Fuel Pressure sensor. With this menu you can configure the system to interpret a signal from a low range (0-30 PSI/0-2 Bar) sensor. The fuel pressure displayed will be automatically adjusted to use a scale appropriate to the sensor selected.

Low Fuel Pressure

```
EDIT TEST
Low Fuel P       10   on
```

The fuel pressure below which the 'Low Fuel Pressure' alarm is triggered. This test can be turned on and off by setting the ON/OFF flag.

Low Oil Pressure

```
EDIT TEST
Low Oil P        35   on
```

The oil pressure below which the 'Low Oil Pressure' alarm is triggered. This test can be turned on and off by setting the ON/OFF flag.

Low Battery Voltage

```
EDIT TEST
Low Batt       10.0   on
```

The battery voltage below which the 'Low Batt' alarm is triggered. This test can be turned on and off by setting the ON/OFF flag.

Zero Lateral G

```
EDIT OFFSET
Zero Lat G       0.00
```

When installed, the V/VS Module may be positioned slightly out of alignment (see Chapter 4 – Installation). With the vehicle on a flat surface, the tank full of petrol and the driver at the wheel, press either DEC or INC on the Video Controller to store the offset.

The figures displayed in this menu item will always be real-time values from the internal channel and not the value stored.

Zero Longitudinal G

```
EDIT OFFSET
Zero Long G      0.00
```

See the description for Lateral G above.

Throttle Pedal

```
Press DEC+INC to cal
Throttle Pedal
```

Using the Video Controller, hold down the DEC button and press INC to enter the Throttle Calibration submenu (see p. 33).

The figures displayed in this setting show both the real-time values from the throttle sensor and the value stored.

This setting stores two values, one at 0% (when the driver's foot is off the throttle) and the other at 100% (when the throttle pedal is fully depressed).

Start with no pressure on the pedal and press NEXT on the Video Controller to store the 0% value. Then fully depress the pedal and press NEXT again to store the 100% value.

Finally, press INC to store the new values or DEC to ignore them.

Gear Number

```
EDIT GEAR
Press DEC+INC to cal
```

The 'Max' versions of the Video-Logger system will estimate your current gear based on a given wheel and engine speed. To do this, it needs to know the wheel speed for each gear when the engine speed is at 5,000 RPM.

The Gear number is then based on the ratio:

$$\frac{\textit{Engine Speed}}{\textit{Wheel Speed}}$$

Hold down the DEC button on the Video Controller and press INC to start calibrating the gears (see p. 34).

Enter the wheel speed for first gear at 5,000 RPM and then press NEXT.

Now press DEC on the Video Controller to calibrate the next gear or if you have calibrated all the gears for your vehicle press INC to save the values and exit the gear menu. The system will store values for up to seven gears.

If you are unable to achieve 5,000 RPM in a gear, you should determine the wheel speed at a lower engine speed and scale upwards. For example, you could use the wheel speed at 1,000 RPM and then multiply by 5 to calculate the correct wheel speed at 5,000 RPM.

Acceleration Limit

```
EDIT SCALE
Accel Limit      10.0 G
```

This setting only applies to the 'Max' version as it relates to the Performance Meter. The Acceleration Limit setting specifies the maximum allowable acceleration in units of G. This is to reduce the impact of wheel-spin on the Predicted Lap Time. At the default setting of 10.0 G it will have no effect.

For road based cars a typical Acceleration Limit would be 1.0 G. Setting the value to 10.0 G disables it.

Deceleration Limit

```
EDIT SCALE
Decel Limit      10.0 G
```

This setting only applies to the 'Max' version as it relates to the Performance Meter. The Deceleration Limit setting specifies the maximum allowable deceleration in units of G. This is to reduce the impact of wheel lock-up on the Predicted Lap Time. This value should be reduced in wet conditions.

For road based cars a typical Deceleration Limit would be 1.5 G. Setting the value to 10.0 G disables it.

Display Offset

```
EDIT VALUE
Display Offset      139
```

This is the vertical position at which the data is overlaid on the screen. Some displays may cut off portions of the text, so you should use this setting to ensure that all the data is clearly visible on the screen.

Exit Menu

Once all the relevant menu items have been modified, press DEC to exit or NEXT to cycle around the menu items again.

Restoring Default Values

To restore the configuration options to their default factory settings:

- Disconnect the unit from the power supply
- Hold down the **DEC** and **INC** keys
- Reconnect the unit to the power supply
- Release **DEC** and **INC**

Chapter 4 – Installation

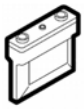
No special tools or training are required to install the Stack Video-Logging System. Before attempting installation you should have set up the equipment outside the vehicle according to the instructions in Chapter 2 and become familiar with the configuration menu settings as described in Chapter 3.

Installation begins by installing the wiring harnesses and V/VS module. Once they are in place you can add the sensors and optional components that came with your system.

Finally, you should attach a power supply and check that everything is functioning correctly. Refer to Chapter 5 – Troubleshooting if there are any problems. If the system appears to be working as expected, you should configure the various settings to suit your particular vehicle.

The steps you will need to take to install your Video-Logger and related items will depend on which system you purchased. Use the table below to guide you.

Table 7 – Installation steps

Installation Step				
V/VS Module	**VS**	**VS**	**V**	**V**
Harnesses	✓	✓	✓	✓
Engine Speed (RPM) Sensor	✓	✓		
Wheel speed sensor	✓	✓		
IR lap timing system	✓	✓		
Oil and water temperature sensors	**O**	**O**		
Oil and fuel pressure sensors	**O**	**O**		
Brake pressure sensor	**O**	**O**	**O***	**O***
Throttle angle sensor	**O**	**O**	**O***	**O***

✓ *= included* *O = optional* *O* = requires brake/throttle sensor harness*

The V/VS Module

If you have a 'Max' system capable of measuring G-forces, the V/VS Module must lie horizontally in the vehicle, parallel to the ground with the Stack label uppermost.

The connectors on the module should be orientated towards the front of the vehicle.

Ensure that the module is fitted securely so that it will not work itself loose when the vehicle is being driven.

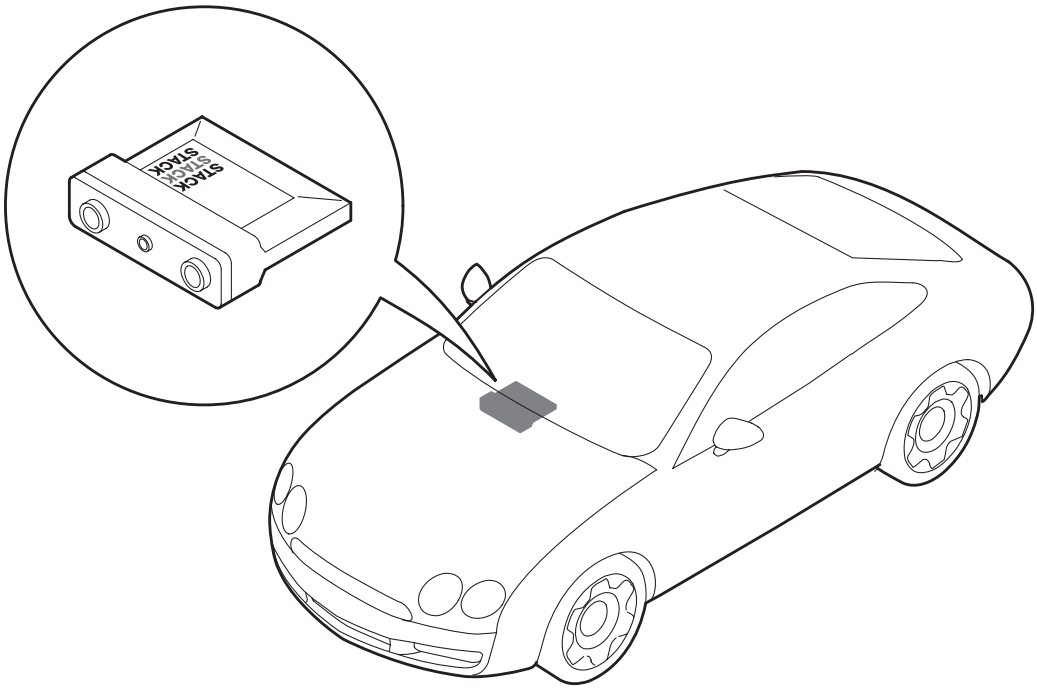


Diagram 13 – Alignment of V/VS Module within vehicle

The Lateral and Longitudinal-G sensors are internal to the V/VS module and require that it is fitted and aligned correctly, as described above. Any small errors can be adjusted in the Lat-G and Long-G offset configuration settings (see Chapter 3 – Configuration).

Attaching the Harnesses

The **ST8302 Standalone system** requires two harnesses – one for the sensors and the other for the video equipment.

The **ST8360 Expansion system** requires a video harness and a CANBus network cable to attach the V module to the Stack Display system. The Stack Display system has its own sensor harness and you should refer to its manual for installation instructions.

Optionally, there may also be a Brake/Throttle sensor harness to connect those sensors.

1. Identify all the connectors, as shown in the diagrams for each harness.
2. Before attaching a harness, plan the location of all the component parts of your Video-Logger system so that you can decide upon the best position for the V/VS module and the optimum layout of the harness cables.
3. Attach the harnesses to the connectors on the module. Route the cable branches to their appropriate locations. Allow sufficient slack in the harness so that you can connect it to the V/VS Module *before* the module is secured to the vehicle.

No cables should be routed closer than 75 mm (3 inches) from the ignition HT leads or distributor cap. Avoid routing cables near sources of intense heat.

4. Fit cable glands to protect the cables where they pass through bulkheads or panels. This is particularly important where cables run through carbon fibre partitions, which can wear through them easily.

Your installation may not use all the cables provided in the harness. Tie back and sleeve any unused connectors to prevent shorting the battery.

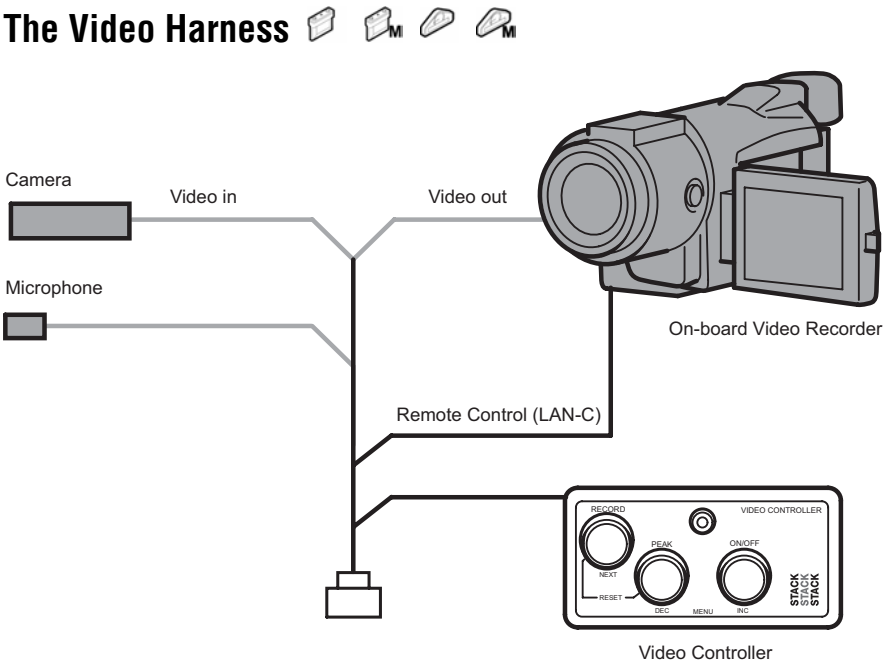


Diagram 14 – The video harness and connections

Disclaimer: You should install the on-board video recorder system in accordance with the manufacturer's instructions. Stack accepts no liability for any damage caused by or to an incorrectly installed video system.

Connect the video harness cables to the appropriate components, as described in Table 3.

Cables can be extended or adapted if required using standard parts obtainable from your video supplier.

The Sensor Harness

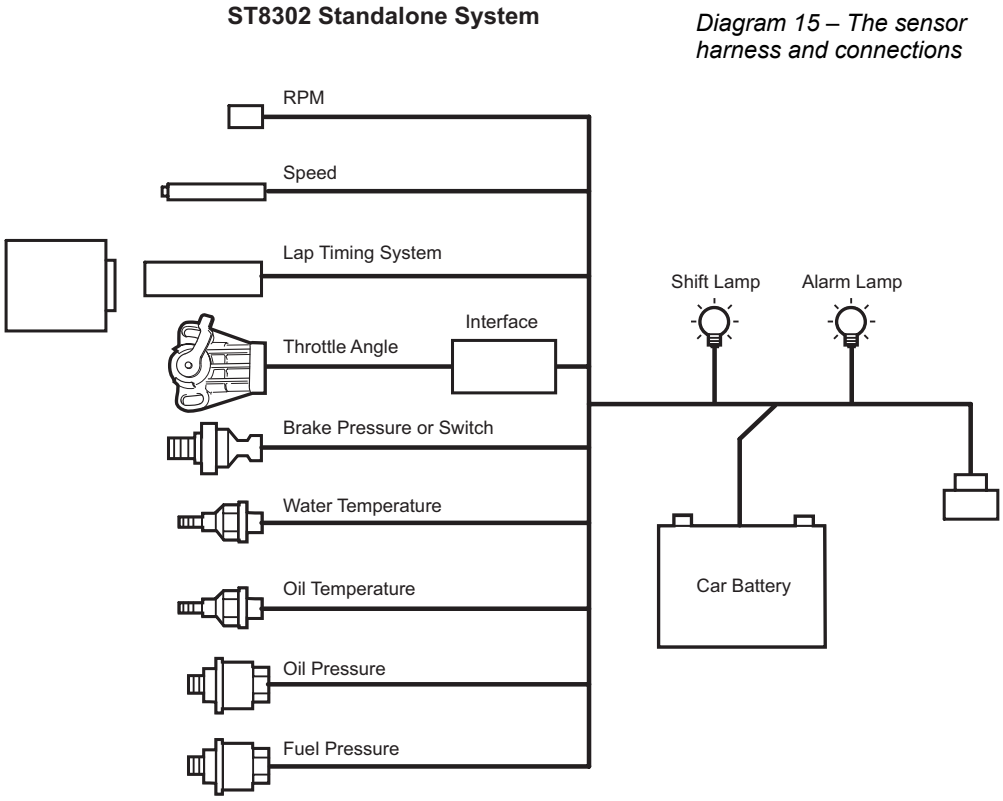


Diagram 15 – The sensor harness and connections

The Throttle and Brake Sensor Harness (Optional)

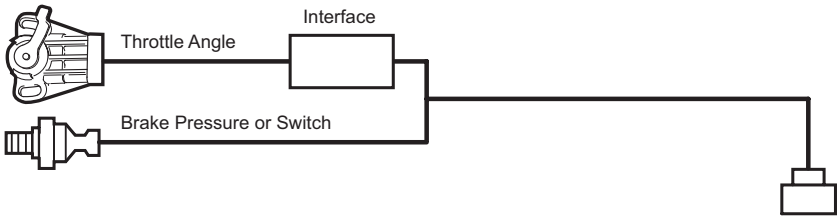


Diagram 16 – The throttle and brake sensor harness and connections

Engine Speed (RPM) Measurement

The engine speed (RPM) is measured by connecting the sensor harness engine speed wire (labelled 'ES') directly to the vehicle ignition system.

Depending on the type of ignition system, the connection point varies. Use the table below to find the correct connection point for your vehicle:

Ignition System	Connection Point
Coil and Points	Coil negative (Low tension)
HEI Systems	Coil negative (Low tension)
Magneto (internal or external)	Use HT pick up (ST697)
MSD	Tachometer output
Magneto CD (2-stroke)	Use HT pick up (ST697)

If none of these connections suit your vehicle, you can use the optional Stack ST697 HT pick-up to get a signal from an ignition lead. Contact your Stack distributor.

Standard Contact Breaker Ignition System

Connect the 'ES' wire of the harness to the negative contact breaker terminal on the coil, as shown in Diagram 17.

Standard Electronic Ignition System

Connect the 'ES' wire of the harness to the electronic ignition of the vehicle, as shown in Diagram 17.

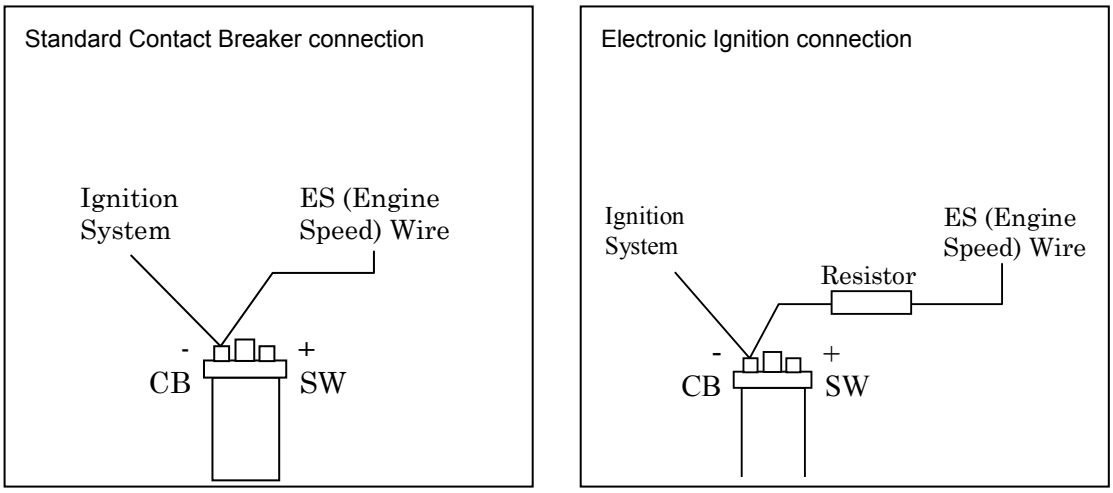


Diagram 17 – Contact breaker and electronic ignition connections

Wheel Speed Sensor

The Stack ST670 wheel speed sensor generates an electrical pulse whenever a ferrous target, such as a wheel bolt, passes close to its end. The sensor should be installed so that it can detect these targets as the wheel turns. The WS Pulses/Rev configuration menu setting specifies the number of targets making up a complete revolution of the wheel, thereby allowing wheel speed to be calculated.

Choosing a location for the wheel speed sensor

Select a suitable location for the sensor with an unobstructed view of your chosen targets. The sensor must detect at least one ferrous target (e.g. a driveshaft bolt) per revolution of the wheel. Note that the sensor will not detect non-ferrous objects such as alloy wheel spokes.

Consider the following points when choosing a location for the wheel speed sensor:

- Ideally, choose a non-driven wheel.
- The targets should be equally spaced around the wheel so that, when the wheel speed is constant, the electrical pulses occur at regular intervals.
- Do not install the sensor too close to the brake disc or calliper.
- Position the sensor no closer than 75 mm (3 inches) from HT leads or sources of intense heat.

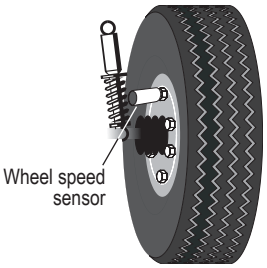


Diagram 18 – Location of the wheel speed sensor

When you have chosen a suitable location for the sensor:

1. Make a suitable rigid bracket to support the sensor and attach it to the vehicle and the sensor to the bracket. Do not fit the sensor too tightly – 1.2 Nm (12 kgf.cm or 0.9 lbf.ft) is ideal. Use fibre washers to insulate the sensor from heat transmitted through the bracket.
2. The gap between the sensor and ferrous targets should be between 0.5mm and 1.5 mm (0.020 inches-0.060 inches). Ensure that no other objects pass within 4 mm (3/16 inch) of the sensor when the wheel rotates.
3. Attach the wire labelled 'WS' in the sensor harness to the sensor at the 4-way 'Sure-Seal' connector. Take care to assemble and orientate this sensor correctly. Press the two halves of the connector together securely to ensure a waterproof seal.

If for any reason you are unable to use this sensor, Stack offers other models which may be suitable. Contact Stack for further details.

Oil and Fuel Pressure Sensors

Consider the following when choosing a location for the pressure sensors:

- Avoid mounting them near sources of intense heat
- Do not position them closer than 75mm (3 inches) to ignition leads, the distributor or engine oil.
- If possible, do not mount the sensor on the engine block, as engine vibrations may shorten its life expectancy

1. Use suitable pressure hoses and fittings to attach the sensor at the appropriate monitoring point
2. Connect the wiring harness to the sensor using the Sure-Seal connector

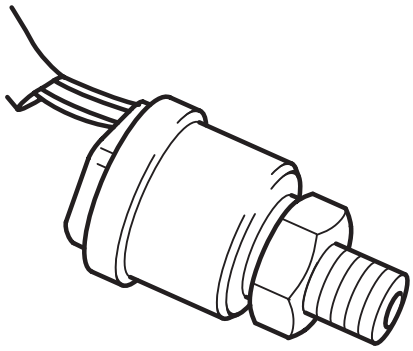


Diagram 19 – Oil and Fuel Pressure sensor

Temperature Sensors

Consider the following when choosing a location for the temperature sensors:

- Do not mount the sensors close to sources of intense heat
- Do not mount the sensors closer than 75 mm (3 inches) to ignition leads, the distributor or the ignition coil

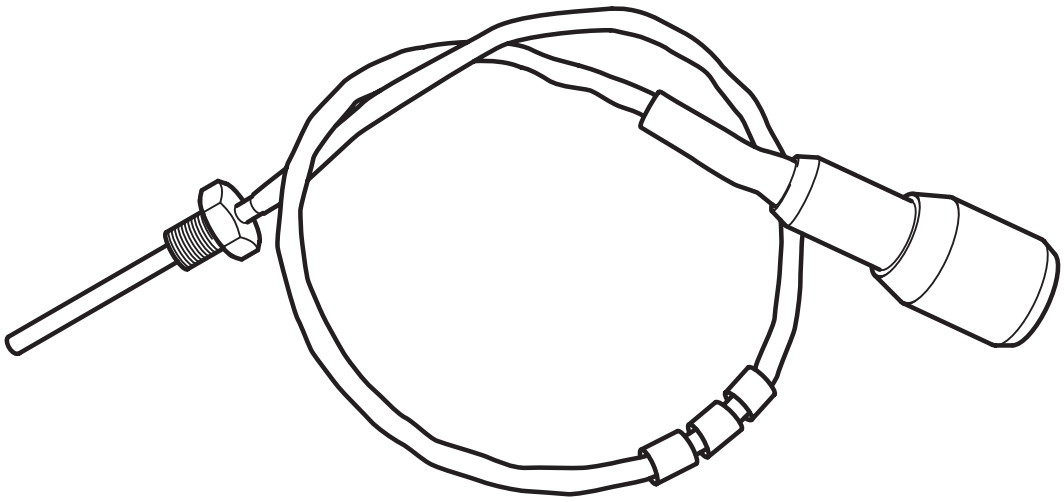


Diagram 20 – Temperature sensor

1. Attach the sensor to its appropriate monitoring point.
2. Connect the wiring harness to the sensor using the Sure-Seal connector.

Lap Timing Sensor

The Stack infrared lap timing system consists of a vehicle mounted sensor and a trackside beacon. The sensor triggers the video-logger system to update the lap data each time the vehicle passes the beacon.

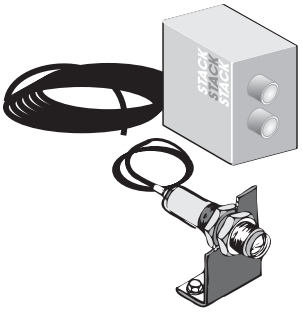


Diagram 21 – Stack infrared lap timing system

Vehicle-Mounted Sensor

Choose a suitable location for the vehicle-mounted sensor:

- It should be horizontal and square to the vehicle axis
- It should have a clear, unobstructed view of the trackside beacon, even when overtaking or being overtaken by other vehicles
- It should not be mounted behind glass or Perspex
- The sensor must be at the same height as the beacon: the beacon's height can be adjusted up and down its mounting post

1. Attach the wire labelled 'LAP' on the sensor wiring harness to the sensor at the 4-way 'Sure-Seal' connector. Take care to assemble and orientate this connector correctly. Press the two halves of the connector together firmly to ensure a waterproof seal.
2. Use a rigid mounting bracket to fix the sensor firmly to the outside of the vehicle. Use the two M18 x 1 mm threaded nuts supplied to secure it.

Different track layouts may require you to have a sensor in another location to ensure an unobstructed view of the beacon. Consider purchasing an extra sensor to install on the other side of the vehicle.

Trackside IR Beacon

Only one Stack trackside beacon can be used on the track. Do not position your beacon half way around the track, as this may inconvenience other users of Stack equipment.

Choose a suitable location for the beacon, which should be:

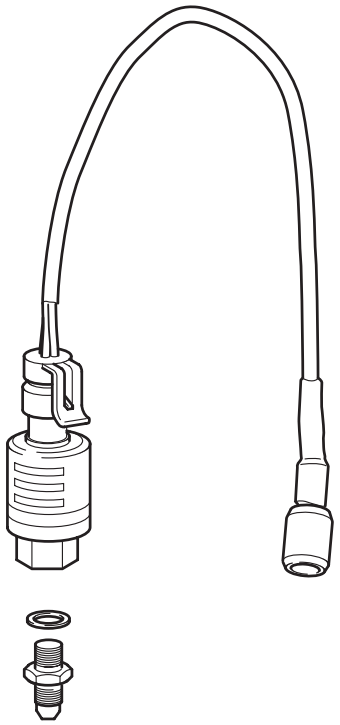
- as close as possible to the start/finish line
- at least 4 metres (12 feet) away from other types of beacon
- positioned at the same height as the lap-timing sensor on your vehicle
- positioned level so that it transmits the IR beam horizontally
- protected from direct sunlight for long periods, in hot conditions
- positioned so that the sun is not directly behind it (because the sensor may be unable to distinguish between the IR emitted from the sun and that given out by the beacon)
- protected from water spray in wet conditions, e.g. by fitting a protective beak. Do NOT cover with a plastic bag.

The beacon needs a 12v DC power supply. A sealed lead-acid battery with a rating of at least 2.5 Ah is ideal. When fully charged, such a battery will provide continuous operation for approximately 15 hours.

There is a two-colour status LED on the beacon which provides an indication of remaining battery life:

- **Green**: adequate voltage for normal operation
- **Red**: too low, replace with a full-charged battery
- **Off**: the battery is discharged or disconnected

Brake Pressure Sensor/Switch

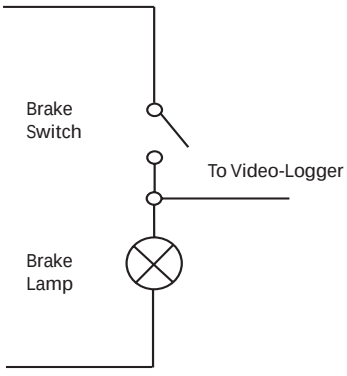


Sensor:

The brake pressure sensor should be mounted in a suitable socket using the DASH 3 adapter (supplied). It measures the pressure of the brake fluid when the driver applies the brake.

- Avoid mounting near sources of intense heat.
- Do not position closer than 75mm (3 inches) to ignition leads, the distributor or engine oil.
- If possible, do not mount the sensor on the engine block, as engine vibrations may shorten

Diagram 22 – The Brake Pressure sensor



Switch:

Connect the sensor harness to the 'brake lamp' side of the brake pedal switch using the Brake Switch Extender supplied with the harness.

Diagram 23 – The Brake Switch

Throttle Angle Sensor

The throttle sensor should be mounted at the position within the throttle linkage which gives the maximum rotational movement as the throttle angle is changed.

This can be achieved by mounting the sensor on the end of a butterfly shaft, or by attaching the lever on the sensor to the throttle control using a wire link.

It should be connected to the V/VS Module using a ST483 adapter between the Throttle sensor and the sure-seal connector on the sensor harness. This converts the voltage of the sensor to a pulse reading for input to the V/VS module.

- Avoid mounting near sources of intense heat.
- Do not position closer than 75mm (3 inches) to ignition leads, the distributor or engine oil.
- If possible, do not mount the sensor on the engine block, as engine vibrations may shorten its life expectancy.

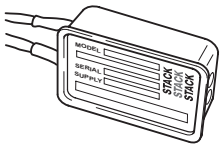


Diagram 24 – ST683 adapter

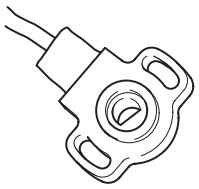


Diagram 25 – Throttle angle sensor for spindle with flat

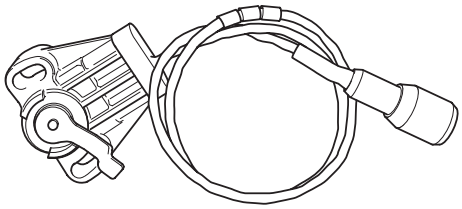


Diagram 26 – Throttle angle sensor with arm (showing wiring for both types of throttle sensor)

Battery Connection

The ST8360 Expansion system derives power from the vehicle battery via the Stack display device. Refer to its manual for details.

The ST8302 Standalone system needs to be connected directly to the vehicle battery by the two cables labelled 'B+' and 'B-' in the sensor harness:

- Connect the **black** 'B-' cable from the harness to the battery's negative terminal. Do not connect it to a chassis ground.
- Connect the **red** 'B+' cable from the harness to a fused supply from the battery's **positive** terminal. The fuse rating for this line should be no greater than 1 A and **should only become live when you switch on the vehicle ignition**.

Chapter 5. Troubleshooting

Abbreviations used:

MSS '(R)' 4w Mini Sure Seal connector Receptacle (sensor end)

MSS '(P)' 4w Mini Sure Seal connector Plug (Harness end)

Symptom	Possible Cause	Remedy	Notes
Video Display is dead	Ignition is off	Turn ignition on	The power lead is labelled B+ & B- The battery positive lead B+ is 19w conn pin G 4w Mil conn pin B MSS(P) pin 3 B- is 19w conn pin H 4w Mil conn pin A MSS(P) pin 4
	Battery is dead	Recharge or replace battery	
	Power connection to **B+** or **B-** is faulty	Check if battery is connected correctly. Check power lead fuse (if fitted) & continuity	
!! Low Batt !! warning on Video Display	Battery is almost dead	Recharge or replace battery	
	Power connection to **B-** or **B+** is faulty	Check power lead continuity	
Video Display gives a fixed temperature reading of 999 C or 999 F	Temperature sensor has failed	Replace sensor	Disconnect sensor. If reading changes replace sensor Otherwise check harness for short circuit on the MSS connector from pin 1 to pin 4
	Faulty harness connections	Check continuity of harness leads	
Video Display gives a fixed temperature reading of -99°C or -99°F	A temperature sensor has failed	Replace sensor	Disconnect sensor. If the reading changes, replace the sensor
	Faulty harness connections	Check continuity of harness leads for short circuits	Check the wiring harness for short circuits on the MSS connector from pin 1 to either pins 2 or 3

Symptom	Possible Cause	Remedy	Notes
Video Display gives a floating (slowly changing) incorrect temperature reading.	A temperature sensor has failed	Replace sensor	Disconnect and replace sensor with a known good sensor. If fault continues then check the harness.
	Faulty harness connections	Check continuity of harness leads for open circuits	Remove the sensor & short MSS(P) harness connector pins 1& 4 together A reading of 999 = harness OK
Fixed pressure reading of 999 PSI or 99.9 Bar	Pressure sensor has failed	Replace sensor	
	Faulty harness connections	Check continuity of harness leads for short circuits	Check the wiring harness for short circuits on the MSS connector from pin 1 to either pins 2 or 3
Fixed pressure reading of -99 PSI or -9.9 Bar	Pressure sensor has failed	Replace sensor	Disconnect sensor. If reading changes replace sensor
	Faulty harness connections	Check continuity of harness leads for short circuits	Check the wiring harness for short circuit on the MSS connector from pin 1 to pins 4

Symptom	Possible Cause	Remedy	Notes
Video Display gives a floating (slowly changing) incorrect Pressure reading.	A Pressure sensor has failed	Replace sensor	Disconnect and replace sensor with a known good sensor. If fault continues then check the harness.
	Faulty harness connections	Check continuity of harness leads for open circuits	Remove the sensor & short MSS(P) harness connector pins 1& 4 together A reading of -99 = harness OK
Suspected low or slow pressure reading	Pressure sensor has failed	Replace sensor	Swap with the other pressure sensor to confirm fault
	Faulty pressure pipe connections	Check pressure connections	Check plumbing for a blockage (kinks in flexible hoses)
V Module shows a different Fuel Pressure reading to the ST8100 Video Display,	Incorrect Fuel Pressure sensor selected	Select the Fuel Pressure sensor to match the ST8100	Sensors can be: 0-30psi / 0-2 Bar 0-150psi / 0-10 Bar
All sensors show fixed high values	PEAK Switch faulty	Replace Video Controller	Disconnect the Video Controller. If values return to normal, replace the Video Controller
	Faulty switch wiring	Check switch wiring	Check wiring for short between 15w connector pins A and E (earth) or 8w Switchcraft pins 3 & 8
Video Displays pressure values too low and temperature values too high	Low Battery voltage	Recharge battery	The system does not give accurate readings when the voltage is below 8.0V

Symptom	Possible Cause	Remedy	Notes
Sensor reading incorrect	Another gauge is connected to sensor	Disconnect the other gauge	It is not permissible to connect a second gauge
Peak values not updated	Gate value set too high	Change Gate RPM in the Video Display configuration menu	Peak values only updated while the engine RPM is greater than the Gate value
	Internal memory battery dead	Return unit to Stack for new battery service	Video Display shows !! Mem Batt !! warning on power up
PEAK [DEC] Switch does not work	PEAK [DEC] Switch faulty	Replace Video Controller	Disconnect Video Controller and short 8w Switchcraft pins 3& 8. If Video Display changes, replace Video Controller
	Faulty switch wiring	Check switch wiring for correct continuity	Check continuity less than 1.0 Ohm between:- 15w conn pin A & 8w Switchcraft p3 Also 15w conn pin E & 8w Switchcraft p8
RECORD [NEXT] Switch does not work	RECORD [NEXT] Switch faulty	Replace Video Controller	Disconnect switch and short its leads. If Video Display changes, replace Video Controller
	Faulty switch wiring	Check switch wiring for correct continuity	Check continuity less than 1.0 Ohm between: 15w conn pin D & 8w Switchcraft p5 Also 15w conn pin E & 8w Switchcraft p8

Symptom	Possible Cause	Remedy	Notes
ON/OFF [INC] Switch does not work	ON/OFF [INC] Switch faulty	Replace Video Controller	Disconnect the Video Controller and short the leads together. If the Video Display changes replace Video Controller
	Faulty switch wiring	Check switch wiring for correct continuity	Check continuity less than 1.0 Ohm between: 15w conn pin B & 8w Switchcraft p4 Also 15w conn pin E & 8w Switchcraft p8
Lap time is not Displayed automatically (Automatic receiver is fitted)	Lap marker receiver lead faulty	Check lap marker wiring	Disconnect receiver and press lap switch 4
	Lap marker receiver faulty	Replace lap marker receiver	If Video Display changes, replace receiver after checking its wiring
Alarm Light dead when an alarm is Displayed	Bulb has burnt out	Replace bulb	Swap with the Shift Light to confirm burnt-out bulb. If not burnt out, check wiring
	Faulty wiring to light	Check continuity of wiring	Check continuity less than 1.0 Ohm between: 19w conn Pin G & Red AL wire. Also 19w conn pin N & Yellow AL wire

Symptom	Possible Cause	Remedy	Notes
Shift Light dead	Bulb has burnt out	Replace bulb	Swap with the Alarm Light to confirm burnt-out bulb. If not burnt out, check wiring
	Faulty wiring to light	Check continuity of wiring	Check continuity less than 1.0 Ohm between: 19w conn Pin G & Red SL wire. Also 19w conn pin M & Green SL
No RPM speed reading	Incorrect wiring	Check the connection of the engine speed wire to the ignition system (or sensor, if used)	See instructions supplied in this manual. If connected directly to the coil, check that it is to the switched low tension side (usually the negative side)
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 -use multiple coils where each additional coil gives proportionately fewer pulses per revolution
	Ignition system pulses per revolution not same as number of cylinders	Reconfigure system to correct number of pulses per revolution	

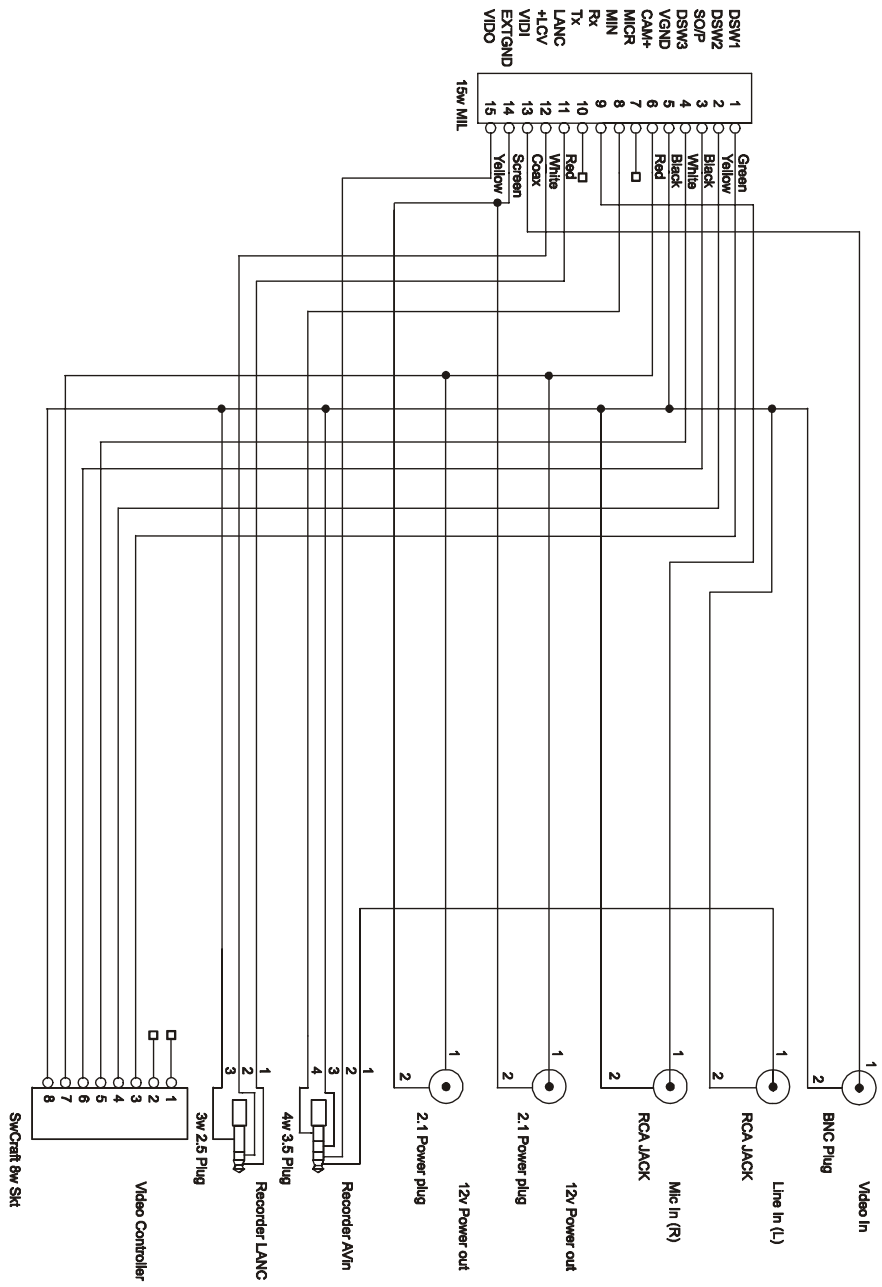
Symptom	Possible Cause	Remedy	Notes
Displayed RPM value erratic, value jumps high or low	Incorrect wiring	Reconnect as specified in this manual	
	Signal from ignition system or coil is noisy	Check condition of points, condenser, & points spring.	Coil & point systems only.
		Condition the ES signal by placing a resistor in line with the ES wire	Resistor values: 10K ohms for dedicated tacho output; 47K Ohms for coil connection (Non-CDI); 100K Ohms for coil connection (CDI). Resistors 1/2W 5% 350v
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 number of targets	Typical wheel circumference for a vehicle is 1800mm / 70” or 900mm / 35” for a kart
	System configured with wrong circumference	Reconfigure the system with correct circumference	
No Speed reading, Speed reading erratic, value jumps high or low	Faulty sensor and/or wiring	Check sensor indicator for correct operation	Rotate the wheel by hand and check that the sensor indicator lights up as each target passes the sensor
	Incorrect sensor gap (too far or too close)	Check that the gap is approximately 1mm	
	Sensor and targets moving apart	Fabricate a more rigid sensor bracket	

Symptom	Possible Cause	Remedy	Notes
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 water, oil or fuel (temperatures and pressures) being Displayed	All the alarms have been switched off	Switch on the required alarms	Alarms only operate when the engine is running at or above the gate RPM value
	The Gate RPM value is set too high	Reset the RPM gate to a lower value	
	Gate RPM test has been switched off	Switch on the Gate RPM test	
Video Display and alarm light flash when the engine is running, Alarm Counter increments constantly	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	
Video Display works OK until engine starts then Video Display freezes or resets continuously. Video Display recovers once engine stopped	Interference from Ignition system & HT Leads	Fit Suppressed (Silicon) HT Leads. Fit a suppression capacitor (2.2uF) between the coil (battery connection) & chassis	Use 'Helical' suppressed leads in extreme cases
	Wiring too close to HT leads and/or injector leads, or HT leads tied to isolated metal work to which Stack wiring is also tied	Keep ALL wiring away from HT leads Low tension leads on High Performance Ignition packs & injector leads	Recommended Minimum spacing 75mm (3.0")

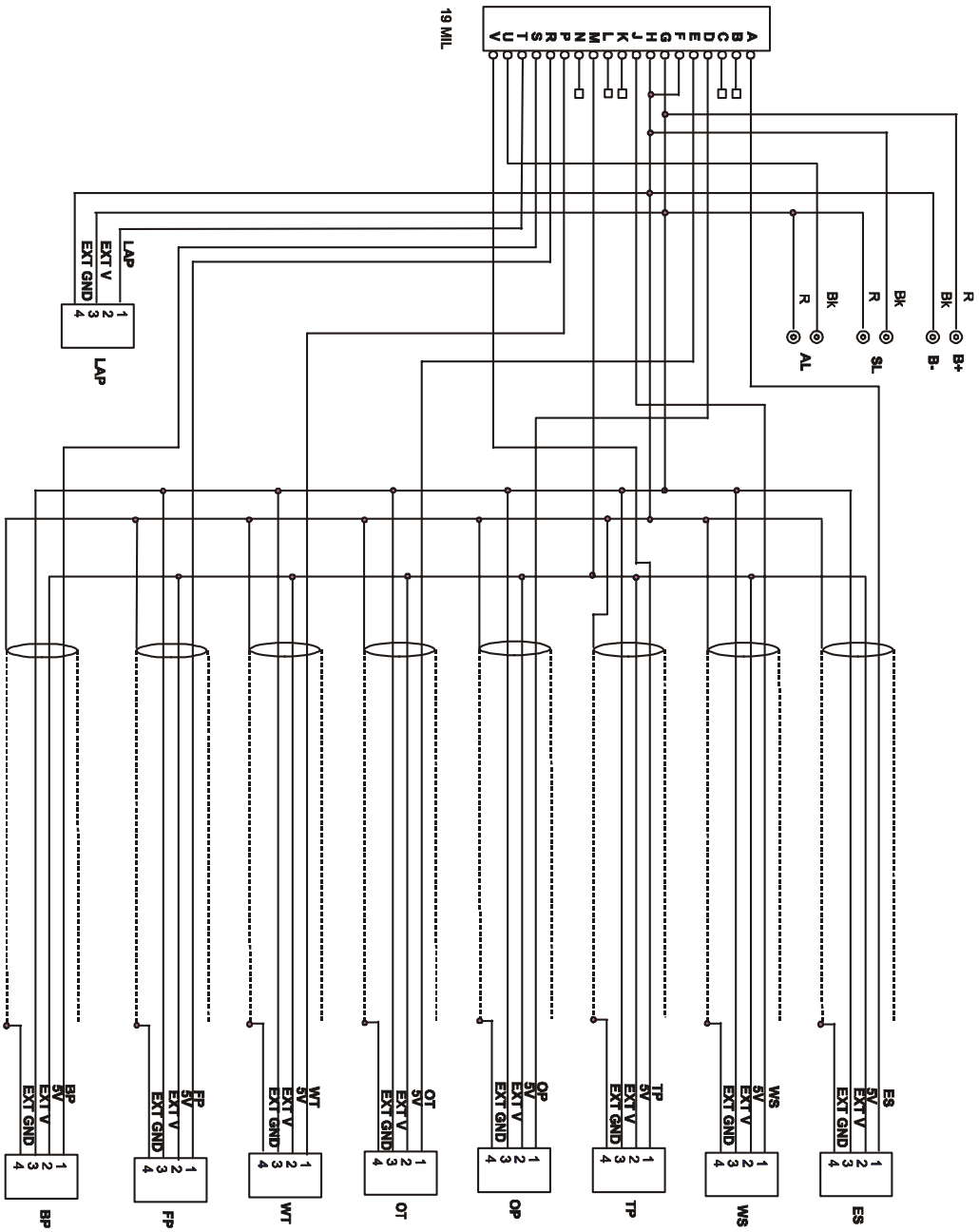
Symptom	Possible Cause	Remedy	Notes
Video Display blurred	Camera out of focus	Focus Camera	
	Condensation or dirt on lens	Clean lens	
	Camera vibrating	Use a more rigid bracket	
		Mount camera on the vehicle somewhere less prone to movement or vibration	
No picture	Camera disconnected	Reconnect camera	
	Camera faulty	Fit a new camera	
	Recorder disconnected	Reconnect recorder	
	No Video input	Check Camera & connections	
No recording	Wiring faulty	Replace Video Harness	Some Recorders will not record if there is no video signal present.
	Tape or memory card not fitted	Fit tape or memory card	
	Tape or memory card full	Fit a new tape or memory card	
		Rewind tape or delete memory card	
	Recording not on Tape	Remove Memory card/stick. (LAN-C) Start recording will record to memory in preference to tape	
	Recorder not started	See above.	

Symptom	Possible Cause	Remedy	Notes
No sound	Microphone(s) disconnected	Reconnect microphone(s)	
	Microphone(s) faulty	Replace microphone(s)	
	Wiring faulty	Replace Video Harness	
Sound too quiet	Microphone output level too low	Connect microphone to the amplified sound input (Red Phono connector)	
Sound too loud &/or distorted	Microphone output level too high	Connect microphone to the Line input (White Phono connector)	Microphone input level = ~50mV Pk-Pk max
		Fit attenuator	Line input level ~350mV Pk-Pk max

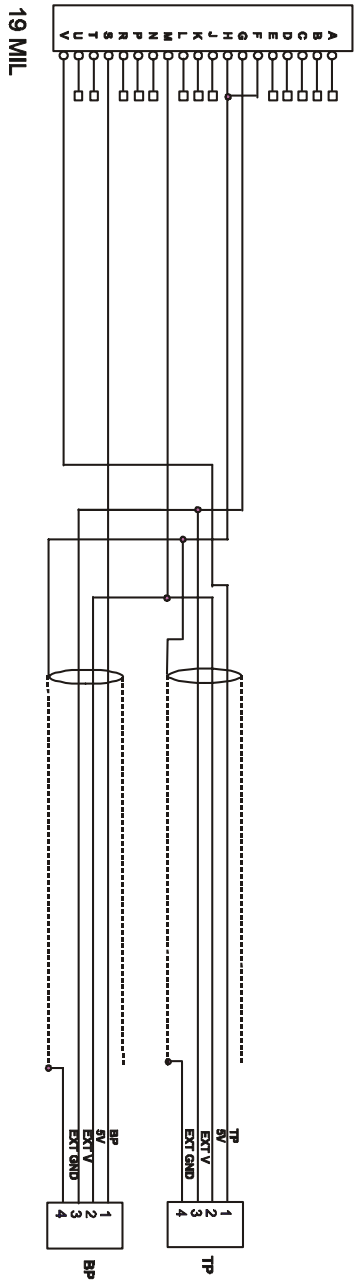
Appendix A – Video Harness Wiring Diagram



Appendix B – Sensor Harness Wiring Diagram



Appendix C – Throttle/Brake Harness Wiring Diagram



Appendix D – Returned Goods Form

In the unlikely event of a Stack part developing a fault and requiring repair, you are kindly requested to send the part back to Stack Ltd with a completed Returned Goods Form. Returning a part without this form will lengthen the repair time and possibly increase the cost of the repair.

Company	_____	Customer	_____
Address	_____	(if different)	
	_____	Contact	_____
	_____		
	_____	Tel No.	_____
Contact	_____	Fax No.	_____
Tel No.	_____		
Fax No.	_____	Return Date	_____

Details of part being returned

Part No. _____

Serial No. _____

Description _____

Other accessories included

(i.e. bracket, switches, etc.) _____

Details of Fault

Please complete as fully as possible. This will speed the repair and return of the parts.

Description of fault _____

_____

_____

Details of vehicle _____

Circumstances leading to fault _____

_____

Stack Ltd use only

Engineer _____ Service No. _____ Date _____

Stack Ltd, Wedgwood Road, Bicester, Oxfordshire, OX26 4UL, England

Tech Support: +44(0)1 869 240420 Tel: +44(0)1 869 240404 Fax: +44(0)1 869 245500

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