



ST8382 Pro DVR

Users Guide

Preface

Congratulations

Thank you for choosing the Stack ST8382 Pro DVR. This solid-state recorder will give you many opportunities to make video recordings in environments where *ordinary* video recorders cannot be used.

Purpose of this manual

This manual will help you install and use the Stack ST8382 Pro DVR. It explains how to set up and configure the system for your vehicle.

Related Products From Stack

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
- Auxiliary Gauges
- Analogue and Digital Sensors
- Data Logging Systems
- Display and Logging Systems
- Radio Telemetry Systems
- Display and Analysis Software
- Video Overlay Systems
- Solid-state Video Recorders
- Tyre Pressure Monitoring Systems

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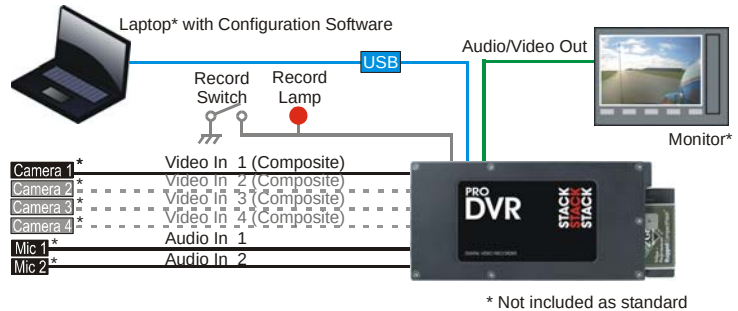
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Chapter 1. Introduction

The Pro DVR is part of Stack's second generation video recorder range. It has the same high quality, reliability and compact design of the original Stack DVR, but at a price and specification chosen specially with motorsport in mind.



Typical Pro DVR Application

The Pro DVR is perfect for all forms of club and semi-professional motorsport. It employs broadcast standard MPEG-2 video compression to record high quality real-time video and stereo audio direct to a Compact Flash card. The CF card can be removed with ease and played on a PC or laptop using an MPEG-2 player, or the files can be burnt directly to a DVD.

The Pro-4 DVR adds the ability to record video from up to four cameras.

The Pro DVR operates from 0-70°C (32 to 160°F) and utilises Autosport (AS) connectors to make the module waterproof to IP65.

Chapter 2. Essential User Information

Please read the important information in this chapter before using the Stack Pro DVR.

Standard Components

The Pro DVR is supplied with the following standard components (Pro-4 DVR in brackets):

Quantity	Description
1	ST8382 Pro DVR (ST8383 Pro-4 DVR)
1	Pro DVR System Harness (ST918101) (red)
1	Pro DVR Monitor Harness (ST918103) (blue)
1	Pro DVR Input Harness (ST918102) (yellow) or Pro-4 DVR Input Harness (ST918106) (yellow)
1	Switch and Lamp Harness (ST918105)
1	DVR Configuration Utility Software (ST920039)

Optional Components

Pro DVRs may be supplied with the following optional components:

Quantity	Description
1	DVR to VS Adapter Harness (ST900145)
1 (to 4)	Bullet Camera & Microphone Kit (ST8390 PAL or ST8391 NTSC)
1 (to 4)	CAM plug to BNC & Power lead (ST918106)
	Compact Flash (CF) Card

Video Standard

The Pro DVR is automatically configured to either the PAL or NTSC video standard depending on the camera which is connected.

! *Only PAL and NTSC are currently supported.*

Using a New Compact Flash Card

The Pro DVR will only operate with a Compact Flash card formatted with a FAT32 File System. Before using a new card, check its File System by inserting it into a PC running

Windows XP or Vista and display the disk properties by right clicking the disk icon in “My Computer”. If supplied as FAT16, reformat to FAT32 (see page 13).

Playing a Recording

The files produced by the Pro DVR are fully MPEG-2 compliant. They may be played directly from the card by inserting it into a PC with a suitable Compact Flash card slot or adapter. However, better replay results are usually obtained by transferring the file to the PC’s hard drive (see page 11).

Before Making a Recording

Before a recording session clear the Compact Flash card so that maximum space is available. Deleting files can cause the write/read speed of the removable Compact Flash card to degrade and only a reformat will restore its performance. A reformat can only be achieved using a PC running Windows XP or Vista. Right-click on the disk icon in “My Computer” and select “Format”. Ensure the “File system” is set to “FAT32”, choose the “Quick Format” option and then click “Start” (see page 13).

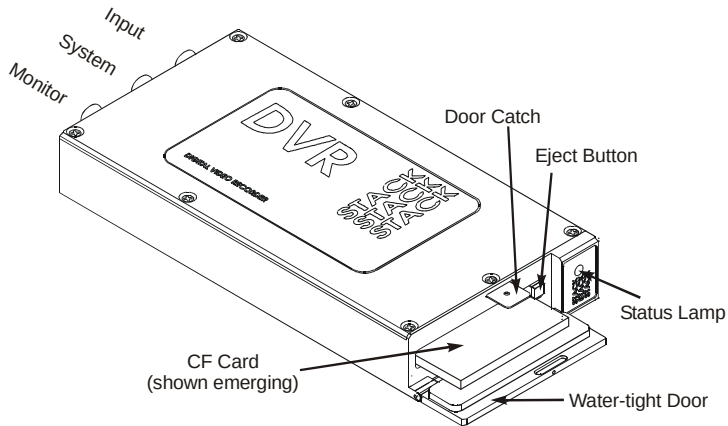
Deleting Files

Once a recording has been made, transfer the files to your PC’s hard drive and then perform a reformat.

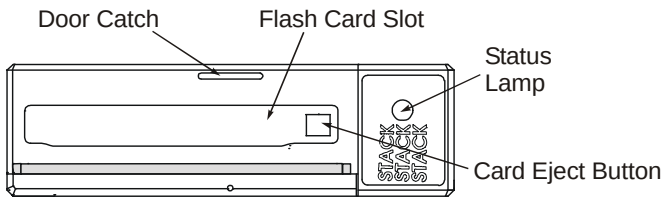
- ! *Ensure any useful recordings have been archived before performing a reformat.*

Chapter 3. Installation

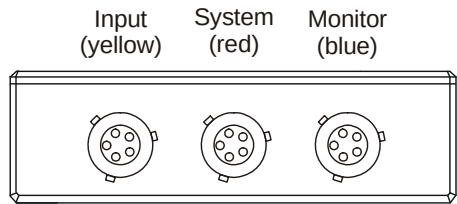
Before installing the Pro DVR, take a few moments to plan the installation. First identify all the components which came with your system. You may like to perform a *dry run* by connecting the components together to get a feel for how the final installation will be accomplished.



The Pro DVR Module



The Front Panel showing the Card Slot



The Rear Panel showing the Connectors

Now identify a suitable location for the Pro DVR. It can be mounted in any orientation but, when looking for a location, please bear in mind that there must be approximately 50mm (2") clearance for the wiring harnesses at the back of the unit to ensure that the cables will not be bent too sharply. There must also be enough space to remove the Compact Flash card at the front.

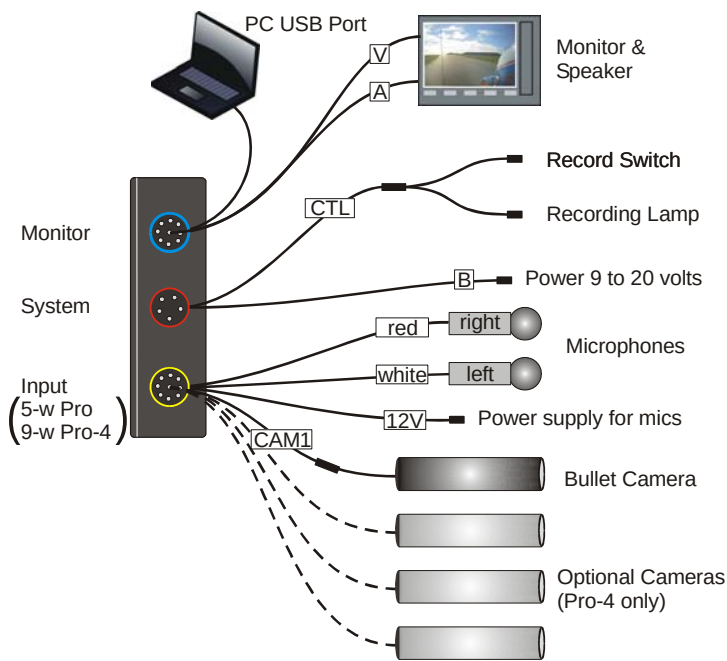
The module can be mounted by various means including using double-sided tape or Dual-Lock™. A rigid mounting can be made to a suitable bracket using the six M3 tapped holes in its underside (see Appendix A for dimensions).

Standard Wiring Harnesses

Once a mounting position has been determined, the components should be connected using the wiring harnesses supplied. The figure below shows the standard electrical connections to the unit.

If you are using the Pro DVR with a Stack Video Overlay system, an adapter harness is available for that system. The differences are described at the end of this chapter. Please contact your Stack distributor if you need to purchase the adapter wiring harness.

! *The wiring harnesses supplied by Stack are terminated with the most commonly used connectors. If your equipment uses different connectors, you will need to obtain appropriate adapters from your Stack dealer.*



Connecting the Components

Plug each harness you have into the appropriately coloured connector on the rear panel of the Pro DVR.

Input Harness (yellow)

Starting from CAM1, connect a camera to each of the 4-way CAM plugs on the wiring harness.

! *If you are using your own camera, you may need to obtain the optional CAM plug and Power lead (ST918106) from your Stack distributor.*

The following connections are optional:

If audio recording is required, connect your microphones to the left (white) and right (red) microphone inputs. A 2.1 mm power connector has been provided if your microphones need to be powered. The power plug supplies a regulated 12 volts up to a maximum of 0.5 amps (Pro-4 1.0 amps). If the current required is greater than that, you must provide a

separate power supply. Microphone gain can be adjusted using the DVR Configuration Utility (see page 20).

- ! *If audio recording is not required, it may be disabled to extend the record time (see page 20).*

System Harness (red)

Connect the Record Switch and Recording Lamp lead to the CTL connector. Extender cables are available from Stack's dealers.

The Recording Lamp output can be used to drive an input on some other equipment to indicate the Pro DVR is recording. This is an open collector output and must not be used to drive more than 50mA max.

Connect a permanent DC supply of between 9 and 20 volts to the Power (B+ and B-) connectors. You must provide a 5 amp fuse in the B+ connection to protect the Pro DVR. An independent switch can be added to isolate the module.

- ! *A permanent power supply is required to ensure that recording finishes cleanly when the Record Switch is turned off. If the supply is obtained from a vehicle's ignition switch, the Pro DVR could switch off before the recording has finished and that recording may be lost (see page 15).*

Monitor Harness (blue)

The composite video output can be used to connect to an external monitor to help align the camera, etc. The video monitor output is the same as the input. Connect the yellow phono plug to the video input on your monitor.

Stereo audio monitor outputs are also provided to aid the set-up of the microphone levels (see page 20). Connect the white and red phono plugs to the audio inputs on your monitor or speakers.

Video Overlay Wiring Harnesses

If connection of the Pro DVR to a Stack Video Overlay system is required, an adapter harness can be supplied for

that purpose. This harness allows direct connection between the Pro DVR and a Stack VS/VSR Module.

With this harness the signal from the camera is first directed to the VS/VSR Module, which overlays vehicle data on to the picture, before that signal is passed to the Pro DVR.

Connect the various components as described above with the addition of connecting the 15-way MIL connector to the VS/VSR module (see page 33).

- ! • *This adapter harness should be connected to CAM1 on the Pro-4 DVR input harness.*

Chapter 4. Operation

To make a recording:

Check that video, power and a Record Switch are connected as described in Chapter 3. Check that the Record Switch is set to the open (off) position.

! *A red marker on the Record Switch indicates when it is in the recording position.*

If not already installed, open the waterproof door and ensure the Eject Button is pushed fully home. Insert a Compact Flash card into the slot until it is flush with the opening. Once inserted, close the waterproof door.

! *The Compact Flash card must only be inserted with its manufacturer's label facing downwards and the lip uppermost. If there is resistance, the card is probably upside down. Attempting to insert the card incorrectly will damage the Pro DVR and void the warranty.*

Apply DC power and, after about 20 seconds delay while the system boots up, the Status Lamp on the front panel will light showing the status of the unit.

If the Status Lamp shows static green the system is ready to record.

If the Status Lamp is not static green, refer to the table below to find out the Pro DVR's status.

Important: Before making a recording, ensure there is enough space available or preferably, clear the Compact Flash card (see page 3). Card space may be checked on a PC or by making a trial recording and viewing the Pro DVR's Status Lamp (as described below).

To start recording close the Record Switch. Once recording, the Recording Lamp will illuminate and the Status Lamp will flash green for 3 seconds with a mark space ratio showing the capacity remaining:

- With an empty Compact Flash card the Status Lamp will flash for approximately 2.7 seconds on : 0.3 seconds off.
- With approximately 50% capacity remaining it will flash 1.5 seconds on : 1.5 seconds off.
- With approximately 10% remaining the Status Lamp will flash for 0.3 seconds on : 2.7 seconds off.

To stop recording, open (switch off) the Record Switch. The Status Lamp will revert to showing static green and the Recording Lamp will be extinguished.

The Compact Flash card may now be removed and placed into a PC with a suitable Compact Flash card slot card slot.

The table below shows the function of the Pro DVR's front panel Status Lamp. Green generally indicates the unit is functioning correctly and red indicates a fault or reset condition.

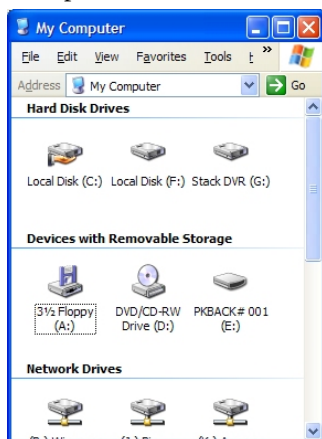
Operation		Status Lamp Operation	Description
Ready		Static green	The Pro DVR is ready to record. Video and card OK.
Video OK, No Card		Flashing long red / short green	In stand-by or unable to record with card not present or full. Video input OK. If card present, reformat with FAT32
No Video, Card OK		Flashing long green / short red	In stand-by (or unable to record) with video not present but card OK. Check Camera connection & power or check PAL / NTSC setting OK
No Video, No Card		Fast flashing red	Unable to record. Video and card not present or full, or system fault.
PC Connected		Flashing equally green / red (0.5s red / 0.5s green)	Pro DVR is under external control of the Configuration Utility.
Recording Memory Remaining	100%	Flashing green	Recording OK. The longer the green flash the greater the memory remaining. With a new card the Status Lamp will flash for approx. 2.7 seconds on : 0.3 off. 50% remaining, lamp flashes 1.5 sec on : 1.5 off. 10% remaining lamp flashes for 0.3 sec on : 2.7 off.
	50%	External Recording Lamp also illuminated	
	10%		
Recording, No Video		Fast flashing green / red	Recording but video is not present, audio only is being recorded.
Resetting or Busy		Static red	System reset / preparing to record or card format.

To play a recording:

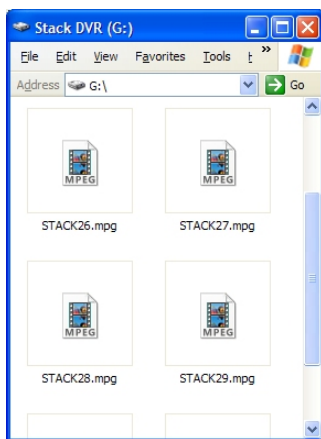
Pro DVR files can be played on a PC using an MPEG-2 media player.

Insert the Compact Flash card into the appropriate slot on your PC. If a slot is not available, there are a number of USB to Compact Flash card adapters available from PC vendors.

Allow the PC a few seconds to recognise the new Compact Flash card and then run “My Computer” or “Windows Explorer” to show the new drive. Double click to display the Compact Flash card contents.



My Computer / Removable Drive



Pro DVR Files

Pro DVR video files are MPEG-2 compliant and filenames begin with “STACK” and have a “.MPG” extension. The files are given sequential numbers starting from zero, eg, “STACK24.MPG”. With a standard Windows configuration, they will be seen as media files (see above). To play, simply double-click the file and it will be displayed.

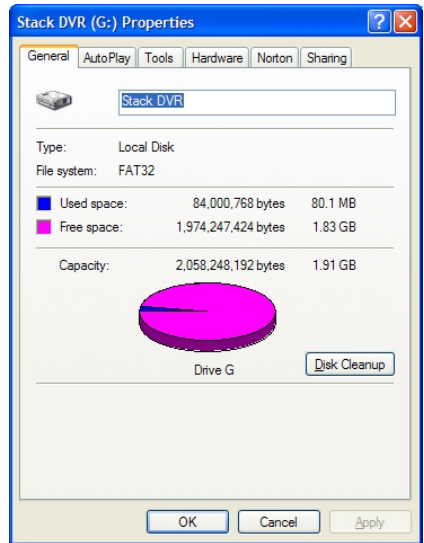
Due to the relatively slow read speed of Compact Flash cards, better results are usually obtained by transferring the required files to the PC’s hard disk before playing.

With an appropriate DVD burner and software, Pro DVR files may also be burnt onto DVD or Video CD for archiving without requiring modification.

Operation with a new Compact Flash Card

The Pro DVR will only operate with Compact Flash cards formatted with a FAT32 File System. Before using a new Compact Flash card check its File System by inserting into a PC and displaying the card properties by right clicking the disk icon in “My Computer”.

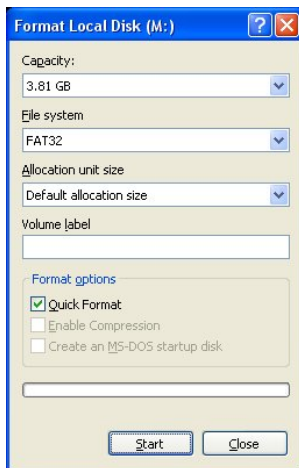
If the Compact Flash card was supplied as FAT16, reformat to FAT32 using Windows XP or Vista’s format utility to select the File System (see Formatting a Compact Flash card below).



Formatting a Compact Flash Card

If using a new Compact Flash card, please ensure it has a **FAT32 File System** (see Operation with a new Compact Flash card above).

To format the Compact Flash card using Windows XP or Vista, right-click on the disk icon in “My Computer” and select “Format”. Ensure the “File system” is set to “FAT32”, choose the “Quick Format” option and then click “Start”.



Deleting Files

Whilst deleting files will release space on the removable Compact Flash card, its performance may degrade over time. Only a reformat will restore the maximum write/read speed of the Compact Flash card. So once a recording has been made which you intend to keep, transfer that file to your PC's hard drive and then perform a reformat of the removable card to keep it in top condition.

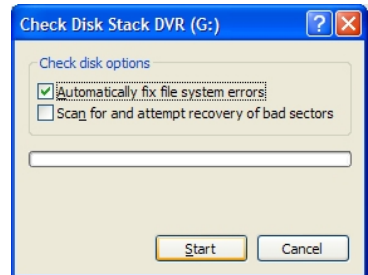
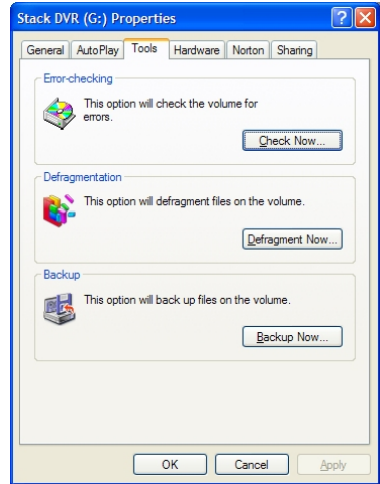
- ! *In summary, to keep your Compact Flash card in good condition, do not delete files. Remove files for archiving and then reformat the Compact Flash card as described above.*

Corrupted Compact Flash Cards

If the Compact Flash card is removed, or if power is disconnected from the Pro DVR during a recording, it is possible the card may become corrupted or the files could be incomplete. In this case run Windows' Scan Disk routine which will help recover any missing data.

To run Scan Disk, right click on the Compact Flash card icon in My Computer and select "Properties". Select the "Tools" tab and, under "Error-checking", click "Check Now".

The Check Disk dialog will now be shown. Check "Automatically fix file system errors" and click the "Start" button.



Chapter 5. Compact Flash Cards

The Pro DVR is compatible with most fast Compact Flash (CF) cards up to 16 Gbytes. Stack recommends Pretec and Sandisk Extreme or Ultra cards as they have been shown to give excellent results in harsh conditions.

- ! *Fitting a Compact Flash card with greater capacity than 16 Gbytes will not be recognised by the Pro DVR and the Status Lamp will indicate a “card not present” error (see page 11).*

Compact Flash cards will only operate if formatted as FAT32. Check any new Compact Flash card before using with the Pro DVR. If supplied as FAT16, reformat to FAT32.

For the highest quality recording it is essential that the Compact Flash card has a sustained write speed of $\times 16$ or faster. If the card is too slow, video will play back with missing frames. This problem can be alleviated by recording at a lower video quality (see page 20).

- ! *Do not change the card loaded into the Pro DVR while it is powered-up or connected to your PC.*

When changing cards, always remember to follow this procedure:

- Switch off the Pro DVR
- Shut down the DVR PC configuration Utility.
- Disconnect the USB cable.

Once the card has been changed you may switch the Pro DVR back on and reconnect the USB cable.

Chapter 6. Configuration

The Pro DVR may be configured from a PC when connected via a USB lead.

- ! *Once you have finished configuring the Pro DVR, exit the DVR Configuration Utility to update the Pro DVR and return it to normal operation. Alternatively, you can upload the new configuration by clicking the “Write Config” button. In both cases you **MUST** remove the USB cable for the Pro DVR to accept the changes.*

PC Connection

Install the DVR Configuration Utility which can be found on the CD-ROM supplied with the Pro DVR system.

Once installed, connect the USB cable to a USB port on the PC.

Run the DVR Configuration Utility on the PC.



System Connection Screen

The DVR Configuration Utility will now recognise the Pro DVR and show that it has established a connection.

Once connected the Pro DVR Status Lamp will flash 50:50 red / green to indicate that it is under control of the DVR Configuration Utility.

- ! *The DVR Configuration Utility is only able to establish connection with the Pro DVR when it is powered-up.*

Read Config

Clicking this button causes the current configuration to be uploaded from the Pro DVR to the PC.

Write Config

Clicking this button causes the new configuration to be transferred from the PC to the Pro DVR. Once the transfer is complete, the following dialog box will be displayed.



The USB cable **MUST** be disconnected from your PC for the new configuration to be accepted by the Pro DVR. After a few seconds you may reinsert the USB plug.

- ! *The time and date are updated when the USB cable is disconnected. For this purpose the utility assumes a one second delay between pressing the “Write Config” button and the USB being disconnected.*

Factory Reset

Clicking this button causes the Pro DVR to reset back to its manufacturing default settings. It should only be necessary to do this in the unlikely event that the Pro DVR’s internal set-up has become corrupted.

Once you have clicked the Factory Reset button, a dialog box will pop up and you must confirm the reset operation by clicking the “Yes” button.

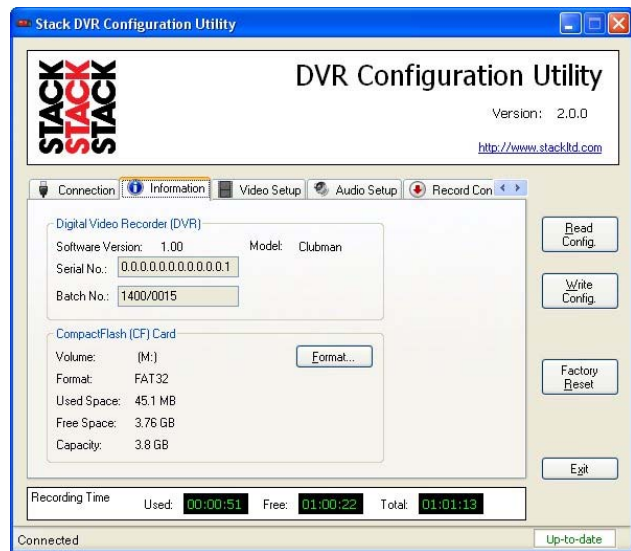
Finally write this default configuration to the Pro DVR using the method outlined above (see page 18).

Exit

Clicking this button closes the DVR Configuration Utility. If the configuration has been modified, you will be prompted to write the new configuration to the Pro DVR.

System Information

This screen shows the serial numbers of the Pro DVR and the DVR Configuration Utility software.



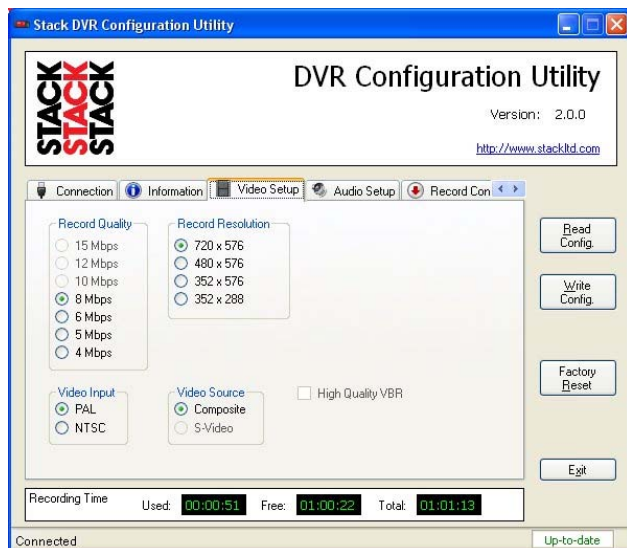
System Information Screen

If a Compact Flash card is fitted, this screen will show details of the card including an indication of the amount of space which has been used.

Click the “Format” button to display the Windows Format dialog box which can be used to format the Compact Flash card (see page 14).

Video Setup

This screen allows you to configure the various aspects of the video recorder.



Video Set-up Screen

Record Quality

Allows you to configure the amount of compression employed by the system. The software shows an estimate of the record time at the bottom of the screen, depending upon configuration.

Record Resolution

Allows you to adjust the resolution of the recordings to those shown in the table below. The software shows an estimate of the record time at the bottom of the screen, depending upon resolution.

Resolution		PAL	NTSC
Full	(D1)	720 x 576	720 x 480
Medium	(2/3 D1)	480 x 576	480 x 480
Small	(1/2 D1)	352 x 576	352 x 480
Smallest	(SIF)	352 x 288	352 x 240

- ! *Always test that the recordings which are made will play correctly on your video equipment. Many DVD players will not play back correctly unless the recordings were made at the highest resolution.*

Video Input

Configures the system to either PAL or NTSC.

Video Source

Configures the system to either Composite or S-Video.

- ! *Only the Composite input is available on the Pro DVR.*

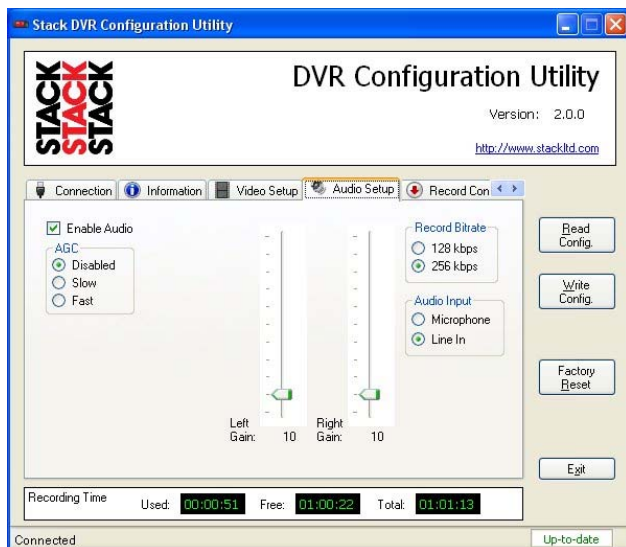
High Quality VBR

This option is used to enable Variable Bit Rate support.

- ! *Variable Bit Rate is not available on the Pro DVR.*

Audio Setup

This screen allows you to configure the various aspects of the audio recorder.



Audio Set-up Screen

This screen allows you to set the recording levels individually for each stereo channel.

You can use Record Bitrate to set the amount of compression applied to the audio signal.

Set the Audio Input level to match your microphones. In most cases Line In is used for powered microphones and Mic level for un-powered microphones.

! *Automatic Gain Control is not available in the Pro DVR.*

! *Uncheck Enable Audio if you do not want to record audio; that will free more space for video recording.*

Record Control

This screen allows you to configure how the recordings will be controlled, ie, how the Pro DVR will respond to the Record Switch.



Record Control Screen

Record When Closed

When this mode is selected, the Pro DVR will record only when the Record Switch is switched on, ie, when the contacts on the external switch are closed. As soon as the Record Switch is switched off, (contacts opened) the Pro DVR stops recording.

Record Start / Record Stop

! *Record Start / Record Stop is not available in the Pro DVR.*

Triggered Recording

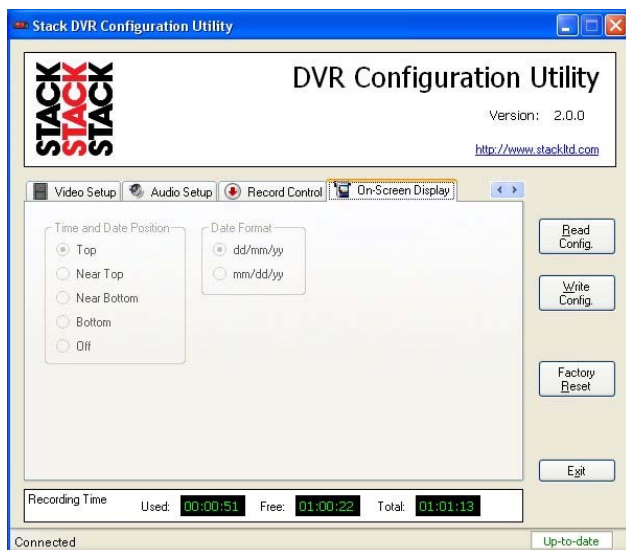
! *Triggered Recording is not available in the Pro DVR.*

Power Control

! *Power Control is not available in the Pro DVR.*

On-Screen Display

This screen allows you to configure how the date and time will be displayed.



On-Screen Display Screen

! *On-Screen Display is not available in the Pro DVR.*

Chapter 7. Video and Data Systems

The Pro DVR may be supplied as part of a Stack Video Logger System:

Synchronised Video Logger Systems

When using these systems, the control of the Pro DVR recording mode is automatic. The Pro DVR will start recording when the Data Logging system starts recording.

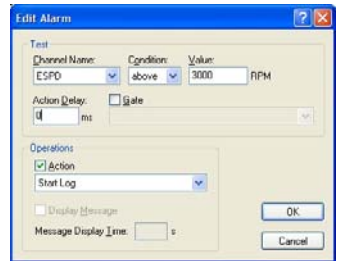
! *Ensure the configuration includes a ‘Stop Log’ command which will also stop the Pro DVR recording.*

Video Overlay Systems

If the Pro DVR is part of a data overlay system that does NOT include a recorder then the VS/VSR will need to be configured with an action to start the Pro DVR recording.

Automatic recording start control

The recording status of the Pro DVR is automatically controlled by the VS/VSR module. Shown is a test based on ESPD (Engine RPM) which causes a ‘Start log’ command when the Engine speed is greater than the specified RPM.



! *The ‘Start Log’ command will cause the Pro DVR to start recording.*

Automatic recording stop control

The system must also include a ‘Stop Log’ command. This is because recording **MUST** be stopped before power is removed.



- ! *Without this, the last part of the video that was recording will be lost when the power is removed.*

Manual recording control

Additionally, recording can be initiated using the Pro DVR Record Switch.

The VS/VSR module’s recorder control output is wired in parallel with the Pro DVR Record Switch such that either the VS/VSR output or the Pro DVR Record Switch can cause the Pro DVR to start recording.

To stop the Pro DVR recording both the VS/VSR output and the Pro DVR Record Switch must be off to stop recording.

Recording Lamp

The Pro DVR Recording Lamp output is directly connected to both the Pro DVR Recording Lamp and the VS/VSR Video Status Lamp. When the Pro DVR is recording, both lamps will be illuminated.

- ! *It is not necessary to connect the Recording Lamp when using the Video Controller.*

Recommended Vehicle System Power connections

Power for the Stack Video/Data System and Pro DVR must be connected to the Master switch supply and not to the switched Ignition supply. This arrangement allows the

engine to be switched off before the power to the Stack system.

- ! • *This is necessary so that the system can detect that, for instance, the Engine Speed (RPM) has fallen to zero and will have sufficient time to stop the Pro DVR from recording before power is removed from the Stack system.*
- ! • *Failure to stop the Pro DVR from recording before the power is removed will cause up to the last 20 seconds of the video recording in progress to be lost!*

Chapter 8. Troubleshooting

Symptom	Possible Cause	Remedy	Notes
The Pro DVR will not operate with a new Compact Flash card.	The new Compact Flash card has an incorrect file system.	Set the Compact Flash card to the FAT32 file system.	To check the CF card's file system, insert the card into a PC and display its properties (see page 13)
Video files are corrupted or missing.	The Pro DVR was switched off before recording finished.	Ensure recording has finished before switching off the Pro DVR.	Use Windows Check Disk utility to recover damaged recording files (see page 15)
My media player will not play Pro DVR files.	Pro DVR files have a MPEG-2 format and some media players can only play MPEG-1 by default.	Install an MPEG-2 decoder on your PC or use another MPEG-2 player.	If the PC does not have a DVD drive / player installed, you may need to obtain a plug-in for your media player. This can often be obtained via the Microsoft Update website.
Video will not play back correctly on a DVD player.	Record Resolution is too low.	Increase Record Resolution to its highest setting.	Many DVD players will not work with low resolution video files.
Video Playback is "jerky" or "hesitates".	The transfer rate from the Compact Flash card to the PC is not fast enough.	Copy the video file to the computer's hard drive and play the copied file from that location.	Where the transfer rate is nearly high enough, it is sufficient to pause playback for a few seconds to fill your media player's buffer. Often the file will play correctly from then on saving the time-consuming transfer to the PC's hard drive.
Video Playback is "jerky" and the picture is incomplete or has extra lines.	Incorrect video standard selected.	Check that the Pro DVR is configured for video of the same standard as the video source (NTSC or PAL).	Check this using the DVR Configuration Utility which shows how the Pro DVR is configured and the standard of the video source.

Chapter 9. Specifications

General

Video Standard	PAL / NTSC
Power Input	9V to 20V DC
Power Over-voltage	not specified
Power Consumption	~4 W
Maximum load	3.5A for 10 mS (in-rush current at power on)
Case Dimensions	151 x 76 x 21 mm
Case Material	Hard anodised aluminium.
Weight	300g (without CF card)
Electrical Connectors	Pro : 2 x 5-w AS, 1 x 9-w Pro-4 : 1 x 5-w AS, 2 x 9-w

Configuration

Operating System	Windows XP or Vista
Connection	Configuration uploaded from PC via USB cable

Recording Media

Recording Media	Compact Flash
Maximum Media size	16 Gbyte
Maximum File size	2 Gbyte Larger recordings are automatically fragmented into 2 Gbyte files with < 2 second gaps
File Format	MPEG-2 DVD compatible
Media supply voltage	3.3v DC
Media format	PC FAT32

Recording Control

Record switch	TTL Compatible with 100K pull up to 3.3 volts.
Status Lamp (internal)	Bi-colour green/red
Recording Lamp output	Open collector (12 volt max)
Power on to recording delay	< 20 seconds
Switch to recording delay	< 0.1 seconds
Video lost between files	< 2 seconds
Video lost at power failure	< 20 seconds

Video

Number video channels	1
Video standards	PAL, NTSC
Frame Rate	25 fps (PAL), 30 fps (NTSC)
Composite Video Input	1.0 V pk-pk
Composite Video Output	1.0 V pk-pk
Compression format	MPEG-2 (MP@ML PS)
Resolutions supported	See Table 1
CF Recording time (at D1 resolution)	14 to 136 minutes per Gbyte
Quality bit-rates	7 Fixed :- (1, 2, 4, 5, 6, 8 & 10 Mbps)

Audio

Channels	2 In, 2 Out
Analogue Input	Line level +3 to -30dB Mic. level -27 to -60dB
Automatic gain control (AGC)	No
Microphone bias	None
Compression format	MPEG-1 (Layer 2)

Real Time Clock

Picture overlay	No
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Environment

Operating temperature range*	0 to 70°C (32 to 160°F)
Sealing	IP65

- * *Specification is for the Pro DVR only. When combined with a CF card, the specifications will be reduced to the lesser of the two.*

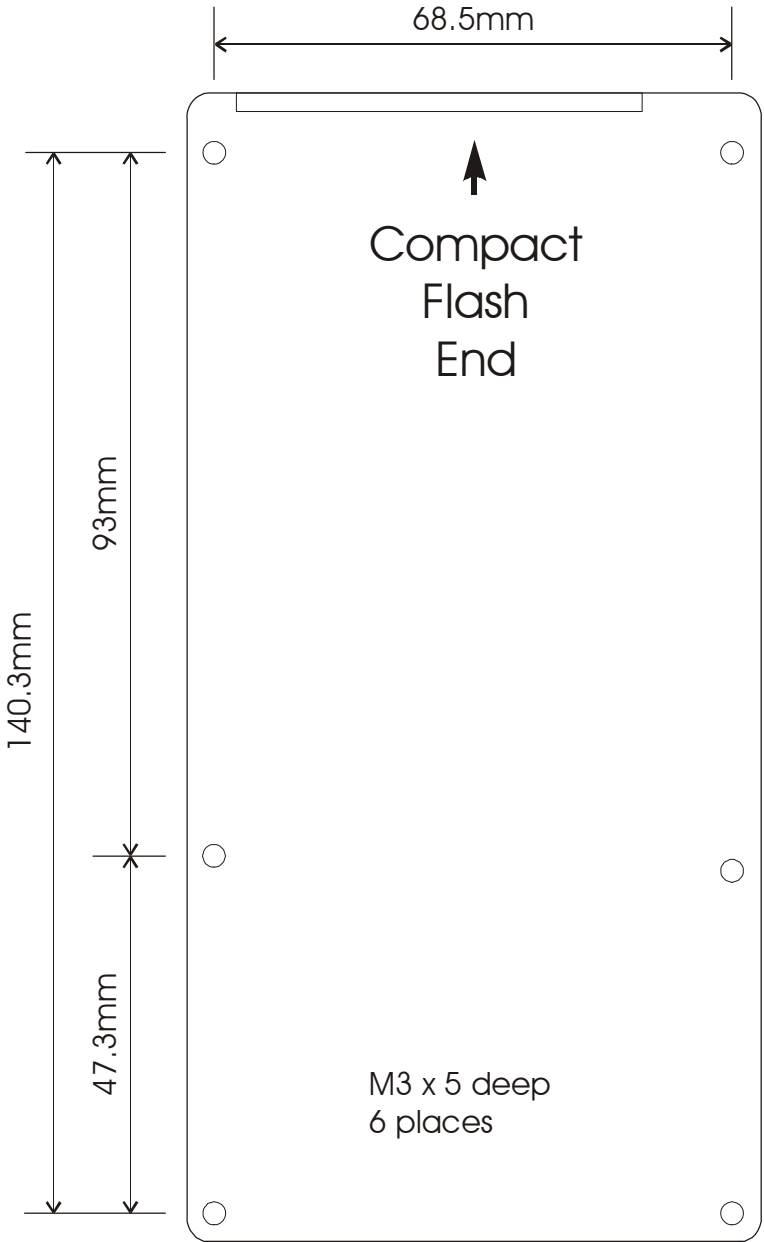
Table 1

Resolution	PAL	NTSC
Full (D1)	720 x 576	720 x 480
Medium (2/3 D1)	480 x 576	480 x 480
Small (1/2 D1)	352 x 576	352 x 480
Smallest (SIF)	352 x 288	352 x 240

Appendix A. Mounting Template

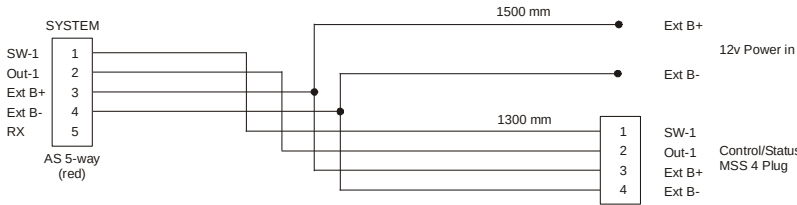
Use the template on the next page for mounting the Pro DVR.

Remember to leave room for card insertion and removal.

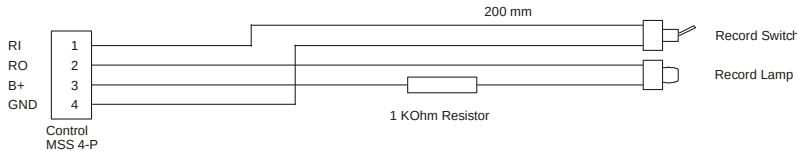


Appendix B. Wiring Harness Diagrams

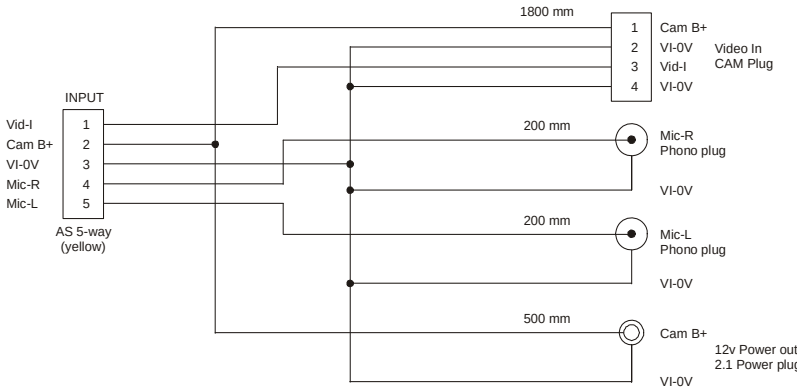
Pro DVR System Harness (ST918101)



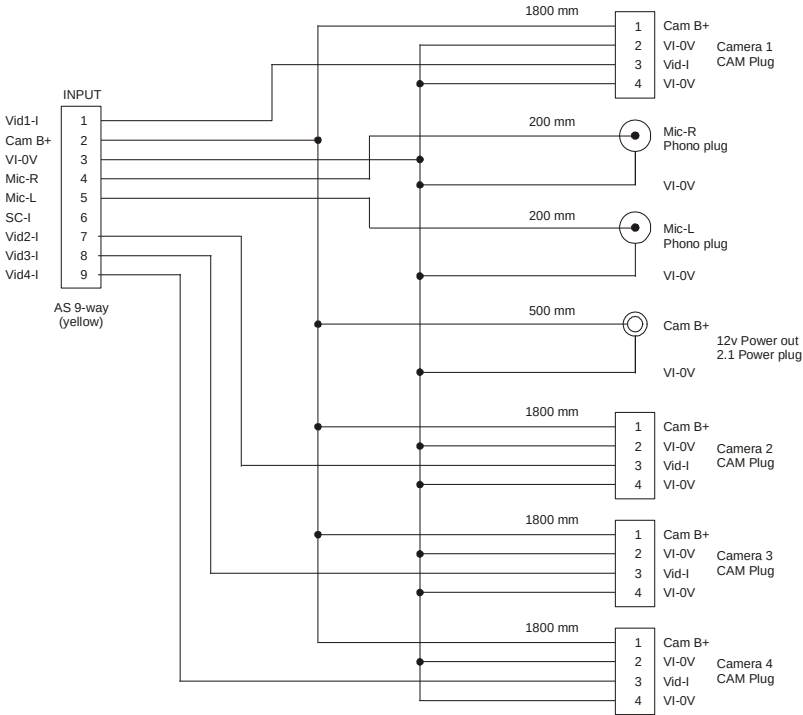
Control / Status Harness (ST918105)



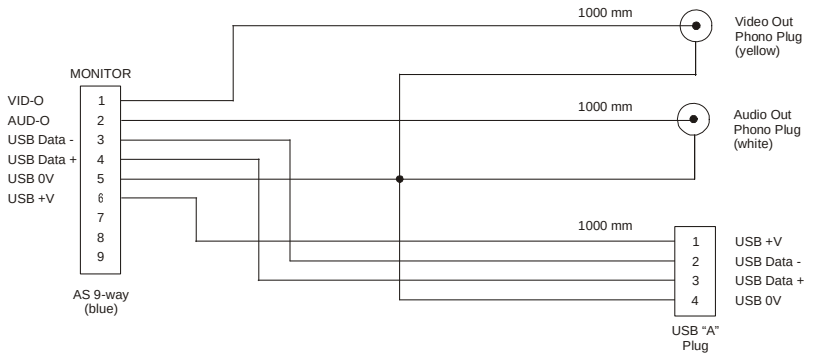
Pro DVR Input Harness (ST918102)



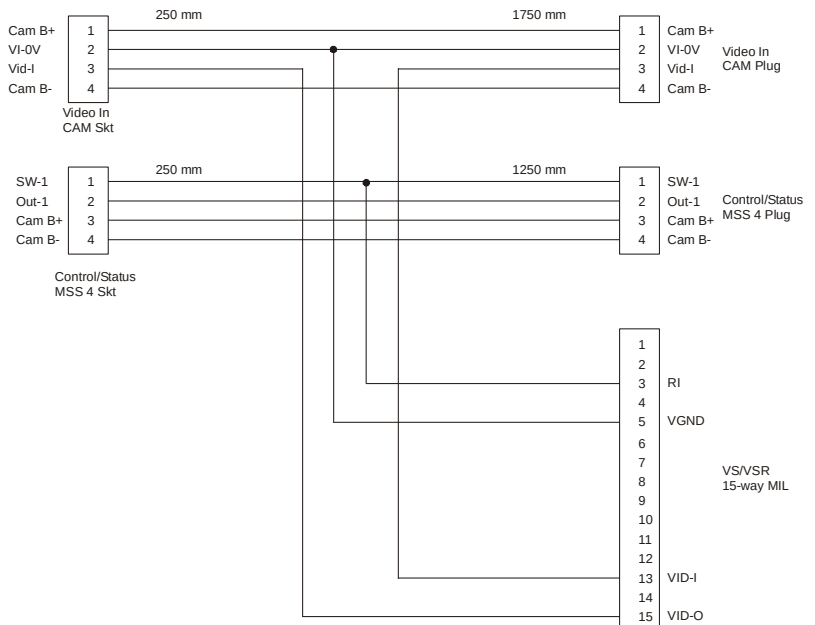
Pro-4 DVR Input Harness (ST918106)



Pro DVR Monitor Harness (ST918103)



DVR to VS Adapter Harness (ST900145)



Appendix C. Upgrading the Firmware

From time to time Stack may release upgrades to the firmware within your Pro DVR. These upgrades can be found on the Stack web-site together with instructions detailing how to perform the upgrade.

We suggest that you visit the web-site from time to time to find out if an upgrade is available.

Appendix D. Service and Support

At Stack we take pride in having a very high-quality engineered product range and strive to offer first class service when supporting our customers.

Stack Web-site

If you have questions about Stack products or are experiencing a problem, a wealth of information is available on our web-sites to find the answers you need.

International

www.stackltd.com

United States

www.stackinc.com

Frequently Asked Questions

Log-on to the Stack web-site, click on **Motorsport Division** and then the **Support** tab and finally the **FAQ Page**.

If you need a User Guide, click on **Manuals and Download Support Area**. You must enter some basic information for Stack's internal use to gain access to downloadable versions of our product manuals. These give clear instructions on installation and correct operation of your Stack product as well as Troubleshooting sections.

! *If you still have questions, please contact your Dealer.*

Contacting your Dealer

For a current list of dealers, log-on to the Stack web-site, click on **Motorsport Division** and then the **Where to buy** tab and select the **Distributors** menu.

When contacting your Dealer it is important you have the following information to hand:

- Serial Number (found on the rear of the product).
- The Model Number.
- The date of purchase.
- A copy of the packing list supplied with the product.

- If it is a Data Logging product, please provide the TAG number, software licence number and DataPro version.
Your Dealer will be able to help locating those numbers.
This information will help your Dealer ensure your enquiry is handled in an efficient manner.

Service Enquiries

If you or the Dealer have identified a fault with your Stack equipment, it is possible to return the goods for inspection. Your dealer will help you with this. Before returning your equipment, please be aware that:

- All services and repairs are subject to an initial inspection. No commitment can be made to repair the goods in full or within a specified budget or timescale until this inspection is complete.
- An initial inspection fee will be charged for all services and payment is required before we conduct the inspection. On completion of the inspection you will be advised of any work and the costs involved in repairing the goods. At this point you have the choice to proceed or terminate this service.
- It is your responsibility to safely ship (at your expense) the goods to Stack. It is also your responsibility to arrange for the safe return of the goods unless they are repaired under warranty, in which case Stack will organise their return. Please ensure that goods are adequately packaged and insured for the journey.

To arrange for your equipment to be returned for inspection, please contact your dealer. The process for returning goods is as follows:

1. Your dealer will complete and send you a Returns Authorisation form by fax or mail. This form includes a unique Returns Authorisation Number (RAN).
2. You must include that form with the goods when shipped. Your dealer will advise you about shipping.

3. At the time of shipping you should arrange to make payment via your dealer for the initial inspection who will advise you of this fee.

Your goods must be returned to Stack's factory in the UK. The inspection and service process is explained below:

1. On receipt your goods will undergo an initial inspection by one of our engineers.
2. The engineer will attempt to reproduce the fault as reported and make an assessment of the complexity of the corrective action:
 - i) If the corrective action can be identified, we will contact you with details of the repair required and a quotation for that work.
 - ii) If corrective action cannot be easily identified, a full diagnosis and a "Corrective Action Assessment" will be conducted. We will then contact you to advise the next course of action and will quote on expected duration and cost of repairs where applicable.
3. Once we have received your authorisation to proceed with the repair, we will complete the work and request payment. A full final test will be conducted before the goods are packed ready for shipping.
4. Once we have confirmation that payment has been received, the goods will be returned to you.

Cost and Duration of Service

Service and repair work is conducted at Stack's factory in the UK. The cost and the duration of the service will depend on:

- Your Geographical location.
- Whether the goods are covered by a warranty.
- The complexity of the repair work required once the initial inspection has been completed.

Cost and Duration of Inspection – Your dealer will advise on the cost of the initial inspection. It is your responsibility to arrange for the safe shipment of the goods.

The time required to complete any service or repair work depends on the initial inspection. Upon receiving your RAN form, we will provide an estimated delivery time, which is subject to the outcome of the initial inspection.

Priority Service – If you require your goods to be returned faster than the estimated delivery time, we offer a priority service for which there is an extra charge. Again, the time required to complete any service or repair depends on the initial inspection. Wherever possible your goods will be returned within our priority delivery times:

- **UK** - 2-3 working days
- **USA & Rest of World** - 7 working days

Cost and Duration of Service and Repair – On completion of the initial inspection, we will quote for the final cost and expected duration of the service and any repair work. We will ask you for authorisation to complete the work and request payment. If you choose not to proceed, we will return the goods to you as we received them and you will only be charged for the initial inspection and return freight.

Harnesses and Sensors – Where goods include harnesses and sensors, those will be inspected to assess functionality. We are unable to repair harnesses or sensors that have been cut or become damaged due to use.

Note: A small number of sensors can be serviced or repaired. Your dealer can advise which sensors are serviceable.

Loan/Replacement equipment – Stack operate a return to base service and repair policy. We do not offer an advance exchange or loan scheme.

Stack Contact Details

Contact

Email:

Web:

International

sales@stackltd.com

www.stackltd.com

United States

sales@stackinc.com

www.stackinc.com

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