

**Stoneridge
Electronics**



A Stoneridge Company

Stoneridge Electronics
Digital Tachograph SE5000

Workshop Manual

IMPORTANT INFORMATION

Due to driver and road safety requirements, it is strongly advised that driver interaction with a Digital Tachograph Vehicle Unit (VU) is not carried out whilst a vehicle is in motion.

Note: the term 'VU' will be used to describe a Digital Tachograph from this point forward.

If a driver does not have a valid VU driver smartcard they **must not** drive a vehicle fitted with the VU described in this manual as it is against EU law. If a card is lost, stolen or faulty, a temporary exemption to drive without a card **may** be granted by the national enforcement agency of the country in which driving is to be done. Drivers should contact national enforcement agencies **directly** (as indicated in *Appendix 6 - National Enforcement Agencies*) for clarification on this matter - **drivers** are responsible for ensuring that they obey driving laws. Workshop Technicians **must** take care of their Workshop cards and associated PIN codes. Workshop cards and PIN codes are not transferable and **shall not** be made available to unauthorised personnel or any other person. A PIN code **must not** be stored on or near to the Workshop card it refers to. All Smartcards **must** be handled with care – **do not** flex or bend the cards. Ensure that the card contacts are kept free from dirt – clean with a soft damp cloth if necessary.

Dirt ingress can lead to premature failure of a VU. Ensure that smartcard drawers are closed at all times, except when inserting or removing cards. Also ensure that the paper cassette is closed at all times except when changing the printer paper or when accessing the calibration / download front connector (which is located behind the paper cassette fascia). **Do not** use excessive force when removing the paper cassette from its compartment (see *section 4.6 Paper Cassette* for more details). It should also be noted that the printer paper fitted in a Stoneridge VU must be a Stoneridge approved type (see *Appendix 5 - Printer Spare Parts* for details) and must be stored in a cool, dark and dry environment.

The VU smartcard drawers are not capable of supporting weight in the open position.

Disconnect the electrical supply to the VU if:

- Electrical welding is carried out on the vehicle.
- Prolonged boost starting is anticipated.

Note: if the electrical supply to the VU is to be disconnected, a workshop card must be inserted prior to disconnection to prevent the disconnection of the supply being recorded as a VU event/fault.

High-level transient voltages can cause permanent damage to VU electronic circuits. Similarly, failure of other electrical components on the vehicle, for example the alternator regulator, may result in damage to the VU, which is permanently connected to the battery. Any permanent damage done to the VU in this way will result in the VU warranty being invalidated.

The EMC performance of the Stoneridge VU complies with the requirements of EU Commission Directive 95/54/EC.

A VU case must **never** be opened, tampered with or manipulated, even in a Tachograph Workshop – if it is then it will become **invalid** for use. If a VU is faulty it must be decommissioned (see *section 11 Repair and Decommissioning of Vehicle Units* for more details). In the case of any exterior damage to a VU, a Tachograph Workshop should carry out a security inspection on the unit to determine whether or not the VU still conforms to security requirements. If a VU does not pass an evaluation it **must be** decommissioned and will require replacing.

The Stoneridge VU has a normal operating temperature range of -25°C to $+70^{\circ}\text{C}$.

Note: ADR version range is -25°C to $+65^{\circ}\text{C}$.

If the VU UTC time is inaccurate by a magnitude of greater than ± 20 minutes, then the VU should be recalibrated.

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1 Introduction

A Stoneridge VU can be operated in one of four modes of operation as described below:

- Operational Mode (Driver Card or No Card Inserted).
- Control Mode (Control Card Inserted).
- Calibration Mode (Workshop Card Inserted).
- Company Mode (Company Card Inserted).

Note: if any combination of Workshop, Control and Company cards is inserted into a VU at the same time, then the mode of operation will be operational.

This manual is concerned mainly with the Calibration mode of operation. However, knowledge of the normal operation of the unit (i.e., as is usually done by Drivers with valid Driver cards inserted) is also required in case any driving in a vehicle with a VU fitted is required for calibration or testing purposes.

The VU detailed within this manual comprises two smartcard drawer mechanisms, a printer, an LCD display, a calibration/download interface (6-pin connector located behind paper cassette fascia) and user controls, located in an ISO standard radio enclosure. This type of enclosure enables mounting in a variety of locations, ensuring that insertion and removal of the smartcards and operation of the controls can be easily achieved by an operator. The VU has been designed to comply with EU Regulations and thus displays and records speed and distance in metric units (kilometres per hour and kilometres respectively). The VU also incorporates an internal clock, which is used to indicate the current time on the VU display. The VU is available in versions for use in both 12 and 24 Volt vehicle systems.

Smartcards used in a VU, upon which the driver duties, speed and distance travelled are recorded, are credit card style flexible plastic cards. When in the calibration mode, a workshop card is additionally used to store VU calibration information. The workshop card can hold data for minimum 88 and maximum 255 calibrations and when card is full the oldest data will be replaced with the newest. The VU drawers, when they contain smartcards, are **locked** in the closed position whilst a vehicle is being **driven** and can only be opened when **a vehicle is stationary**.

Note: if there is no smartcard inserted, a drawer can be opened at any time.

The 'Speed/Odo/Distance' display for a VU when in the normal driving mode has, in the upper right hand area, the cumulative vehicle distance travelled to the nearest 1/10 km as an eight-digit figure (i.e., the 'odometer' reading between 0 and 9,999,999.9 Km). The current local time is displayed in the lower right hand area of the display as a four-digit figure (24-hour clock). The current speed of the vehicle is displayed on the left-hand side of the display (3-digit value with units km/h).

The VU is designed for use by up to two drivers, and thus two driver-specific buttons ('1' for driver and '2' for crew) are provided adjacent to the smartcard drawer slots. These buttons have the dual function of being able to set the current duty and to open the smartcard drawer. Four further control buttons are provided on the VU, immediately below the display. The left-hand control is the 'Cancel' button, the middle two are 'Up' and 'Down' buttons and the right hand control is the 'Enter' button.

A Workshop card can be inserted in either of the Smartcard drawers to initiate the Calibration mode of operation, however when driving the card should always be in the driver ('1') drawer. It should be noted that if workshop cards were inserted in both drawers in a VU, the card in drawer '1' would be used for calibration purposes.

The Stoneridge VU has full type approval for use in the European Union according with Commission Regulation (EC) No. 1360/2002 of 13 June 2002 and other legislatives related.

Note: The Approval Certificate number is e5 ???. This type approval number will be indicated on all Stoneridge VUs.

The Stoneridge VU is security certified in accordance with ITSEC E3 high as per the relevant EU Digital Tachograph legislation.

2 Description of the Digital Tachograph System

A Digital Tachograph vehicle system consists of a number of different parts as follows:

- The Vehicle Unit (VU) – this is an ISO standard radio sized device within which there is a printer, a display, user interface buttons and two smartcard slots. Information stored in a VU consists of: certain vehicle related parameters; all driver related activity; events and faults information; speed information (for the last 24 hours of driving only) and distance information. The VU internally calculates the speed of the vehicle and any distance travelled and updates the displayed values accordingly. The VU can also supply signals to other vehicle systems that require speed or distance information and can accept input signals for recording events information.
- Motion Sensor – this is used to provide a VU with speed signal pulses from a vehicle gearbox and must be a Stoneridge approved type. To ensure the integrity of the speed sensor signal, the speed signal is transferred between the sensor and the VU in an encrypted form – thus the motion sensor is also known as an “Encrypted Sender”. Encrypting the speed signal ensures that any tampering with the signal will be detected and recorded. The motion sensor is ‘paired’ specifically with a VU during the VU activation process (see *section 9.3 Activating the VU for Use* for more details). This means that the VU and the motion sensor work together as a mutually inclusive pair. Thus neither the motion sensor nor the VU with which it is paired can be replaced by another part unless the VU is in the calibration mode.
- Smartcard – a driver card is used to store driving data relating to the named driver on the card. A workshop smartcard under security PIN control can also store driving data and can be used to enter the VU calibration mode of operation.
- Remote Display – this usually takes the form of an Instrument Cluster that can be used to display speed (speedometer) and distance travelled (trip and odometer) using information passed from a VU. However it is possible that speed and distance will only be available for display on the VU.

3 Workshop Functions and Equipment Requirements

A Tachograph Workshop will be involved in a number of different functions associated with Digital Tachograph VU systems. Initial requirements will be for the physical installation (i.e., mounting and making electrical connections) of the system into a vehicle followed by the activation of the systems’ VU – a VU **will not** work in the ‘normal driving’ operational mode unless it has been properly activated. As part of the installation procedure an in-vehicle calibration of the system **must** be carried out. Regular recalibration will be necessary, as part of the 2-yearly periodic inspection program that is required for a VU system, however recalibration of in-vehicle systems will also be required in a number of other circumstances as follows:

- After alteration of the vehicle characteristic coefficient (W-factor).
- After a change in the effective circumference of the vehicle drive wheels (L-factor).
- After a change of vehicle registration number.
- If the Tachograph system requires resealing.
- If the Tachograph UTC time is inaccurate by more than 20 minutes.

Tachograph Workshops will also be required to inspect VU systems. The inspections will consist of checking that the equipment functions properly and the VU complies with maximum tolerances for speed and distance display, and recording. The type approval mark for the VU, the tyre size and L-factor of the drive wheels, and the sealing of the Tachograph system should also be checked as part of an inspection. Repairs to Stoneridge VUs are not allowed with the exception of paper cassette replacement - the VU case must **never** be opened (if it is then it will become **invalid** for use). Faulty units must be decommissioned. When decommissioning, it should be noted that the internal data stored in the unit is the property of the vehicle owner and thus must be downloaded and returned on request.

A variety of equipment will be required to carry out the above-mentioned workshop functions. Pivotal to most of the workshop functions carried out is the workshop smartcard. With a validated workshop card it is possible to enter the VU calibration mode. Whilst in this mode VU activation, calibration, and programming of calibration factors are possible. Also, unrestricted data downloading of an entire VU data memory contents is possible with a workshop card inserted. Cards are obtained by a workshop via application to the relevant authorities. Due to the security implications of Digital Tachograph systems, all workshop cards use a PIN number for authentication.

Other equipment required will include an approved method and equipment for the determination of the vehicle calibration parameters. A Tachograph programmer will be necessary for programming a VU with calibration data and specialist data download equipment will be required for downloading VU data. It is recommended that a secure data store is used for the storage of downloaded VU data and also a secure data backup facility used in case the primary data store fails. The interface to the VU for all the external equipment mentioned above is through the calibration / download front 6-way connector that is located behind the paper cassette fascia.

4 Description of the Controls

Figure 1 shows the controls for the Digital Tachograph VU.

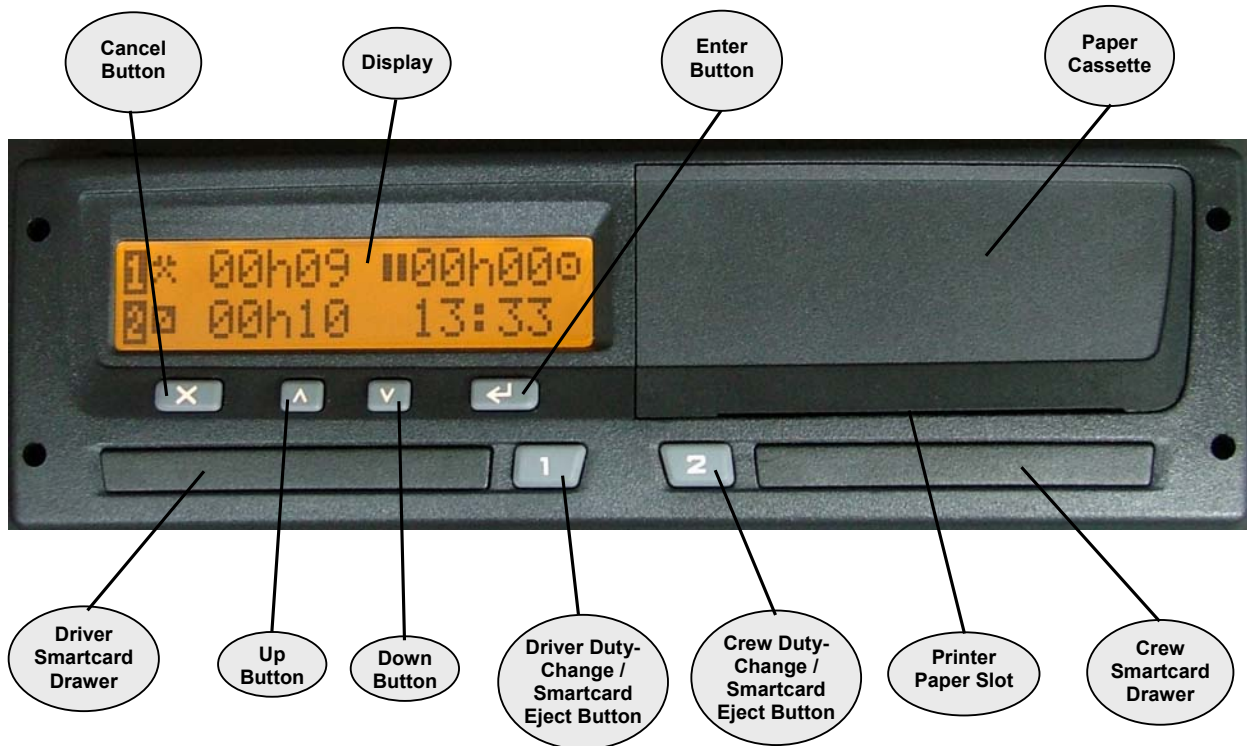


Figure 1 Illustration of the Controls

Figure 2 shows the VU with the paper cassette removed to reveal the position of the calibration/download front connector. The printer mechanism can also be seen towards the rear of the unit with the paper cassette removed.



Figure 2 VU Download / Calibration Connector

4.1 Driver Duty-Change / Smartcard Eject buttons

These buttons (one for driver and one for crew) have the dual functionality of being used firstly to change the currently selected duty and secondly for ejecting the associated smartcard drawer.

4.1.1 Duty Change Function

Two individual buttons are provided, respectively for the driver and crew (if two drivers are present), for initiating a period of recorded duty in the normal driving mode. The **Driver** is allocated the left hand Duty-change button ("1"), while the **Crew** is allocated the right hand Duty-change button ("2"). The duty mode for the Driver or the Crew is selected by short pressing the appropriate Duty-change button (see *section 7.4 Duty Setting*, for a more extensive description). In order to change the mode of activity, the Driver or Crew will press their respective Duty-change button a number of times, until the correct mode of duty is displayed (top line for Driver and bottom line for Crew).

It should be noted that when a vehicle begins to move, the VU automatically switches the Driver duty mode to 'drive' and the Crew duty mode to 'available'. When a vehicle stops moving, the Driver duty automatically changes to 'work' and the Crew duty will remain at 'available'. **Please note that 'Rest' mode for both Driver and Crew, 'Available' mode for the Driver and 'Work' mode for the Crew all must be explicitly selected.**

4.1.2 Smartcard Eject Function

The Driver Duty-Change buttons also have an alternative function in that they can be used to eject the smartcard drawers in order to insert or remove a smartcard (left hand '1' button for the Driver smartcard and right hand '2' button for the Crew smartcard). To eject a smartcard drawer **'long-press'** the appropriate button. After a short while the required drawer will latch open.

Notes:

1. If a smartcard is inserted in a VU, the associated 'eject' button is only active when the vehicle is stationary.
2. The 'eject' buttons are not active when the electrical supply to the VU is interrupted. If it is not possible to restore the power, the drawer will require to be released by an approved service engineer using procedures and special tools, as described in *Appendix 7 - Troubleshooting (Section (b) Opening the Smartcard Drawers With No Power or Whilst Disconnected)*.

4.2 Enter Button

The Enter button is pressed to enter the Main Menu of sub-functions whilst the standard Driving Mode screen (or one of the page selection alternatives) is displayed. The button also has the alternative function of being used to confirm selectable options as displayed in the various main menu sub-function screens and Manual duty entry screens etc (as explained throughout the manual). Finally, the Enter button can be used to acknowledge and clear warning messages.

4.3 Cancel Button

The Cancel button is used for returning to the main menu and driving mode screens.

4.4 Up / Down Buttons

The Up / Down buttons are used to scroll through the various menu options or to increment or decrement displayed values e.g. hours.

4.5 Smartcard Drawers

The Driver (left hand side) and Crew (right hand side) smartcard drawers are used to insert (or remove) smartcards into a VU, as explained in *section 4.1.2 Smartcard Eject Function*.

4.6 Paper Cassette

The paper cassette is used to house the paper roll. The paper cassette should remain closed at all times except when fitting a new paper roll. When taking a printout, the paper will emerge from the slot at the bottom of the cassette and consequently the slot must be kept free from obstructions.

4.6.1 Printer Paper Insertion

To replace the printer paper the entire paper cassette has to first be removed from its compartment. The cassette can be removed as shown and described in Figure 3.



1. Gently press the fascia in the middle near the top of the VU.



2. This will result in the fascia tilting outwards at the bottom.



3. Hold the fascia at the bottom where it is tilting outwards.



4. Gently pull the fascia/mechanism forward out of the VU.

Figure 3 Paper Cassette Removal

The printer paper roll can then be placed in the removed paper cassette. The paper should be fitted such that the paper comes up from the cassette (nearest the front fascia) and then round the back of the cassette, over the paper roller at the rear of the paper cassette. Finally the paper should be fed underneath the paper

cassette as shown in Figure 4. The paper cassette should then be carefully re-inserted into the VU compartment and gently pushed in the middle of the paper cassette fascia until it latches into the main unit.

Note: The printer paper used must only be a Stoneridge approved type (see Appendix 5 - Printer Spare Parts for details).

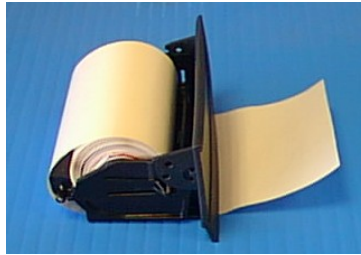


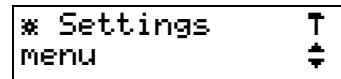
Figure 4 Printer Paper Orientation

4.7 Display

The display area of the fascia provides indication of all information that an operator will require to interface with the VU. The individual screens are described at relevant parts throughout the manual. A full listing of the display symbols and some display symbol combinations are listed in *Appendix 1 - VU Display Symbols*.

5 Settings Menu

The settings menu is used for setting the VU clock (adjustment of UTC and setting local time), to invert the display or to carry out VU internal tests. It should be noted that Settings menu interaction is identical regardless of which mode of operation the VU is in. The Settings menu can be accessed from any of the 'Driving' display screens (see *Appendix 4 - Display Screens Selectable Whilst 'Driving'* for details). Initially press the 'enter' button to access the 'Main Menu'. The 'up' or 'down' buttons should be pressed to scroll through the main menu functions until the 'Settings' sub-menu screen is displayed as shown. Press the 'enter' button again to access the 'Settings' sub-menu and press the 'up' or 'down' buttons to scroll through the list of settings options as follows:



- “* Settings Local Time” - this is used to adjust the VU local offset time.
- “* Settings UTC” - this is used to adjust the VU UTC time.
- “* Settings Invert display” - this is used to invert the VU display.
- “* Settings Built-in test” - this is used to check the functionality of different parts of a VU.

Once the required settings option is shown on the bottom line, press the 'enter' button once more to select the required option. If the wrong sub-menu is entered, press the 'cancel' button to go to the previous menu.

5.1 UTC Time and Local Time

All VUs use Universal Time Coordinated (UTC) as their master reference time. UTC is an incremental count of the number of elapsed seconds since 1st January 1970, and is approximately equivalent to Greenwich Mean Time. UTC time does **not** change due to seasonal adjustment. A local time may also be shown on the VU and this may be adjusted in ±30 minute offsets up to a maximum of ±12 hours from the UTC time. It should be noted that **all** driving event times stored are UTC times - setting a local time on the VU is for display purposes only.

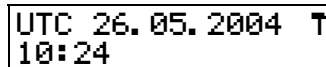
5.1.1 Adjusting VU UTC Time

A 'Normal Operation' VU user (i.e., with a valid driver smartcard inserted) can alter the VU UTC time by a magnitude of ± 1 minute per 7day period, however a valid workshop cardholder can alter a VUs' UTC time by any amount.

Notes:

1. For alterations greater than ± 1 minute per week the VU **must** be in calibration mode (i.e. valid Workshop card under PIN control inserted) and external programming equipment is also required.
2. UTC time adjustments are restricted to within the time validity limits of the VU inserted Workshop card.
3. If the VU UTC time becomes inaccurate by a magnitude of greater than 20 minutes, then the VU should be recalibrated.

To modify UTC time using the VU manual entry method, enter the UTC sub-menu via the main menu/settings sub-menu as described in *section 5 Settings Menu*. With the UTC date/time displayed as shown opposite, press the 'up' or 'down' buttons to increment or decrement the UTC time.



Note: using this method by ± 1 minute per 7-day period only - if the UTC time has already been changed within the previous 7 days then no adjustment will be possible and the display will stay at the 'settings menu / UTC option' display screen.

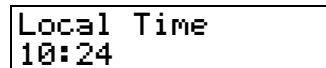
Press the 'enter' button to accept the new UTC time or the 'cancel' button to leave the UTC time at its original setting.

For each time adjustment, following data are recorded in the VU;

- Date and time, old value,
- Date and time, new value,
- Workshop name and address,
- Workshop card number, card issuing Member State and card expiry date.

5.1.2 Setting VU Local Time

To set the local time, enter the 'Local Time' sub-menu via the main menu/settings sub-menu as described in *section 5 Settings Menu*. The 'Local Time' sub-menu display will then be similar to that shown opposite. To adjust the local 'offset' time, press the 'up' or 'down' buttons respectively to increment or decrement the local 'offset' time.

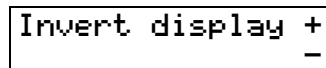


Note: increments/decrements are in ± 30 minute steps only up to a maximum of ± 12 Hours variance from the UTC time.

Press the 'enter' button to accept the new local 'offset' time or the 'cancel' button to exit without changing the local time.

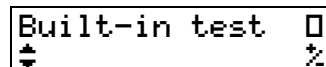
5.2 Inverting the Display






The settings menu can also be used to set a positive display (dark characters on a light coloured background) or a negative display (light coloured characters on a dark background). The display can be adjusted in this manner using the 'Invert Display' option from the Settings sub-menu. Enter the 'Invert Display' sub-menu via the main menu/settings sub-menu as described in *section 5 Settings Menu*. The 'Invert Display' sub-menu display will be as shown opposite. Press the 'up' or 'down' buttons to highlight either the '+' option for a positive display or the '-' option for a negative display. When the required display option is highlighted, press the 'enter' button again to select the display setting or press the 'cancel' button to exit without changing from the previous display setting.



5.3 Built-In Test

The settings menu can also be used to access the 'Built-in Test' sub-menu and this can be used to check the functionality of different parts of a VU. The 'Built-in Test' sub-menu can be accessed via the main menu/settings sub-menu as described in *section 5 Settings Menu*. The 'Built-In Test' sub-menu display will be as shown opposite. Press the 'up' or 'down' buttons to select the sub-functions available with the required sub-function pictogram highlighted at the right hand side of the display. The functions available are as follows:



Display Pictogram	Test Type	Description
	Display Test	This is used to test the VU display
	Invert Display Test	This is used test the inversion of the VU display.
	Printer Test	This is used to print a test printout.
	Keypad Test	This is used to check the operation of the VU buttons.
	Smartcard Test	This is used to check VU inserted smartcards.

A fuller description of the built-in test sub-functions is included in *Appendix 7 - Troubleshooting*.

6 Inserting and Removing Smartcards

This section describes the process of inserting and removing smartcards from a VU.

Note: Both a workshop card and associated PIN code is needed to identify and authenticate workshop card holder before VU is entering calibration mode

6.1 Inserting a Card

Figure 5 shows a flow chart of the stages involved in inserting a smartcard in a VU.

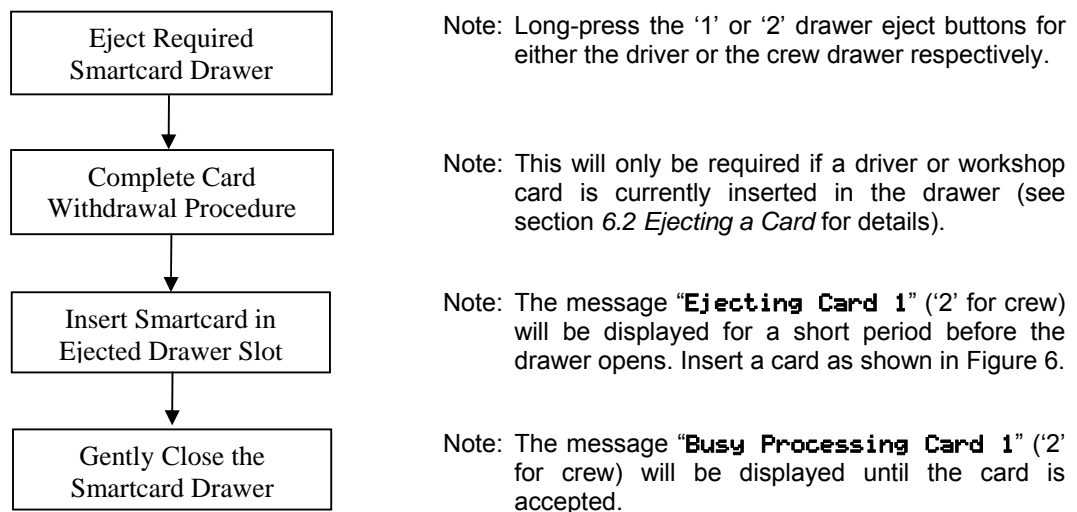


Figure 5 Flow Chart of Smartcard Insertion Procedure

Note: If the message **"x1z*Unable to open slot"** is displayed then this means the drawer cannot be opened by the VU – acknowledge and clear the warning (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and retry opening the drawer. If a drawer repeatedly fails to open the VU must be decommissioned. For information on how to retrieve cards from drawers that will not open using the normal eject procedure please see *Appendix 7 - Troubleshooting, section (b) Opening the Smartcard Drawers With No Power or Whilst Disconnected*.

With the card drawer open, place the card in the drawer with the smartcard chip towards the rear of the drawer and facing upwards as shown in Figure 6.



Figure 6 Smartcard Insertion in Drawer

If a card is rejected by a VU the pictogram message “! Insertion of non-valid card” will be displayed to indicate that the card is invalid. The warning should be acknowledged and cleared (as described in section 14 VU Warnings (Events and Faults Conditions)) and the smartcard should be ejected. The VU and card should be checked if necessary to determine which is faulty. If the card is faulty, a new card must be applied for and the relevant authority contacted for advice (see Appendix 6 - National Enforcement Agencies). If the VU is faulty it must be decommissioned.

If the inserted card is a Workshop card, the display will be as shown. The security PIN code associated with the Workshop card must then be input. The PIN code may be input either by using the method described in section 6.1.1 VU Entry of PIN code, or by using programming equipment (e.g. a Stoneridge MKII Tachograph Programmer) that is interfaced to the VU front calibration connector located behind the paper cassette. If the wrong PIN code is entered, then the message “! *1 Card auth. failure” will be shown (Note: ‘2’ displayed if the card is inserted in the Crew drawer) to indicate that there has been a Workshop card authentication failure and the VU will not then enter the calibration mode of operation. In case of authentication failure the card should be ejected and then re-inserted and then the PIN authentication process repeated. Please note that **failure of PIN code entry 5 times consecutively would result in the Workshop card self-locking and becoming invalid for use**. Once the correct PIN code has been input and the card is accepted, the display will be as shown opposite. The message shown indicates that a valid Workshop card is inserted in slot 1 and along with the display of the card owners’ name, confirms the card has been validated.

1	PIN?
0	

1	Smith
	John

Note: correct entry of the valid PIN code is the **only** way to reset the Workshop card PIN code ‘retry’ counter.

6.1.1 VU Entry of PIN code

Entry of the Workshop card PIN code can be carried out manually using the VU front panel buttons. The PIN code will be between 4 and 8 characters and the character ‘↓’ is used to identify the end of the PIN code. Initially the display will be as shown opposite (Note: the character in the top left corner will be ‘2’ if the workshop card is in the Crew drawer). The left hand digit on the bottom row (i.e. the first character in the PIN code) will initially be ‘0’ as shown. The ‘up’ or ‘down’ buttons should be pressed to scroll through the list of characters until the correct character for the first digit of the PIN is displayed. Short press the ‘enter’ button to accept the first digit. When the first digit is accepted a ‘*’ will be placed instead of the first PIN character and the next PIN

1	PIN?
0	

digit will then initially be shown as '0'. The remaining characters of the PIN code should then be accepted in turn using the 'up', 'down' and 'enter' buttons as described for the first digit.

Please note that for digits 5 to 8 of the PIN code (if required) initially the '↓' character (i.e. the PIN termination character) will be shown rather than '0' as for digits 1 to 4. To check a PIN code digit, press the 'cancel' button to move to the left across the display and this will highlight each of the PIN code values in turn – use the 'up', 'down' and 'enter' buttons to modify a digit if required. When all of the digits of the PIN code have been accepted (by short pressing the 'enter' button after each digit in turn), the display will be similar to that shown (8 digit PIN in this case). Long-pressing the 'enter' button can then authenticate the PIN code.

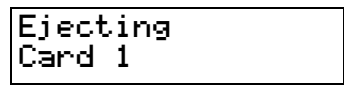


It should also be noted that if a PIN code were received from external programming equipment during the manual entry of PIN procedure then the manually input PIN would be ignored and replaced by the VU front connector input code.

6.2 Ejecting a Card

A card may be ejected from a VU at any time providing the vehicle is stationary and the VU is displaying either one of the main driving displays or is in the main menu. To eject a card from a VU, long-press the relevant Duty-change / smartcard eject button (i.e. '1' for Driver and '2' for Crew). The VU will need to know the location if the card is being ejected at the end of the daily drive period. Locations may be entered as described in *section 7.2.3 Manual Entry of Locations*. If a location is not required press the 'cancel' button.

The display will then be as shown opposite, to indicate the card ejection process is under way. After the card ejection sequence has been completed the slot will open automatically. If the VU displays the message "x1z*Unable to open slot" then this means the drawer cannot be opened by the VU – acknowledge and clear the warning (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and retry opening the drawer. For information on how to retrieve a card from a drawer that will not open through the usual method see *Appendix 7 - Troubleshooting (Note: Section (b) Opening the Smartcard Drawers With No Power or Whilst Disconnected)*. Repeated failure to open a drawer during normal operation will mean that the unit will require to be decommissioned.



If the drawer opens successfully, carefully remove the card from the drawer by popping the card out the slot from below using a finger (shown in Figure 7 below). Once the card has been removed, to close the drawer press gently on the front of the drawer slot until it latches.



Figure 7 Smartcard Removal From Drawer

7 Driving

This section describes the normal operation mode of a VU i.e., driving with a valid Workshop or Driver card inserted in the Driver ('1') drawer. For information on what to do if driving is required but there is no valid smart card inserted see *section 7.7 Driving Without a Valid Smartcard*. Figure 8 shows a flow chart of the stages involved in the normal driving operation of a VU.

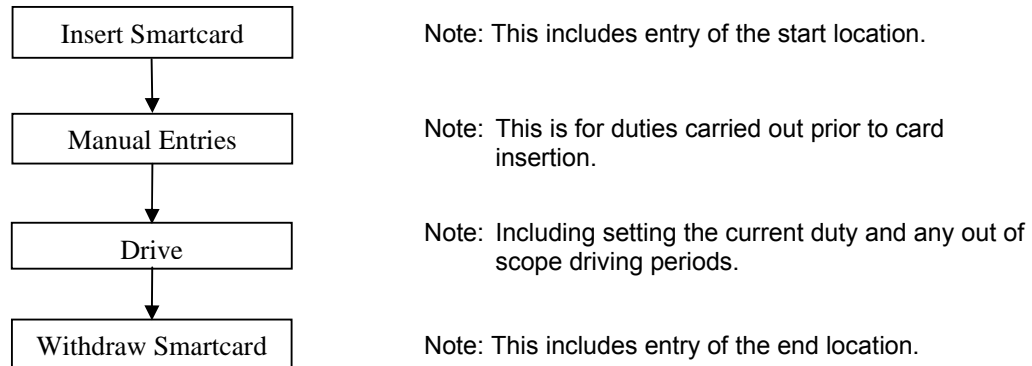



Figure 8 Flow Chart of Normal Driving Operation

Note: The purpose of the manual entry of driver duties is to provide a driver with the opportunity to store a record of any duties that have been carried since their smartcard was last withdrawn from a VU.

7.1 Card insertion for Driving

Before driving a driver must initially insert a valid Workshop or Driver card into the Driver ('1') smartcard drawer. The card should be inserted in the card drawer as described in *section 6.1 Inserting a Card*.

Once a card has been inserted, the VU will read the 'time of last withdrawal' from the card just inserted. The display will be as shown, with the last withdrawal date and time will be displayed on the bottom line. Manual entries for duties and location will then be required as described in *section 7.2 Manual Entries for Duties and Locations*.


 Last withdraw 09:15 15.04.04
--

It should be noted that if the last 'withdrawal time' was not stored correctly on the inserted card (due to a VU or Card error for example) then the pictogram message "**!0A1 Last session not closed ok**" will be shown (Note: '2' displayed if the card is inserted in the Crew drawer) to indicate that the last card session was not closed properly. The warning should be acknowledged and cleared (as described in *section 14 VU Warnings (Events and Faults Conditions)*) before continuing. If the warning is regularly displayed the VU/Card system should be checked for faults. If the card is faulty, a new card must be applied for and the relevant authority contacted for advice (see *Appendix 6 - National Enforcement Agencies*). If the VU is faulty it must be decommissioned. The VU will then automatically make the card insertion time to be the start of a new daily work period and there will be no requirement for manual duty entries only for the start location as described in *section 7.2.3 Manual Entry of Locations*.

7.2 Manual Entries for Duties and Locations

After a valid workshop or driver smartcard has been inserted correctly and it has been verified by the VU, with the 'time of last withdrawal' displayed the next stage is to manually input any duties that have been carried out by the card owner since the card was last withdrawn. Press the 'up', 'down', 'enter' or 'cancel' buttons to continue.

The display will then be similar to that shown opposite. The top line pictogram is asking the question "is this a continuation of the current daily work period?". There are three options to continue: the first two are to press the 'up' or 'down' buttons to highlight either "✓" for 'yes' or "*" for 'no' and then press the 'enter' button to

 Cont. day? ✓ 09:15 15.04.04 *


accept either the 'yes' option for a continuation of the current daily work period (see *section 7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period*) or the 'no' option for a new daily work period (see *section 7.2.2 Manual Entry of Duties – New Daily Work Period*). The third option is to short press the 'cancel' button if the card insertion is for a new daily work period but no manual duty entries are required and then to proceed by entering the start location as described in *section 7.2.3 Manual Entry of Locations*.



Please note that the manual duty entry procedure will be automatically terminated if any of the following conditions are met (Note: any manual duty entries input up to the point of when the manual entry procedure is cancelled **will be stored**):



1. If the vehicle begins to move;
2. If a smartcard is inserted or removed;
3. If there is no user interaction with the VU for more than 1 minute;
4. If there is a long press of the cancel button.



7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period



Note: All entries of time must be UTC time.

If the 'continuation of daily work period' option was accepted from the previous section, then the process for the manual entry of duties is initiated. It should be noted however that if the last card withdrawal was more than 24 Hours ago, the warning message will ">24h last card withdrawal >24h" be displayed. When the warning is acknowledged (as described in *section 14 VU Warnings (Events and Faults Conditions)*), the VU will automatically register the card insertion as part of a new daily work period and the VU will continue as described in *section 7.2.2 Manual Entry of Duties – New Daily Work Period*.

If the last card withdrawal time was less than 24 Hours previously, the cardholder must then manually enter any duties done between the 'last card withdrawal' and 'card insertion' times. Initially the display will be similar to that shown opposite - Manual Entry 1 (M' in top right corner) for Driver '1' is shown: the current duty is rest (i.e., 'H') and the start time/date of the duty is also shown (Note: initially the same time/date as when the card was last withdrawn). The duty symbol should be highlighted - press the 'up' or 'down' buttons to change the duty until the correct duty is displayed (i.e. * (work),  (available) or H (rest)) and then press the 'enter' button to confirm the displayed duty. The start time/date of the duty then has to be confirmed. Press the 'enter' button to select each of the digits of the start time/date in turn. Use the 'up' and 'down' buttons to change the highlighted digit if it is required to be changed or press the 'cancel' button to move back to alter a previous value.

1H 	 M
13:15	19.04.04

The manual entry of the duty end time must then be completed. The display will then be similar to that shown opposite. The 'duty end' time is shown on line 2 and initially defaults to the card insertion time. Again press the 'enter' button to select each of the digits of the duty end time/date in turn, using the 'up' and 'down' buttons to change the highlighted digit if it is required to be changed or press the 'cancel' button to move back to re-edit a value. If the duty end 'time/date' is **not** the card insertion time, then when the end time/date is accepted, the display will automatically update for the manual entry of the next duty. The Manual Duty Counter (top right corner) will be incremented (i.e. M' then M' etc) and the start 'time/date' will be the same as the end time for the previous duty. The next duty and the start and end time/date for the next manual duty entry have to be confirmed using the same method as above. Please note that only up to a maximum of 16 manual duty entries is possible, attempting to enter more than this will result in the warning message "M.....! Memory Full" being displayed. The warning should be acknowledged and cleared (as described in *section 14 VU Warnings (Events and Faults Conditions)*) before continuing.

1H 	 M
13:15	19.04.04

This process of manually entering driver duties has to be repeated for all duties up to the card insertion time. When the last manual duty entry has been confirmed (i.e., the end time of the duty is the card insertion time or the number of manual duties entered is 16) then the opportunity to check or modify the manual entry of duties will be given as described in the next section.

7.2.1.1 Manual Entry of Duties – Modification of Entries

After completing the manual entry of duties, initially the display will be as shown opposite. The VU is asking “Modify Manual Duty Entries? Yes/no” - press the ‘up’ or ‘down’ buttons to toggle between the “✓” (yes) and “*” (no) options. In order to accept the current manually input duties, press the ‘enter’ button with the “*” option highlighted. The message “**Activities validated**” will be displayed to indicate that the manually input activities have been validated and stored.

Modify	✓
Entries	*

Similarly, to check or to modify the manual duty entries, press the ‘enter’ button with the “✓” option highlighted. The display will change to one similar to that shown opposite with the start time/date of the first stored duty displayed. The up/down arrowheads in the top right corner next to the manual entry number indicate that the ‘duty edit mode’ is active. The ‘up’ and ‘down’ buttons can be pressed to cycle through the stored manual duty entries (Note: the Manual Duty Counter in the top right corner will increment/decrement as the ‘up’ or ‘down’ buttons are pressed). If the displayed Manual duty entry has to be changed, short press the ‘enter’ button and modify the entry in the same manner as described in *section 7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period*. Please note that any time overlaps will be automatically adjusted by the VU.

140+	01M
12:25	19.04.04

It is also possible to delete an unwanted manual duty entry or to add a previously missed manual duty entry. With the duty to be deleted displayed or the position of the duty to be added displayed, long press the ‘enter’ button. The display will then be similar to that shown opposite - in this case the duty entry is number 2. To delete this entry press the ‘enter’ button with the ‘-’ option highlighted or to add a new ‘02’ entry (assuming that less than 16 duties are currently entered) press the ‘enter’ button with the ‘+’ option highlighted (Note: press the ‘up’ or ‘down’ buttons to toggle between ‘+’ and ‘-’ options). If a duty entry is added (Note: use the same method for duty entry as described in *section 7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period*) then this may create a time overlap between duty entries and the VU will then automatically adjust to ensure no time overlap occurs.

02M Add or	+
delete entry	-

Once all of the Manual Duty entries have been checked/alterd, press the ‘cancel’ button to return to the ‘Modify Manual Duty Entries? Yes/No’ screen previously described above, and then select the no (‘*’) option to validate the manual entry of duties.

Note: the message “**Activities validated**” will be displayed to confirm validation.

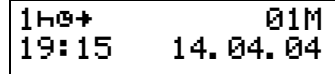
7.2.2 Manual Entry of Duties – New Daily Work Period

Continuing from *section 7.2 Manual Entries for Duties and Locations*, where the ‘no’ option was selected to indicate that the recent card insertion was for a new daily work period, initially the display will be as shown. The VU is displaying the time of the last card withdrawal and needs to know if the end time of the previous daily work period is the same as the displayed time. If it is the same, then only manual duty entries for the new daily work period are required. The ‘up’ or ‘down’ buttons should be pressed to highlight the ‘yes’ option (“✓”) and then the ‘enter’ button should be pressed to select the option. Otherwise, manual entry of duties will be required for the period up to the actual end of the previous daily work period and also for the period from the start of the new daily work period up to the card insertion time. In this case, the ‘no’ option (“*”) should be selected by pressing the ‘enter’ button when the option is highlighted.

18? Last work?	✓
18:24 14.04.04	*

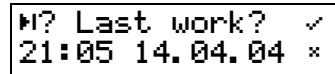
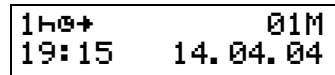
7.2.2.1 Manual Entry of Duties – New Daily Start Time to Present time Only

Continuing from *section 7.2.2 Manual Entry of Duties – New Daily Work Period*, where the ‘yes’ option was selected because the last card withdrawal time and the end of the previous daily work period were the same. Initially the location at the end of the previous daily work period will have to input (see *section 7.2.3 Manual Entry of Locations* on how to enter locations) unless the location was previously entered at the time of last card withdrawal. The user will then have to manually input duties for the period from the start of the new daily work period to the card insertion time and initially the display will be similar to that shown (Note: Manual Entry 1 - ‘01M’ in top right corner). The time shown will be the start time for the first duty to be entered. The user must then manually input the duties carried out until the card insertion time in a similar manner to that described in *section 7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period* (Note: a maximum of 16 manual duty entries only is allowed). Once the duties have been entered up to the card insertion time, the location for the start of the new daily work period must be entered. Checking or modifying the manual entry of the duties just entered can then be carried out in a similar manner to that described in *section 7.2.1.1 Manual Entry of Duties – Modification of Entries*.

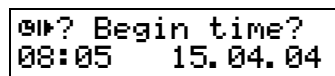


7.2.2.2 Manual Entry of Duties – Last Card Withdrawal to Daily Work Period End & New Daily Start Time to Card Insertion Time

Continuing from *section 7.2.2 Manual Entry of Duties – New Daily Work Period*, where the ‘no’ option was selected because the last card withdrawal time and the end of the previous daily work period are **not** the same. Manual entry of duties will be required for the period up to the actual end of the previous daily work period and also for the period from the start of the new daily work period up to the card insertion time. Initially the user will have to manually input duties for the period from the last card withdrawal time until the end of the previous daily work period. The display will be similar to that shown (Note: Manual Entry 1 - ‘01M’ in top right corner) and the time shown will be the last card withdrawal time. The user must then manually input the duties carried out until the end of the previous daily work period in a similar manner to that described in *section 7.2.1 Manual Entry of Duties – Continuation of Current Daily Work Period* (Note: a maximum of 8 manual duty entries only is allowed up to the end of the previous daily work period). After each manual duty entry the VU needs to know if the duty was the end of the previous daily work period. The display will be similar to that shown opposite. If the time shown was the end of the previous daily work period, press the ‘up’ or ‘down’ buttons to highlight the ‘yes’ option (“✓”) and then press the ‘enter’ button to accept. Otherwise highlight the ‘no’ option (“*”) and press the ‘enter’ button to input the next manual duty. Once all of the duties up to the end of the previous daily work period (8 maximum) have been input, then the end location must be entered, as described in *section 7.2.3 Manual Entry of Locations*.



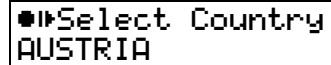
The user must then input information about the new daily work period. Initially the VU needs to know what the start time of the new daily work period was. The display will be similar to that shown opposite and the VU is asking “What is the start time for the new daily work period?”. Adjust the time/date on the second line until it shows the actual start of the new daily work period and press the ‘enter’ button to confirm this. The location for the start of the new daily work period should then be entered as described below. The user must then enter duties from the start of the new daily work period up to the card insertion time in a similar manner to that described above, although it should be noted that a maximum of 16 duty entries are allowed **including** any duties just entered up to the end of the previous daily work period.



It should again be noted that once all the duties have been entered up to the card insertion time, checking or modifying of the manual entry of the duties can be carried out in a similar manner to that described in *section 7.2.1.1 Manual Entry of Duties – Modification of Entries*.

7.2.3 Manual Entry of Locations

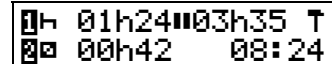
The location at the start and the end of each daily work period must be entered into the VU. These are prompted for automatically each time a smartcard is ejected or when it is inserted as part of the procedure described in *section 7.2 Manual Entries for Duties and Locations*. It should also be noted however that the Start or End location for a daily work period could be entered manually at any time whilst not driving. To do this, enter the main menu by pressing the 'enter' button whilst in one the driving mode displays (as described in *section 7.5 Alternative Driving Displays*). Press the 'up' or 'down' buttons until the display shows either "●▶ **Begin place**" or "▶● **End place**" for the Start or the End location respectively and then press the 'enter' button again. The display for the 'start of daily work period' location will then be as shown opposite. A full list of countries is shown in *Appendix 2 - VU Location Countries/Regions*, and the user should press the 'up' or 'down' buttons to scroll through the list of countries until the required country is displayed – press the 'enter' button to set the start of daily work period location country. If the chosen country is Spain then a region must also be entered. The display will then be as shown opposite. The full list of Spanish regions is also shown in *Appendix 2* and the user should press the 'up' or 'down' buttons to scroll through the list of Spanish regions until the required region is displayed – press the 'enter' button to set the start of daily work period location Spanish region.




The process for entering 'end of daily work period' location countries (and Spanish regions if the location country is Spain) is the same as that described for the 'start location' above except that the 'end of daily work period' location pictograms ("▶●") will be displayed instead of the 'start of daily' location pictograms ("●▶").

7.3 Standard 'Driving' Display

Once the manual entry of driver duties has been validated and the 'start of daily work period' location input, the display will change to show the standard 'Driving' display, which will be similar to that shown opposite. The top line relates to the driver and shows the duration of the current activity (left hand side) and the cumulative break time (right hand side). The right hand corner of the top line shows the current mode of operation of the VU (i.e. "T" for Calibration mode assuming a Workshop card is inserted). If the vehicle starts to move the current activity automatically changes to Drive. When the vehicle is stationary the driver must select the current duty as described in the next section. The second line initially shows the current activity and time for the crew (42 minutes 'available' in this case) and then has to the right hand side of the display the current local offset time in 24-hour format.



7.4 Duty Setting

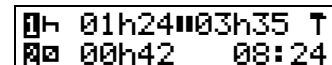
When a vehicle is stationary there are three Driver Duty types that can be selected, with the respective legends ✖, ◻ and ◻. The legends are used to indicate that the Driver (or Crew) is in one of the following activity modes, which correspond with the activities defined in the relevant EU regulation:

✖ indicates **work** – used to record non-driving active work (such as loading a vehicle etc.)

◻ indicates **available** – used to record time when a Driver is waiting to start driving (such as waiting for passengers to arrive or for paperwork to be completed etc.) and to record time spent travelling as Crew in a moving vehicle.

◻ identifies **break or rest**.

In order to change the currently selected Driver duty, the vehicle must be **stationary** and one of the main menu or standard driving displays must be active. To alter the driver duty, initially press the '1' button once (do not press and hold the button as this will cause the inserted card to eject). After pressing the button, the display will change to the standard driving display as shown opposite (Note: the 'speed/odo/time' display will remain unchanged). The currently selected driver duty is shown in the top left corner of the display and is represented by one of the three symbols listed above. Pressing the '1' Driver Duty-change button repeatedly will result in the duty symbol cycling through the three duty options until the



desired duty option is displayed. The process for changing the Crew duty is the same as that for the Driver except that the '2' Crew Duty-change button should be pressed to alter the Crew duty and the duty symbol is shown on the second line instead.

Note: Whilst a vehicle is moving, Crew can select work as their duty but **not** rest.

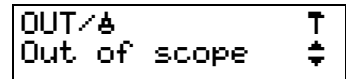
Please note that when a vehicle stops moving after being driven, the Driver duty mode **automatically** changes to 'work' and the Crew duty mode will remain at 'available'. The 'rest' and 'available' duty modes for the Driver and the 'rest' and 'work' duty modes for the Crew **must** all be selected explicitly. (Note: if a vehicle begins to move again after less than 1 minute then the duty modes selected will not be stored as a driver event).

7.5 Alternative Driving Displays

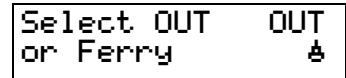
Once a vehicle starts to move the driver duty automatically changes to 'Drive' and the display will usually be as shown in *section 7.3 Standard 'Driving' Display*. If the 'Standard Driving Display' is not shown, press the 'cancel' button to return to it. There are 4 other displays that may be selected whilst driving, using the 'up' or 'down' buttons to scroll through the screens. For a full description of the alternative screens see *Appendix 4 - Display Screens Selectable Whilst 'Driving'*. Whilst driving it is possible that driver warnings will be periodically displayed – please see *section 14 VU Warnings (Events and Faults Conditions)* for a full list of possible warnings and details of how to acknowledge and clear warning messages.

7.5.1 Out of Scope Driving

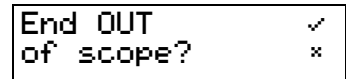
If it is required to drive for some period that is out of scope then the 'Out-of-Scope' mode **must** be selected before starting to drive. To select the 'Out of Scope' mode, first enter the main menu by pressing the 'enter' button whilst displaying one of the displays described in *Appendix 4 - Display Screens Selectable Whilst 'Driving'*. Once in the main menu press the 'up' or 'down' buttons until the 'Out of Scope/Ferry' option is displayed, as shown opposite.



Press the 'enter' button to enter the 'Out of Scope/Ferry' sub-menu and the display will then be as shown. Press the 'up' or 'down' buttons until the 'Out' option is highlighted (for 'Out of Scope' mode) and press the 'enter' button to enable the 'Out of Scope' mode or the 'cancel' button to exit without enabling 'Out of Scope'. Once the 'Out of Scope' mode is enabled, this can be identified by a small 'OUT' being displayed in the top left corner of the standard driving display in place of the driver duty symbol.



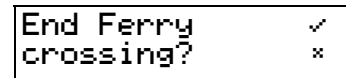
To disable the 'Out of Scope' mode first enter the 'Out of Scope/Ferry' sub-menu from the main menu as described above. The screen will then be as shown opposite. The VU is asking the question "End 'Out of Scope' Condition yes/no?" - press the 'up' or 'down' buttons to highlight the 'yes' ('✓') option and then the 'enter' button to end the 'Out of Scope' condition. Alternatively to keep the 'Out of Scope' condition active, press either the 'enter' button with the 'no' ('✗') option highlighted or the 'cancel' button. If the condition is disabled the small 'OUT' will no longer be displayed in the top left corner of the standard driving display.



7.5.2 Ferry/Train Crossing Mode Selection

This mode is selected by entering the 'Out of Scope/Ferry' sub-menu using the same method as described in *section 7.5.1 Out of Scope Driving* above. However in this case, the 'Ferry' option (identified by the '⚓' pictogram) should be highlighted using the 'up' or 'down' buttons before pressing the 'enter' button. Once enabled, the 'Ferry/Train Crossing' mode is identified by the 'Ferry' (⚓) symbol being displayed in the top left corner of the standard driving display in place of the driver duty symbol.

To disable the 'Ferry/Train Crossing' mode first enter the 'Out of Scope/Ferry' sub-menu from the main menu as described above. The screen will then be as shown opposite. The VU is asking the question "End 'Ferry/Crossing' Condition yes/no?" - press the 'up' or 'down' buttons to highlight the 'yes' ('✓') option and then the 'enter' button to end the 'Ferry Crossing' condition. Alternatively to keep the 'Ferry/Crossing' condition active, press either the 'enter' button with the 'no' ('✗') option highlighted or the 'cancel' button. If the condition is disabled, the small 'Ferry' (⚓) symbol will no longer be displayed in the top left corner of the standard driving display.

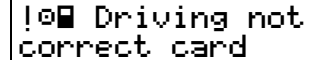


7.6 Ejecting a Card After Driving


Once driving has been completed, a smartcard can be ejected from the VU drawer as described in *section 6.2 Ejecting a Card*.

7.7 Driving Without a Valid Smartcard

If a vehicle begins to move and there is no card inserted, then a warning message will be displayed as shown to indicate that the vehicle is being driven without a valid workshop/driver card inserted. If a card is lost, stolen or



faulty, a temporary exemption to drive without a card **may** be granted by the national enforcement agency of the country in which driving is to be done. Drivers should contact national enforcement agencies **directly** (as indicated in *Appendix 6 - National Enforcement Agencies*) for clarification on this matter - **Drivers** are responsible for ensuring that they obey driving laws. Even though no workshop/driver card is inserted in the VU, the information relating to the Drivers' driving activity can still be obtained as the VU will still store a record of all driving activities. If a vehicle is moving, then inserting a valid workshop/driver card and closing the smartcard drawer will result in a warning message being displayed as shown to indicate that a card has been inserted whilst driving – acknowledge and clear the warning (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and continue. A record of the card being inserted whilst driving will be stored.



When driving without a valid workshop or driver smartcard, in order to obtain a record of details of driving activity for any 'driving without a card' period, a Driver can obtain printouts from the VU. The printout required from the VU for this is the "Daily Driver Activities from VU" printout and for information on how to obtain this printout please see *section 8.2 How to Initiate a Printout and How to Stop a Printout*. Note: printouts should be taken both before and after driving in order to obtain a complete record of driving without a card activity.

8 Printouts

A VU has the ability to supply various types of printout relating to the unit itself and to inserted smartcards (Driver or Workshop). The following sections will describe the types of printout available and how to obtain a printout and also show the layout of a sample printout.

Note: The ignition switch must be switched on to obtain a printout.

8.1 Types of Printout

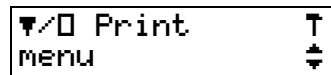
There are six types of printout available from a VU via the 'print/display' sub-menu as follows:

Displayed Message	Printout Type	Description
24h Print 24h card	Daily Driver Activities from Card	This is a list of all driver activities stored on a smartcard for a selected day.
24h Print 24h VU	Daily Driver Activities from VU	This is a list of all driver activities stored in a VU for a selected day. In the normal operational mode (valid Driver card inserted) only the 8 previous days activities can be accessed.
!x Print event card	Warnings from Card (Events and Faults)	This is a list of all Events and Faults stored on a driver smartcard.
!xA Print event VU	Warnings from VU (Events and Faults)	This is a list of all Events and Faults stored in a VU.
T Print technical data	Technical Data	This is a list of technical data applicable to a VU, e.g. Calibration factors VIN etc.
>> Print overspeeding	Overspeed Data	This is a list of over-speeding events. Note: an over-speeding event is recorded if a VU's set over-speed limit is exceeded for a period of greater than one minute.

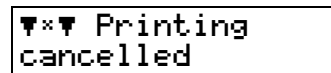
It should be noted that if the printer is not working or if no printer paper is available, then when required the data that would be printed on the above listed printouts could instead be shown on the VU display.

8.2 How to Initiate a Printout and How to Stop a Printout

Printouts are obtained via the "Print/Display" sub-menu and this can be accessed as follows. From any of the 'Driving' display screens (see *Appendix 4 - Display Screens Selectable Whilst 'Driving'* for details), press the 'Enter' button to access the 'Main Menu'. Press the 'up' or 'down' buttons to scroll through the main menu functions until the "Print/Display" sub-menu screen is displayed as shown opposite. Press the 'Enter' button again to enter the "Print/Display" sub-menu and use the 'up' or 'down' buttons to scroll through the list of six printout types (as listed in section 8.1 *Types of Printout*) until the required option is displayed on the bottom line. Press the 'Enter' button once more to select the required displayed 'print/display' option. If the wrong sub-menu is entered, press the 'Cancel' button to go to the previous menu.



Once a printout has been initiated it can only be stopped by long-pressing the 'cancel' button. A warning message will be displayed as shown to indicate that printing has been cancelled. It should be noted that if there is a problem with the printer then a warning message will be displayed, with the exact message displayed dependant on the problem. A full list of printing instructions for each printout type and a description of printer warning messages is included in *Appendix 3 - Details of Printing Routines*.



8.3 Sample Printout

A sample 'Daily Driver Activities From Card' printout is shown below in Figure 9. The printout initially consists of information on the cardholder and then information on the VU and the vehicle in which it was inserted. Then shown are details of the driver duties for the day and start and end odometer information.

▼ 20.07.2004 09:48 (UTC)	Date & time of printout
-----▼----- 24h▼	Type of print out - Daily Driver Activities from card
-----○----- ○ Andersson Richard	Cardholder's last name Cardholder's first name
○MS /ABCD6789012345 1 1 31.12.2037	Card issuing state & number Card expiry date.
-----▲----- ▲ 1234567890ABCDEFG VIN	Vehicle registration state & number
S /123 A 23F	VU Manufacturer VU Part Number
-----□----- □ Stoneridge Electronics SE5000 1 56789123	Workshop carrying out last calibration Workshop card number Date of last calibration
-----┆----- ┆ Johansson and Sons ┆MS /WSABC479328652 1 1 ┆ 15.01.2004	Date of Driver Activities, daily counter
-----○----- 19.07.2004 10	Period of unknown activity Period of activity entered manually Period of unknown activity
-----1----- ? 00:00 08:04 08h04 * 17:33 18:26 00h53 ? 18:26 23:59 05h33	Card inserted into slot 1 Vehicle Card was inserted into Vehicle odometer value at card insertion Activities whilst card was inserted
-----1----- ▲ S /123 A 23F 97 206 km	h = Rest (Note: rest periods more that 1 hour are identified with "**") □ = Available * = Work ○ = Drive
○ 08:04 11:00 02h56 h 11:00 14:39 03h39 * ○ 14:39 15:32 00h53 □ 15:32 15:53 00h53 h 15:53 17:10 01h17 * ○ 17:10 17:15 00h05 h 17:15 17:29 00h14 ○ 17:29 17:33 00h04 97 716 km 510 km	Vehicle odometer value at card removal, distance travelled

Figure 9 Sample Printout

9 Installation of a Digital Tachograph System

This section is concerned with the installation of a vehicles' Digital Tachograph system. The full fitting procedure consists of a number of different parts as listed in the steps that follow:

- Fitting the motion sensor and the sensor cable.
- Making mandatory electrical power connections and the required electrical signal connections.
- Mounting the VU.
- Connecting the sensor cable to the VU and pairing the VU with the sensor.
- Activating the VU.
- Calibrating and programming the VU.
- Sealing the Tachograph system.
- Completing and fitting an installation plaque.

Please note that the entire installation procedure (including fitment of the installation plaque) should be carried out before a vehicle may be driven on a road that is covered by EU drivers' hours legislation. It should also be noted that in the case of the fitment of a replacement unit, only certain parts of the full installation procedure would be required as necessary.

9.1 Pre-Installation VU Checks

Warning: Before the VU installation procedure can begin it must be ensured that the VU about to be installed is a genuine Stoneridge Electronics VU. Checking a number of things can ensure this as follows:

- The VU data label must show the correct Stoneridge VU type approval number, i.e. e5 ??.
- The tamper label (as shown in Figure 16) must be intact and have not been interfered with.
- The Stoneridge hologram must be correct (as shown in Figure 16).
- It must be ensured that there is no damage to or drill holes in the exterior casing of the VU so that a security breach attempt could be made.
- Any evidence of tampering with the VU seals and labels should be checked for.
- Any evidence of additional seals or labels should be checked for as they might cover drill holes.
- It must be checked that the heat seal is present.
- The label positioned as shown in the right hand diagram should be present.
- The hologram with the Stoneridge name should be present.

If any of the above conditions is not met the VU **must not** be installed.

Note: The VU package must not be tampered with at the delivery and the content of the package should be confirmed with Stoneridge Electronics, e.g. using AWB number or fax/telephone.

9.2 Fitment of a VU into a Vehicle

Before mounting the VU, initially the power, motion sensor and associated signal connections should be prepared in advance.

9.2.1 Motion Sensor and the Sensor Cable

The motion sensor must be a Stoneridge approved type of sensor that is directly fitted to the vehicle gearbox – please see the motion sensor manufacturers installation instructions for more details. It should be noted that a Stoneridge VU will only work with a Stoneridge approved motion sensor. Any existing motion sensor that was previously used with an analogue 'paper-chart' type Tachograph must be replaced before progressing.

If a motion sensor of the correct type is fitted the sensor cable can then be connected. Stoneridge sensor cables are available in various lengths to suit different types of vehicle. When fitting a sensor cable the cable assembly should be laid into the vehicle to ensure that the length is adequate bearing in mind the following criteria:

- Wherever possible the cable should be protected from possible damage by routing alongside other cables.
- Avoid loose connections, which may catch or drag.
- Do not clip or tie the cable to any moving parts.
- Ensure that the VU may be removed from the panel with the sensor cable still plugged in.
- Do not pull the cable tight at either end.
- With tilt cabs, care should be taken that the cable cannot be nipped, cut or stretched when the cab is tilted.
- Cable should be routed well away from sources of intense heat such as an exhaust manifold or turbocharger.

Having satisfied the above conditions, the cable assembly should be appropriately secured using cable ties.

The sensor is connected to socket B on the rear of the VU. For more details of the connections to a motion sensor see *Appendix 9 - Technical Data ((c) Rear Socket Connections)*.

9.2.2 VU Power Connections

Power is supplied to a VU through Rear socket A. It should be noted that all fuses used to protect a non-ADR type VU must be of an anti-surge type and the fuses must be positioned in such a way as to discourage illegal disconnection. For details of how to make power connections and to protect the ADR version of the Stoneridge VU see *section 16 Stoneridge ADR Digital Tachograph*.

A Stoneridge Power cable should be used to make the circuit shown below in Figure 10.

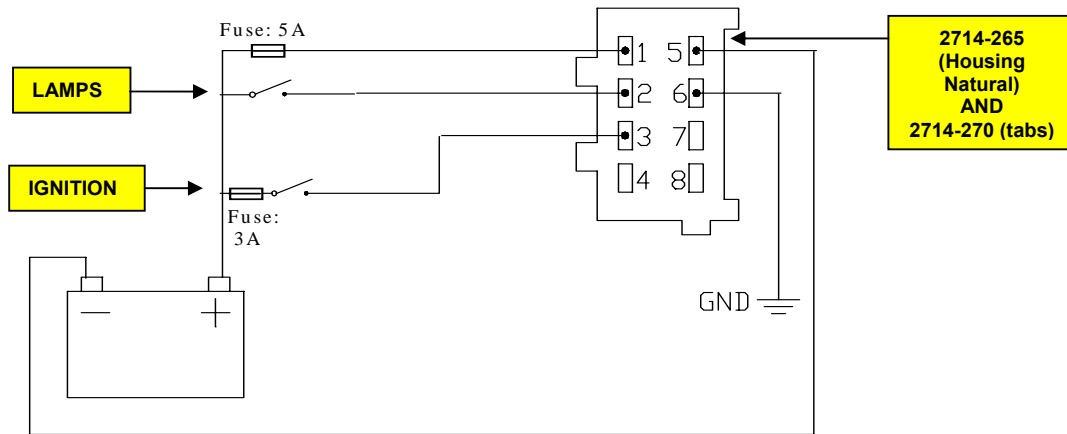


Figure 10 Connecting to the Vehicle Wiring System

The VU can be affected by line borne interference and current surges. The effects of these occurrences can be reduced by connecting the power and ground feeds directly to the battery and using a relay on the ignition feed as shown in Figure 11.

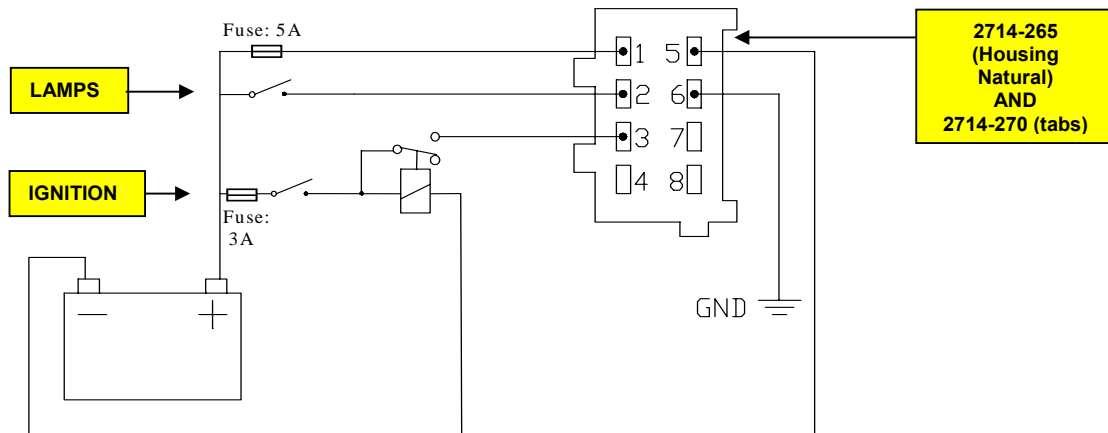


Figure 11 Connecting to the Vehicle Wiring System With Relay

Note: Line connections are to be avoided, in particular the “scotchlock” type. A connector can be used for making in-line connections if necessary.

On vehicles where an isolator switch (or battery master switch as it is also known) is required, the switch may be fitted in the positive line only (a), the negative line only (b) or with both switches (a) and (b) fitted as shown in Figure 12.

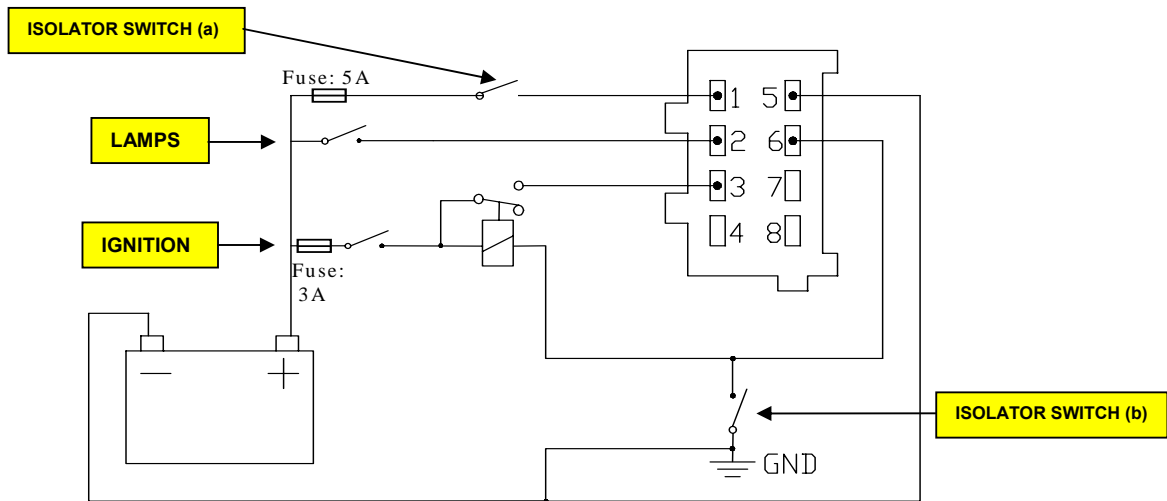


Figure 12 Vehicle Wiring with Battery Isolator Switch

9.2.3 VU Signal Connections

Various electrical signal connections to the VU rear sockets will be required, with the exact connections dependant on the Vehicle type. A description of all rear socket connections is included in *Appendix 9 - Technical Data (Section (c) Rear Socket Connections)*.

9.2.4 Mounting the VU

Since the Stoneridge VU conforms to the ISO 7736 standard for a radio enclosure, fitment of the VU is an easy procedure. The VU **must** be positioned in such a way as to allow a driver to view the display and also to access the necessary functions safely from their seat.

A VU Installation Kit is available to aid fitting the VU into a vehicle (for more information see *Appendix 8 - Stoneridge Electronics Aftermarket Contact Details*).

When installing a VU, first of all pull the wires through from the back of the cavity and insert the radio cage into the enclosure. It is very important that the wires are of a suitable length to allow the unit to be moved in and out of the slot when connected. Equally important is to allow the wires enough space at the rear of the unit so that it can sit in place without damaging the wires.

It is recommended that the VU be supported at the rear of the unit. Placing a rubber acorn onto the peg at the rear of the unit and using this to support the unit can achieve this. Alternatively a universal mounting strip and self-threading nut can be used to aid the support of the VU. One end of the mounting strip is placed over the VU rear peg and then secured with the self-threading nut screwed onto the peg. The other end of the strip can then be fixed to the vehicle to secure the rear of the VU.

When mounting a VU care must be taken to ensure no damage is done to the exterior casing.

9.2.5 Pairing the VU with a Motion Sensor

When a motion sensor is first connected to a powered Digital Tachograph VU it will not work correctly unless it has been paired with the VU. Pairing the sensor with the VU can only be done in the calibration mode of operation i.e., with a valid Workshop card inserted in the VU. Once the Workshop card is inserted and the correct workshop card security PIN number has been entered, then if a motion sensor is connected to the VU the VU/Sensor pairing process will occur automatically. When automatic pairing begins the VU display will be as shown. When the pairing process is completed the pictogram message “**↗A... ✓ Pairing complete**” will be displayed to indicate the pairing process is completed. If the automatic pairing of a VU/Sensor combination is not completed then the pictogram message “**↗A... * Pairing failed**” will be shown to indicate pairing failure. If pairing fails, the workshop card should be removed from the VU. The system connections should be checked for faults before the Workshop card is re-inserted until pairing is successful.



↗A...
Pairing

Notes:

1. Changing a motion sensor can only be done in the VU calibration mode of operation.
2. In cases where the VU has not previously been activated then the activation process will occur first as described in *section 9.3 Activating the VU for Use*.

9.2.6 Programming the VU with Vehicle Related Parameters

Once the physical installation of the VU into a vehicle is complete, then a number of vehicle related parameters (e.g. Vehicle Registration Number, Vehicle Identification Number, Registration Country – see *section 9.4 Calibration of a VU* for full details of parameters) require to be programmed into the VUs internal memory. Programming of the vehicle related parameters is achieved using a Tachograph Programmer (e.g. the Stoneridge MKII version). Connection of the Programmer to the VU is achieved via the VU front calibration/download connector (as shown in Figure 2 VU Download / Calibration Connector).

9.3 Activating the VU for Use

When a Stoneridge Digital Tachograph VU is manufactured it leaves the factory in a non-activated mode of operation. In the non-activated mode the unit is not fully operational – no data records will be stored in this mode and entry of calibration data is possible **without** a workshop card inserted in the VU.

Note: this allows pre-programming of VUs without the need for a valid Workshop card.

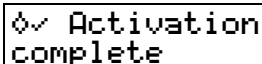
A non-activated VU can be identified when powered by the appearance of the activation symbol (“**⚡**”) in the top right corner of the display.

A non-activated VU is automatically activated by the first insertion of a valid Workshop card followed by entry of the cards’ valid security PIN number. The display will be as shown opposite. Activation should then be completed automatically unless the power to the unit is interrupted or the valid workshop card is removed.



⚡
Activation

The activation process causes certain VU parameters to be initialised (see *section 9.4 Calibration of a VU* for full details of parameters). It should be noted that the VU must detect and automatically pair with a motion sensor in order for the activation process to be completed. When the activation process is completed a message will be displayed as shown to indicate completion. If the automatic activation of a unit is not completed then the pictogram message “**⚡* Activation failed**” will be shown to indicate activation failure. If activation fails, the Workshop card should be removed from the VU. The system connections should be checked for faults before the Workshop card is re-inserted until activation is successful.



⚡✓ Activation
complete

Note: in calibration mode if no motion sensor is present the VU will continually attempt to pair with a motion sensor until the Workshop card is removed. The pictogram messages “**↗A... * Pairing failed**” and “**⚡* Activation failed**” will be displayed to indicate the pairing and activation failure.

9.4 Calibration of a VU

Calibration of a VU is a mandatory part of any inspection and should also take place after installation or after any repair that requires a VU system to be disconnected or the seal to be broken. In the non-activated mode, calibration parameter entry is possible to allow pre-programming of VUs prior to fitment without the need for valid workshop card ownership. Once a VU has been activated then calibration and programming of a VU can only be done in the calibration mode of operation.

There are a number of calibration parameters that are stored or updated in a VU by means of the calibration process as follows:

- The current UTC date and time.
- The odometer reading.
- The characteristic coefficient of the vehicle (W-factor) and the VU constant value (K-factor).
- The effective circumference of the vehicle drive wheels (L-factor) and the tyre size used on the drive wheels.
- The due date of the next calibration (2 years from current date).
- The speed limiting device setting.
- The vehicle registering country, the vehicle registration number (VRN) and the vehicle identification number (VIN).

Notes:

1. If the time is updated by less than 20 minutes then this does not constitute a calibration.
2. The K and W-factors must **both** be explicitly written into a Digital Tachograph VU.

When a calibration is carried out a record of the calibration is generated and stored in the VU. The contents of the record are as follows:

- The calibration purpose – this may be:
 1. At activation.
 2. The first calibration after activation.
 3. The first calibration of the VU in the current vehicle.
 4. Calibration as part of an inspection.
- The workshop name, address, card number and card expiry date.
- The VIN and VRN.
- The W, K and L-factors.
- The tyre size and speed limiting device setting.
- The odometer value.
- The UTC date and time.
- The date of next calibration (2 years from current date).

Similarly a calibration record is also generated and stored on the inserted valid workshop card (Note: the card in slot 1 if valid workshop cards are in both slots). The contents of the workshop card stored calibration records are as follows:

- A count of the total number of calibrations performed with the card.
- The calibration purpose (as described above).
- The VIN and VRN.
- The W, K and L-factors.
- The tyre size and speed limiting device setting.
- The odometer value.
- The UTC date and time.
- The date of next due calibration.
- The VU part number and serial number.
- The motion sensor serial number.
- A count of the number of calibrations performed since the workshop card stored calibration records were last downloaded.

The vehicle calibration parameters should be determined using approved methods, for instance a rolling road. These along with all the other parameters listed above require to be programmed into the VU. The method of programming is described in *section 9.2.6 Programming the VU with Vehicle Related Parameters*. The Tachograph programmer will give confirmation of the success or failure of programming the calibration parameters into a VU. If the programming procedure fails, the workshop card should be removed from the VU. The connections should be checked for faults before the Workshop card is re-inserted and an attempt to reprogram should be made. When in the calibration mode of operation it is possible to inject speed pulses into the VU via the Calibration/download front connector pin 4 (the Calibration I/O pin). This can be done to check the speed display by inputting speed pulses at a known rate. It should be noted however that whenever a vehicle begins to move, any speed pulses injected via the front connector will be ignored and any speed displayed or recorded will be derived from the true speed pulse signal coming from the motion sensor via the rear connector.

9.4.1 Checking Calibration Data

It should be noted that all VU calibration data **must** be checked for correctness following a VU calibration mode session. The Workshop card must first be ejected and then a "Print Technical Data" printout must be taken (see *section 8 Printouts* for more details) to confirm the correctness of the VU stored data. A Workshop is responsible for the correct entry of the vehicle parameters.

9.5 Sealing of a Digital Tachograph System

Sealing of the motion sensor at its connection to the gearbox is a necessity. This is to ensure the integrity of the signal from the vehicle (through the gearbox) to the VU. It should be noted that the sensor cable connections do not require to be sealed as the encrypted signal ensures that undetected tampering is not possible. The VU front programming connector does not require to be sealed. The installation plaque must be sealed unless it is of a type that cannot be removed without damaging it.

Sealing of the motion sensor may be achieved using the same methods as that used for analogue Tachograph systems i.e., by the use of sealing pliers and traditional seals. Authorised holders of valid Workshop cards must carry out resealing of Digital Tachograph systems. Please note that when a Digital Tachograph system is presented to a Tachograph Workshop with a broken seal, as well as inspecting, calibrating and resealing the Tachograph system, a report must be prepared and made available to the relevant authorities as to why the seal was broken.

Figure 13 shows an example of how to seal the motion sensor at the gearbox. However it should be noted that the actual sealing method used must be authorised by the relevant authorities (see *Appendix 6 - National Enforcement Agencies* for details). As shown in the diagram, the retaining nut for the motion sensor is cross-drilled so that it may be wired and sealed to a suitable drilled bolt securing the gearbox.

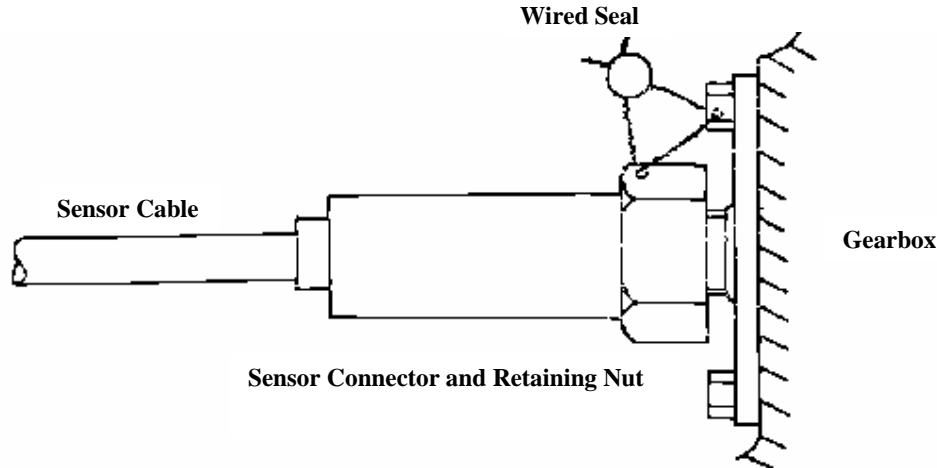


Figure 13 Sealing the Motion Sensor at the Gearbox

9.6 Installation Plaque Completion and Fitment

The final part of the Digital Tachograph system installation procedure is the completion and fitment of an installation plaque. If the plaque is a replacement, the old plaque should be removed first and the newly completed plaque should be placed in approximately the same position as the old one. If the plaque fitment is after the initial installation, then the plaque must be placed near the VU and must be clearly visible and easily accessible. An example installation plaque showing the type of information required is shown in Figure 14.


<u>Workshop Details</u>	<u>Calibration Details</u>	<u>Date Determined:</u>	
Name:	W=..... Imp/km	
Address:	K=.....Imp/km		
	L=.....mm	
	Tyre Size=.....		
	VIN=.....		

Figure 14 Example Installation Plaque

9.7 Removing the VU

Once fully mounted, a Stoneridge Digital Tachograph VU may be removed from its mounting cage via the four small holes that can be seen at the sides of the plastic front fascia, as indicated in Figure 15 below. To remove the unit, a pair of VU extraction tools (6350-023) should be inserted into the two pairs of holes, with the tools perpendicular to the VU. Once pushed in, both extraction tools should be pushed out sideways and then pulled at the same time. The tools will grip the unit and enable it to be pulled forward out of the cage.



Figure 15 Position of VU Removal Holes

10 Inspection of a Digital Tachograph System

10.1 Reasons for Inspection

Inspections of Digital Tachograph systems will be necessary due to a number of reasons. An inspection of a Digital Tachograph system must be carried out under the following circumstances:

- After any repair.
- If the motion sensor seal is broken.
- After any alteration to either the vehicles characteristic coefficient (W-factor) or the effective circumference of the drive wheels (L-factor).
- If the VU UTC clock time is inaccurate by more than 20 minutes.
- If the vehicle registration number (VRN) has changed.
- When it has been 2 years since the last system inspection.

10.2 Inspection Procedure

During an inspection it must be confirmed that the recording equipment functions correctly. The ability of the VU to store driver data on smartcards must be checked and it must also be determined that the unit operates to within maximum tolerances for both speed and distance. The VU type approval mark must be checked and it must be made sure that all system seals are intact. The tyre size and the actual circumference of the drive wheel tyres should also be checked, as should be the presence and content of the current installation plaque. A mandatory part of any inspection is to check the calibration of the recording equipment. A full description of the calibration procedure is given in *section 9.4 Calibration of a VU*.

As shown in Figure 16 VU must also be visually inspected. The following list must be checked as indicated on the diagrams:

1. It must be ensured that there is no damage to or drill holes in the entire exterior casing of the VU including rubber acorn, so that a security breach attempt could be made.
2. Any evidence of tampering with the VU seals and labels shall be checked for.
3. Any evidence of additional seals or labels shall be checked for as they might cover drill holes.
4. It must be checked that the heat seal is present.
5. The label positioned as shown in the right hand diagram shall be present and must be in one piece.
6. The hologram with the Stoneridge name and logotype shall be present.

Any unit that fails an inspection should be decommissioned and replaced with another unit.

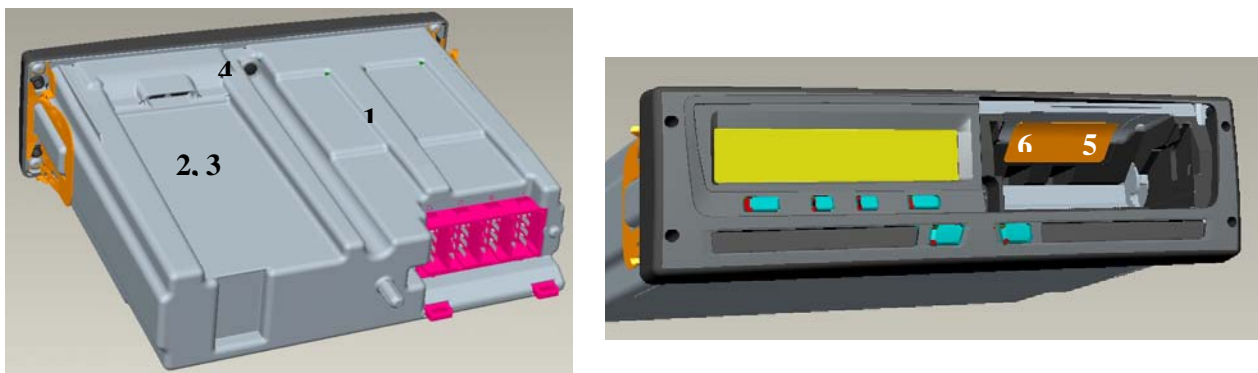


Figure 16 External Inspection of a VU

After each inspection a VU test certificate should be issued to the owner of the VU. Information on the certificate will include:

- The owner of the VU.
- The VU make, model and serial number.
- The VIN and VRN.
- The result of the inspection.
- The date of certificate issue.

11 Repair and Decommissioning of Vehicle Units

Due to Digital Tachograph system requirements the only allowable repair that can be carried out on a Stoneridge VU is the replacement of the paper cassette. Please note that a VU case must never be opened, as this would be a breach of Digital Tachograph security.

When it is not possible to repair a faulty VU, then the unit must be decommissioned and replaced with a new unit. Decommissioning a Digital Tachograph VU initially consists of removing it from the vehicle. Once removed, the **entire** contents of the VU memory must be downloaded (see *section 13 Workshop Downloading of Drivers Hours Data*) and stored in a secure data store following guidelines as set by the relevant authorities (see *Appendix 6 - National Enforcement Agencies* for contact details). If it is not possible to download data from a decommissioned VU then the relevant authorities should be contacted directly for advice.

If a faulty VU has smartcards stored in the drawer slots and these cannot be removed by the normal method of pressing the appropriate eject button, then please note that a smartcard can be removed from a unit with the **power removed**, as described in *Appendix 7 - Troubleshooting, part (b) Opening the Smartcard Drawers With No Power or Whilst Disconnected*.

The recycling of the VU shall be performed according to the guidelines of the respective member state.


12 Replacement of a VU

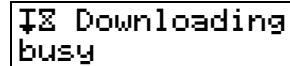

Certain Stoneridge VUs are vehicle manufacturer specific and consequently are not interchangeable between different makes of vehicle (for more information see *Appendix 8 - Stoneridge Electronics Aftermarket Contact Details*). The VU being replaced should be removed as described in *section 9.7 Removing the VU*, with the rear socket connectors being carefully disconnected. If the old VU is being removed because it is faulty then data stored in the VU must be downloaded and returned to the data owner. The replacement unit will be required to be put through the entire installation procedure as is described in *section 9 Installation of a Digital Tachograph System*.

13 Workshop Downloading of Drivers Hours Data

Downloading means the copying, together with a security digital signature, of a partial or a complete set of data that is stored in the memory of a vehicle unit or on a driver smartcard. The entire VU memory contents can be downloaded by a Workshop under the control of a valid Workshop card. All downloading of stored data from a VU or from a driver smartcard must be done when the vehicle is stationary and when the VU is in the calibration mode of operation.

The actual download of stored data from the VU memory (or an inserted card) will be done using approved models of dedicated download equipment. These tools must be compliant with the protocol as laid out in the legislative document 1360/2002 Annex 7. Communication between the VU and the download equipment will take place via the VU Calibration/Download front 6-way connector. Information on the actual method of data download should be found in the literature supplied with the dedicated download device.

When the actual download of the stored data begins a message will be displayed as shown opposite to indicate that the VU downloading process is active. When downloading is complete, a message will be displayed as shown to indicate this. If the download process is not completed then the VU display will show the pictogram-warning message “ **Downloading failed**” to indicate the download failure. If download fails, the workshop card should be removed from the VU. The connections and download equipment should be checked for faults before the Workshop card is re-inserted and a further attempt to download data made.

If a VU is faulty it should be decommissioned as described in *section 11 Repair and Decommissioning of Vehicle Units*. If the workshop card is faulty then a replacement card must be applied for and the relevant authority contacted for advice (see *Appendix 6 – National Enforcement Agencies*).





14 VU Warnings (Events and Faults Conditions)

A VU can detect a number of different Events and Fault conditions and these are described in the sub-sections that follow. Details of any Events and Faults that are detected are stored in the VU. A printout of the Events and Faults stored can be obtained as described in *section 8.2 How to Initiate a Printout and How to Stop a Printout*.

The VU will warn a user when it detects an event or fault condition. The warning will consist of a visual display message (see sections that follow for details of messages). Initially the user should press the ‘enter’ button to acknowledge the warning. Once a message is acknowledged, to clear the message the user must again press the ‘enter’ button. Please note that manufacturer specific warnings, i.e. with a reference number greater than 0x80, require only one ‘enter’ button press to acknowledge and clear the warning. It should also be noted that warnings of power-supply interruptions would be delayed until the power is restored. Finally, if the ignition switch is turned off then on again then any ‘still active’ warning messages will be re-displayed even although they had previously been acknowledged and cleared.

It should be noted that when certain of the warning messages listed below are displayed, the reason for the warning should be noted and appropriate action taken as described in the sections that follow.

14.1 General Events Warning Messages

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Insertion of a Non-valid Card	 Insertion of non-valid card	0x01	The card may be faulty, out of date or the wrong type. Eject card and check. See note 1 below also.
Card Conflict	 Card Conflict	0x02	This will occur either if workshop and driver cards <u>or</u> any combination of workshop, control and company cards are inserted in slots 1 and 2 at the same time. Eject one of the cards to stop the card conflict.
Time Overlap (Note: 2 displayed for slot 2)	 Time overlap	0x03	The smartcard just inserted has a last card withdrawal time that is later than the current VU UTC time. Check current VU UTC time is correct. Adjust VU UTC time and recalibrate VU if necessary (i.e. if more than 20 minutes inaccurate).
Driving Without an Appropriate Card	 Driving not correct card	0x04	A vehicle is in motion and there is no valid driver or workshop card inserted in the driver smartcard drawer. Stop driving and insert a valid Workshop or Driver card into the VU.

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Card Insertion While Driving	!C Card ins. while driving	0x05	A card has been inserted whilst a vehicle is in motion. If card is valid continue driving.
Last Card Session Not Correctly Closed (Note: 2 displayed for slot 2)	!C1 Last sess. not closed OK	0x06	The card was removed erroneously from the last VU in which it was inserted or the previous withdrawal of the card was not terminated correctly by the VU. Eject card and check. See note 1 below also.
Over Speeding	>> Over speeding	0x07	The vehicle has travelled faster than the set over-speed limit for 1 minute and the event will be stored. The vehicle speed must not increase above the speed limiter setting.
Power Supply Interruption	!P Power supply interruption	0x08	The VU supply voltage has dropped below the minimum limit for the correct operation of the VU. Check battery voltage and wiring. See note 3 below also.
Motion Data Error	!M Motion data error	0x09	The data from the vehicle motion sensor is erroneous. Check motion sensor operation and wiring – replace if necessary.

Notes:

1. If it can be clearly identified that a smartcard is faulty (either by checking that the suspected card is faulty in a number of different VUs or by checking if a suspected VU is faulty by trying other 'known good' cards in it), then a new card must be applied for and the relevant authority contacted for advice (see *Appendix 6 – National Enforcement Agencies*).
2. If a VU is found to be faulty or damaged beyond repair it must be decommissioned.
3. The reason for display might be known e.g. the message will be displayed if the battery is disconnected to enable welding to be carried out for example - a workshop card may be inserted prior to disconnection to prevent the disconnection of the supply being recorded as a VU event/fault. Repeated unknown display of this message will mean the VU must be decommissioned.

14.2 VU Related Security Breach Attempt Events Warning Messages

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
VU Motion Sensor Authentication Failure	!M* Sensor auth. failure	0x11	The VU does not recognise the motion sensor connected to it as the one it should be paired with. Re-Pairing of the VU & motion sensor should be carried out and the system retested. The sensor should be repaired or replaced if necessary.
VU Tachograph Card Authentication Failure (Note: 2 displayed for slot 2)	!C*1 Card auth. failure	0x12	The VU has identified that the card inserted has failed the security check. Message displayed also if the wrong Workshop card pin code is entered. Eject card and check. See note 1 also.
VU Unauthorised Change of Motion Sensor	!M* Unauth. change of sensor	0x13	The VU does not recognise the motion sensor connected to it as the correct type. Re-Pairing of the VU & motion sensor should be carried out and the system retested. The sensor should be repaired or replaced if necessary.

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
VU Card Data Input Integrity Error (Note: 2 displayed for slot 2)	!A←B*1 Card data integrity error	0x14	The data transferred from the smartcard to the VU memory has errors. Eject card and check. See note 1 below also.
VU Stored User Data Integrity Error	!A/A* Data integrity error	0x15	The user data stored in VU memory has errors. Check VU operation for errors.
VU Internal Data Transfer Error	!A→A* Int. data transfer error	0x16	Data transferred internal to the VU has errors. Check VU operation for errors.
VU Hardware Sabotage	!A*** Hardware sabotage	0x18	The VU has been tampered with. Inspect VU casing for damage etc. Check VU operation. Decommission if inspection fails.

Notes:

1. Where it can be clearly identified that a smartcard is faulty (either by checking that the suspected card is faulty in a number of different VUs or by checking if a suspected VU is faulty by trying other 'known good' cards in it), then a new card should be applied for and the relevant authority contacted for advice (see *Appendix 6 – National Enforcement Agencies*).
2. If a VU is found to be faulty or damaged beyond repair it must be decommissioned.

14.3 Sensor Related Security Breach Attempt Events Warning Messages

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Sensor No further details	!I? No further details	0x20	A sensor error of an unknown type has occurred. Check motion sensor operation and wiring – repair or replace if necessary.
Sensor Authentication Failure	!IA* Sensor Auth. failure	0x21	The motion sensor does not recognise the VU it is connected to as the one it should be paired with. Re-Pairing of the VU & motion sensor should be carried out and the system retested. The sensor should be repaired or replaced if necessary.
Sensor Stored Data Integrity Error	!I/I*Sensor data integrity error	0x22	The internal data in the motion sensor has errors. Check motion sensor operation and repair or replace if necessary.
Sensor Internal Data Transfer Error	!I→I*Sensor data transfer error	0x23	Data transferred internal to the motion sensor has errors. Check motion sensor operation and repair or replace if necessary.
Sensor Unauthorised Case Opening	!IZ* Sensor unauth. case open	0x24	The motion sensor has identified that its case has been opened. Check motion sensor operation and reseal if necessary. Repair or replace the sensor if faulty.
Sensor Hardware Sabotage	!I***Sensor hardware sab.	0x25	The motion sensor has been tampered with. Check motion sensor operation and reseal if necessary. Repair or replace the sensor if faulty.

Note: Repeated Sensor/VU authentication problems may mean that the VU is faulty. If this is the case the VU must be decommissioned.

14.4 Recording Equipment Faults Warning Messages

Message Description	Warning Message	Warning Reference	Reason For Occurring And Required Action To Be Taken
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		Number	
VU Internal Fault	xA VU internal error	0x31	The VU has detected an internal hardware fault during self-test. Check VU operation for errors.
Printer Fault	xv Printer fault	0x32	The VU has detected an internal fault during the printer test. Check printer operation. Check paper cassette and paper and replace if necessary. If the printer still fails the VU must be decommissioned.
Display Fault	x0 Display fault	0x33	The VU has detected an internal fault with the display. If the display is unreadable the VU must be decommissioned.
Downloading Fault	xI Downloading fault	0x34	The VU has detected an internal fault during the data download process. Check external download equipment and connections. If VU is the cause of repeated downloading failures the VU must be decommissioned.
Sensor Fault	xJ Sensor fault	0x35	The VU has detected a fault with the motion sensor. Check motion sensor operation and repair or replace if necessary.

Note: If a VU is found to be faulty beyond repair it must be decommissioned.

14.5 Card Faults Warning Messages

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Card Fault (driver slot)	I Card 1 fault	0x40	The card inserted in the driver smartcard drawer is faulty. Eject card and check. See note 1 below also.
Card Fault (crew slot)	I Card 2 fault	0x40	The card inserted in the crew smartcard drawer is faulty. Eject card and check. See note 1 below also.

Notes:

1. If a smartcard is faulty then a new card should be applied for and the relevant authority contacted for advice (see *Appendix 6 - National Enforcement Agencies*). If a VU rejects cards that are accepted by other units then the VU should be decommissioned.
2. Only "card fault" (reference number 0x40) is stored irrespective of which card is faulty.

14.6 Manufacturer Specific Events & Faults Warning Messages

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Quarter Left Reminder	>4½h? Quarter left reminder	0x81	The driver has 15 minutes of driving time left until they reach 4½ Hours of continuous driving time.
Time For Break Reminder	>4½h Time for break reminder	0x82	The driver must complete their 45-minute cumulative break following 4½ Hours of continuous driving.

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Unable to Open Slot 1 (Note: 2 displayed for slot 2)	x1z* Unable to open slot	0x83	The appropriate smartcard slot will not open. Check operation. If drawer will not eject the VU must be decommissioned.
Printing Complete	∇∇ Printing complete	0x84	The current printout has been completed successfully. Detach printout from VU as required.
Printing Cancelled	∇∇ Printing cancelled	0x85	The current printout has been cancelled.
Printing Stopped – No Paper	∇∇* Printer out of paper	0x86	The current printout has stopped because there is no paper left. Replace paper. If printer does not work decommission VU.
Printing Stopped – Low Power	∇↓∇ Printer low power	0x87	The current printout has stopped because the input VU voltage has dropped below the minimum allowed. Check battery voltage, wiring etc. If VU faulty beyond repair it must be decommissioned.
Printing Stopped – Low Temperature	∇↓° Printer low temperature	0x88	The current printout has stopped because the ambient temperature has dropped below the minimum allowed for the printer. The vehicle cab ambient temperature must increase to allow the printer to work.
Printing Stopped – High Temperature	∇↑° Printer high temperature	0x89	The current printout has stopped because the ambient temperature has risen above the maximum allowed value for the printer. The vehicle cab ambient temperature must decrease to allow the printer to work.
Printing Stopped – High or Low Temperature	∇↑° Printer high/low temp.	0x8A	The current printout has stopped because the printer temperature is out with the range of allowed temperatures. Wait until printer temperature is within allowable range and try to print again.
Card Withdrawn Without Proper Saving (Note: 2 displayed for slot 2)	!⊠→*1 Card out without saving	0x8B	The card was removed after a failure to write data to the card. Check VU / card operation. If VU faulty decommission. If card faulty replace with new card.
Wanted Function Not Possible to Perform	fn* Function not possible	0x8C	The last function request was not possible.
Over Speeding – Pre Warning	>>? Overspeeding pre-warning	0x8D	The vehicle is travelling faster than the set over-speed limit (Note: 1 minute continuous overspeeding will result in an overspeed event being stored). The vehicle speed must not increase above the speed limiter setting.
Timeout – Card Insertion or Withdrawal Passivity	⊠→° Timeout no key press	0x8E	A user has tried to insert (or withdraw) a smartcard and has not answered the required questions within the allowable time limits.
Driving Cannot Open Slot	⊠/⊠* Driving can't open slot	0x8F	A user has attempted to open a smartcard drawer whilst the vehicle is in motion. A smartcard may not be accessed whilst a vehicle is moving.
Pairing	⊠→A... Pairing	0x90	The Motion Sensor and VU are in the process of pairing. Wait until the automatic pairing process is complete.

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Pairing Complete	↗A...✓ Pairing complete	0x91	The Motion Sensor - VU pairing process has been completed successfully.
Pairing Failed	↗A...✗ Pairing failed	0x92	The Motion Sensor - VU pairing process has failed. Remove Workshop card from VU. Check system connections. Re-insert card to retry pairing. Replace or repair sensor if required. If VU is faulty beyond repair it must be decommissioned.
Lock-in Complete	↗✓ Lockin complete	0x93	VU Company data Lock-in has been successful.
Lock-out Complete	↖✓ Lockout complete	0x94	VU Company data Lock-out has been successful.
Inserted Valid Card Expired (Note: 2 displayed for slot 2)	☑! Card expired	0x96	The inserted card was valid but has now expired. Eject card and replace with valid card.
Activation	⊖ Activation	0x97	The VU is being activated for use. Wait until automatic activation is completed.
Activation Complete	⊖✓ Activation complete	0x98	The VU activation process has been completed successfully.
Activation Failed	⊖✗ Activation failed	0x99	The VU activation process has failed. Remove Workshop card from VU. Check system connections. Re-insert card to retry activation. If VU will not activate it must be decommissioned
Processing Card1 Busy (Note: 2 displayed for slot 2)	Busy processing Card 1	0xE0	A card has just been inserted in the slot – the message will be displayed until the VU has accepted the card as valid.
Please Wait Ejecting Slot 1 (Note: 2 displayed for slot 2)	Ejecting Card 1	0xEC	A request has been made to eject a card – the message will be displayed until the VU is ready to eject the card.
No Driver or Workshop Card Inserted	!⊖/! No driver/workshop card	0xED	The user has tried to interface with a card and there is no driver or workshop card present in either drawer. Insert a valid card as required.
Enter PIN	⌘PIN Enter PIN code	0xEE	Used to inform a user to enter a PIN code to activate a VU or to enter the VU calibration mode.
Memory Full	M.....! Memory full!	0xEF	The maximum number of manual duty entries has been reached.
More Than 24 hours Since Last Card Withdrawal.	>24h ⌘→last card withdrawal >24h	0xF0	The card just inserted was last withdrawn from a VU more than 24 Hours ago.
Downloading Busy	⌘⌘ Downloading busy	0xF1	The VU is downloading data. Wait for the download procedure to complete.
Downloading Incomplete	⌘*⌘ Downloading failed	0xF2	The VU download process has failed. Remove Workshop card from VU. Check connections and download equipment. Re-insert card and retry download. Replace or repair download equipment if required. If VU is faulty beyond repair it must be decommissioned

Message Description	Warning Message	Warning Reference Number	Reason For Occurring And Required Action To Be Taken
Downloading Complete	⬇️⬇️ Downloading complete	0xF3	The VU download process has been completed successfully.

15 Care and Maintenance of a VU

15.1 Cleanliness

Ensure that the Smartcard drawers are **closed and latched at all times** – except when inserting or removing cards. Also ensure that the paper cassette is closed at all times except when changing the printer paper or when accessing the calibration / download front connector (which is located behind the paper cassette fascia). These will prevent the ingress of contaminants, which could lead to premature failure of the VU. If it is necessary to clean the outside of the VU use a mild detergent solution. Avoid the use of solvents that could permanently damage the plastic fascia.

15.2 Protecting the VU System from Damage

- **Disconnect** the VU from its electrical supply if electrical welding is carried out on the vehicle or if prolonged boost starting of the vehicle is anticipated or if high-level transient voltages are anticipated.
Note: Failure of other electrical components on the vehicle, for example the alternator regulator, could damage the VU, as it is permanently connected to the battery.
- The Smartcard drawers are **not** designed to support weight when in the open position.
- When removing the paper cassette **do not** use excessive force as this may cause permanent damage. The correct method for removing the paper cassette is fully described in section 4.6 *Paper Cassette*.
- Replacement printer paper must be a Stoneridge Approved type – failure to use approved printer paper may cause permanent damage to the printer mechanism.
- Smartcards **must** be handled with care – **do not** flex or bend the cards. Ensure that the card contacts are kept free from dirt – clean with a soft damp cloth if necessary.

15.3 Printer Maintenance

The only serviceable parts in the Stoneridge VU are the paper cassette and the printer paper. The printer heads may also be cleaned using a Stoneridge approved printer head cleaning pen. **Do not** attempt to service any other VU parts. If the paper cassette is damaged then the complete cassette must be replaced as a single item – see section 4.6 *Paper Cassette* for information on how to replace the paper cassette. See *Appendix 5 - Printer Spare Parts* for details of spare parts available. It should be noted that cleaning of the printer heads of an ADR VU **must** be done with the ignition switched off.

16 Stoneridge ADR Digital Tachograph

The ADR version of the Stoneridge VU is approved for use in Dangerous Goods Vehicles. An ADR type VU is identified by the use of the ADR identification symbols as shown in Figure 17.

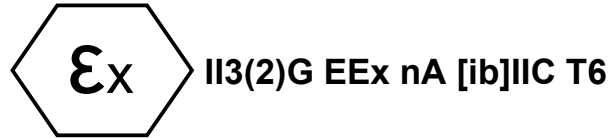


Figure 17 ADR Identification Symbols

The Stoneridge ADR VU must only be fitted to vehicles that are equipped with a battery master (or isolator) switch. It should be noted that the **explosion protection of the Stoneridge ADR VU is only ensured when the vehicle is stationary and the battery master switch is opened**. When fitting a Stoneridge ADR VU the unit must be mounted within the Truck cabin. To ensure that the VU conforms to IP54, the unit must be mounted with the VU at least level with the horizontal. If a VU is to be mounted at an angle the front fascia must be lower than the rear of the VU. It should also be noted that ADR vehicles might have a safety network integrated into the VU wiring system as well as a battery master switch. If fitted, the safety network will be connected between the main supply from the battery and the VU itself as shown in Figure 18. The battery master switch may be at 'A' only, 'B' only or at both 'A' and 'B'.

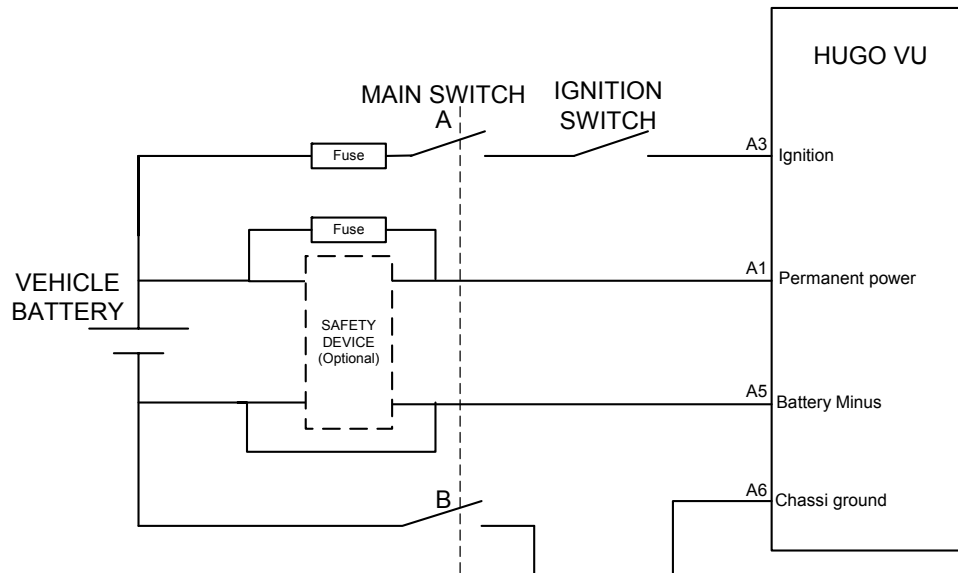


Figure 18 VU Wiring Diagram With Safety Network

The Stoneridge ADR VU is certified according to the EU Commission Directive 94/9/EC. The relevant examination certificate number for this is: TÜV 04 ATEX 2507 X. This number will be displayed on the data label as shown in Figure 19.

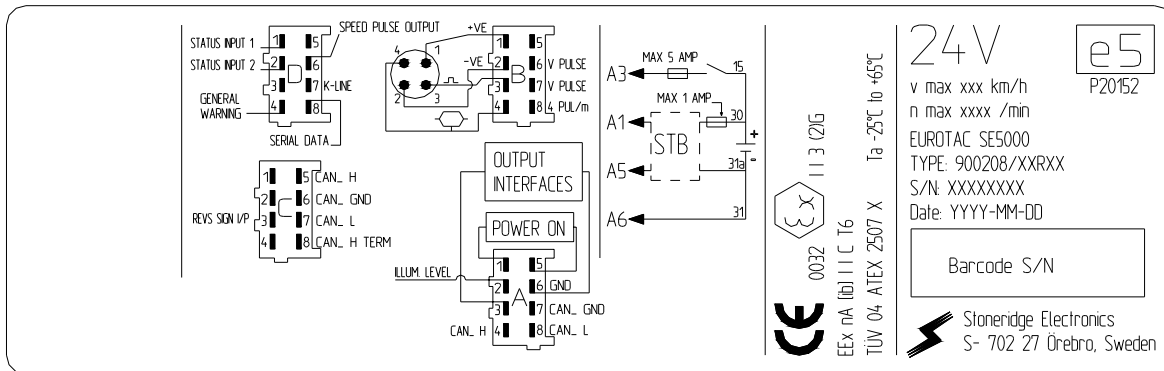


Figure 19 ADR VU Data Label

The permissible ambient operation temperature range for a Stoneridge ADR VU is -25°C to $+65^{\circ}\text{C}$.

The main differences between the standard Stoneridge Digital Tachograph and the ADR version are all concerned with the situation where the vehicle ignition switch is **off**. The differences are listed as follows:

- Any Smartcards inserted in a VU **CANNOT** be ejected – if smartcard ejection is attempted, a warning message will be displayed to indicate that this function is not possible.
- The VU printer will **not** function at all under this condition.
- The backlights for the display will be switched off and will remain off until the ignition switch is turned on again.
- The backlights for the buttons on the VU fascia will be turned off and will remain off as long as the ignition is off also.
- The supply voltage to pin 5 of the front connector is not active.

ADR VU Electrical Data Specification (all Rear Connector)

Supply Circuit (permanent supply from the vehicle battery, i.e. A1 (+) and A5 (-)): $U_n = 24\text{Volts}$

Ignition System (supply via the battery master switch and the ignition switch from the battery, i.e. A2 (illumination), A3 (ignition supply) and A6 (chassis ground)): $U_n = 24\text{Volts}$

Motion Sensor Connections (compliant with Intrinsic safety Eex ib IIC protection): B1 (Sensor +ve), B2 (Sensor -ve), B3 (Sensor Signal) and B4 (Sensor Encryption).

(Note: the motion sensor data is only valid for connection to motion sensor type KITAS 2171.xx according to EU type examination certificate number TÜV 02 ATEX 1842 X).

Appendix 1 - VU Display Symbols


The following is a list of display symbols and combinations that the Stoneridge VU uses:

(a) Basic Display Symbols







	<u>People</u>	<u>Actions</u>		<u>Modes of operation</u>
♁	Company			Company mode
⌚	Controller	Control		Control mode
⊙	Driver	Driving		Operational mode
T	Workshop/test station	Inspection/calibration		Calibration mode
⊞	Manufacturer			
	<u>Activities</u>	<u>Duration</u>		
⊞	Available	Current availability period		
⊙	Driving	Continuous driving time		
H	Rest	Current rest period		
*	Work	Current work period		
⏸	Break	Cumulative break time		
?	Unknown			
	<u>Equipment</u>	<u>Functions</u>		<u>Equipment</u> <u>Functions</u>
1	Driver slot		2	Co-driver slot
♠	Card		⊙	Clock
⊞	Display	Displaying	⏴	External storage
⚡	Power supply		⏴	Printer/printout
⏴	Sensor		⊙	Tyre size
⏴	Vehicle/vehicle unit			
	<u>Specific conditions</u>			
OUT	Out of scope	⚓	Ferry/train crossing	
	<u>Miscellaneous</u>			
!	Events	×	Faults	⏴
⏴	Start of daily work period	⏴	End of daily work period	*
●	Location	M	Manual entry of driver activities	⊞
⊞	Security	>	Speed	⊙
⊙	Time	Σ	Total/summary	⊞
⏴	Eject	⏴	Lock	⏴
⏴	Case Opened	⏴	Paper	⊙
↑°	High Temperature	↓°	Low Temperature	⏴°
	<u>Qualifiers</u>			
24h	Daily	I	Weekly	
⏴	Two weeks	+	From or to	





(b) Display Symbol Combinations

<u>Miscellaneous</u>			
⏴●	Control place	⏴+	From vehicle
●⏴	Location start of daily work period	⏴●	Location end of daily work period
⊙+	From time	+⊙	To time
OUT+	Out of scope begin	+OUT	Out of scope end

Cards	
 Driver card	 Company card
 Control card	 Workshop card
 No card	

Driving	
 Driving time for one week	 Driving time for two weeks

Printouts	
 Driver activities from card daily printout	 Driver activities from VU daily printout
 Events and faults from card printout	 Events and faults from VU printout
 Technical data printout	 Over speeding printout

Manual Entries	
 Still same daily work period?	 End of previous work period?
 Enter location of start of work period.	 Enter location of end of work period.

Appendix 2 - VU Location Countries/Regions

The countries (and regions for Spain) that can be used as VU Locations at the start and end of the daily work period are listed as follows:

(a) Countries

A	Austria,	AL	Albania,	AND	Andorra,
ARM	Armenia,	AZ	Azerbaijan,	B	Belgium,
BG	Bulgaria,	BIH	Bosnia and Herzegovina,	BY	Belarus,
CH	Switzerland,	CY	Cyprus,	CZ	Czech Republic,
D	Germany,	DK	Denmark,	E	Spain,
EST	Estonia,	F	France,	FIN	Finland,
FL	Liechtenstein,	FR	Faeroe Islands,	GE	Georgia,
GR	Greece,	H	Hungary,	HR	Croatia,
I	Italy,	IRL	Ireland,	IS	Iceland,
KZ	Kazakhstan,	L	Luxembourg,	LT	Lithuania,
LV	Latvia,	M	Malta,	MC	Monaco,
MD	Republic of Moldova,	MK	Macedonia,	N	Norway,
NL	The Netherlands,	P	Portugal,	PL	Poland,
RO	Romania,	RSM	San Marino,	RUS	Russian Federation,
S	Sweden,	SK	Slovakia,	SLO	Slovenia,
TM	Turkmenistan,	TR	Turkey,	UA	Ukraine,
UK	United Kingdom, Alderney, Guernsey, Jersey, Isle of Man, Gibraltar,	V	Vatican City,	YU	Yugoslavia,
UNK	Unknown,	EC	European Community,	EUR	Rest of Europe,
WLD	Rest of the world.				

(b) Regions in Spain

AN	Andalucía,	AR	Aragón,	AST	Asturias,
C	Cantabria,	CAT	Cataluña,	CL	Castilla-León,
CM	Castilla-La-Mancha,	CV	Valencia,	EXT	Extremadura,
G	Galicia,	IB	Baleares,	IC	Canarias,
LR	La Rioja,	M	Madrid,	MU	Murcia,
NA	Navarra,	PV	País Vasco.		

Appendix 3 - Details of Printing Routines

Printouts are obtained via the "Print/Display" sub-menu. Instructions on how to access this sub-menu are listed in *section 8.2 How to Initiate a Printout and How to Stop a Printout*. The full details of the six types of printout available from the "Print/Display" sub-menu of a VU are described in the subsections that follow. Please note that once printing has started it can only be stopped by long-pressing the 'cancel' button until the message "▼▼ Printing cancelled" is displayed to indicate printing has been cancelled. It should be noted that if there is a problem with the printer then a pictogram-warning message will be displayed, with the exact message displayed dependant on the problem as follows:

- "▼❌ Printer out of paper" – indicates that the printer is out of paper;
- "▼⚡ Printer low power" – indicates that printing has stopped due to low power;
- "▼❄ Printer low temperature" – indicates that printing has stopped due to low ambient temperature;
- "▼🔥 Printer high temperature" – indicates that printing has stopped due to high ambient temperature;
- "▼❄ Printer high/low temperature" – indicates that printing has stopped due to high or low temperature.

(a) Daily Driver Activities from Card

This option is used to provide a copy of the driving activities stored on a driver or workshop smartcard for a selected day. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite. If a valid driver or workshop card is **not** inserted in either slot '1' or slot '2', then the warning message "!!🚫 No driver/ workshop card" will be shown before the display returns to the previous display.

24h▼ Print	↑
24h card	↓

If there are valid Driver or Workshop cards inserted in both smartcard slots, then the VU will need to know which slot contains the card from which the printout information is to be taken. The display will be as shown opposite. Press the 'up' or 'down' buttons to toggle between slots '1' and '2' and when the required slot is highlighted, press the 'enter' button to continue.

Select card	1
1 or 2	2

The VU then needs to know for which date the printout of the driver activities from the card is required. The display will be as shown, with the current date displayed on the bottom line and the two digits of the day highlighted. Press the 'up' or 'down' buttons to increment or decrement until the correct number is displayed for the day and then press the 'enter' button to accept the day displayed. Repeat this process for the month and year until the correct date for printing is displayed. Please note that when modifying the date, adjustments are restricted to within normal calendar possibilities and also to that for the first and last drivers records stored on the smartcard inserted. To accept the displayed date, press the 'enter' button or press the 'cancel' button to go back and modify the date.

Enter date
25. 06. 04

Once the correct date for printing has been accepted, the option will be given to display or to print the driver activities from the card for the selected date. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required option highlighted, press the 'enter' button to print (or display) the stored data, or to abort the operation, press the 'cancel' button. When the printout is complete, the message "▼▼ Printing complete" will be displayed. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

Select Print	▼
or display	□

(b) Daily Driver Activities from VU

This option is used to provide a copy of the driver activities stored in a VU for a selected day. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite.

```
24h▲▼ Print  ↑
24h UU      ↓
```

The VU then needs to know for which date the printout of the driver activities from VU is required. The display will be as shown, with the current date displayed on the bottom line and the two digits of the day highlighted. Press the 'up' or 'down' buttons to increment or decrement until the correct number is displayed for the day and then press the 'enter' button to accept the day. Repeat this process for the month and year until the correct date for printing is displayed. Please note that when modifying the date, adjustments are restricted to within normal calendar possibilities but also in the normal operation mode (driver card inserted) only the eight previous days can be selected. To accept the displayed date, press the 'enter' button or press the 'cancel' button to go back and modify the date.

```
Enter date
25. 06. 04
```

Once the correct date for printing has been accepted, the option will be given to display or to print the VU driver activities for the selected date. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required option highlighted, press the 'enter' button to print (or display) the stored data, or to abort the operation, press the 'cancel' button. When the printout is complete, the message "▼▼ Printing complete" will be displayed. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

```
Select Print  ▼
or display   □
```

(c) Warnings from Card (Events and Faults)

This printing option is used to provide a copy of all Events and Faults stored on a driver smartcard. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite. If a valid driver card is not inserted in either slot '1' or slot '2', then "!x/! No driver/workshop card" will be shown as a warning message before the display returns to the previous display.

```
!x/! Print  ↑
event card  ↓
```

If there are valid driver cards inserted in both smartcard slots, then the VU will need to know which slot contains the card from which the printout information is to be taken. The display will be as shown opposite. Press the 'up' or 'down' buttons to toggle between slots '1' and '2' and when the required slot is highlighted, press the 'enter' button to continue.

```
Select card  1
1 or 2      2
```

The option will then be given to display or to print the Events and Faults from the card. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required option highlighted, press the 'enter' button to print (or display) the stored data, or to abort the operation, press the 'cancel' button. When the printout is complete, the message "▼▼ Printing complete" will be displayed. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

```
Select Print  ▼
or display   □
```

(d) Warnings from VU (Events and Faults)

This printing option is used to provide a copy of all Events and Faults stored in a VU. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite.

```
!x▲▼ Print  ↑
event UU    ↓
```

The option will then be given to display or to print the stored VU Events and Faults. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required option highlighted, press the 'enter' button to print (or display) the stored data, or to abort the operation, press the 'cancel' button. When the printout is complete, the display will show the pictogram-message "▼▼ Printing complete" to indicate this. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

```
Select Print  ▼
or display   □
```


(e) Technical Data

This printing option is used to provide a copy of technical data with regard to a VU, e.g. calibration factors, VIN etc. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite.

```

┌──────────────────────────┐
│ T> Print                  │ T
│ technical data           │ ↕
└──────────────────────────┘
    
```

The option will then be given to display or to print the stored technical data. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required

```

┌──────────────────────────┐
│ Select Print             │ ▼
│ or display               │ □
└──────────────────────────┘
    
```

option highlighted, press the 'enter' button to print (or display) the stored Technical data, or to abort the operation, press the 'cancel' button. When the printout is complete, the display will show the pictogram-message "▼▼ Printing complete" to indicate this. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

(f) Over-speeding Data

This printing option is used to provide a copy of over-speeding events stored in a VU. To initiate the printout, press the 'enter' button when the display in the "Print/Display" sub-menu is as shown opposite.

```

┌──────────────────────────┐
│ >> Print                 │ T
│ overspeeding            │ ↕
└──────────────────────────┘
    
```

The option will then be given to display or to print the stored Overspeed data. The display will be as shown - press the 'up' or 'down' buttons to toggle between "Paper Print" (i.e. '▼') and "Display" (i.e. '□'). With the required option highlighted, press the 'enter' button to print (or display) the stored Overspeed data, or to abort the operation, press the 'cancel' button. When the printout is complete, the message "▼▼ Printing complete" will be displayed. Acknowledge the message (as described in *section 14 VU Warnings (Events and Faults Conditions)*) and the display will return to the Print/Display sub-menu.

```

┌──────────────────────────┐
│ Select Print             │ ▼
│ or display               │ □
└──────────────────────────┘
    
```

Appendix 4 - Display Screens Selectable Whilst 'Driving'

The full details of the five display screens that are available whilst in the normal 'driving' mode are shown below (Note: see *section 7.5 Alternative Driving Displays* also). When in the standard 'Driving' mode, press the 'up' or 'down' buttons to scroll through the different driving displays shown as follows.

Note: in most of the displays that follow the top line relates to the driver ("D") and the bottom line to the crew ("C").

1. Default Display. The example display shown opposite is the default driving display for the VU. The top line shows the Driver's current activity and time (24 minutes rest in this case) and the Driver's cumulative break time. The right hand corner of the top line shows the current mode of operation of the VU (i.e. "T" for Calibration mode assuming a Workshop card is inserted). The second line initially shows current activity and time for the Crew (42 minutes available in this case) and then has to the right hand side of the display the current local offset time in 24-hour format.

```
D 00h24 00h32T
C 00h42 08:24
```

2. Speed/odometer/local time display. As shown opposite, the speed is a 3-digit value in km/h, the odometer is an 8-digit value in km (i.e. from 0 to 9,999,999.9 km) and the local 'offset' time is shown in 24-hour format.

```
D 1234567.8km
C 123km/h 08:24
```

3. UTC Date and Time Display (see *section 5.1 UTC Time and Local Time* for a full description of UTC). As shown on the bottom line, the UTC time is in 24-hour format and the date in dd.mm.yyyy format.

```
UTC
09:46 08.03.2004
```

4. Drive and Break display. The continuous driving time and the cumulative break time for the Driver and Crew and shown on the top and bottom lines of the display respectively.

```
D 002h34 00h18
C 000h00 00h18
```

5. Two-Week Driving Time display. The cumulative driving for the previous week and the current week in hours and minutes is displayed with the Driver on top line and Crew on the bottom line.

```
D 0158h53
C 0174h16
```

Appendix 5 - Printer Spare Parts

A list of Stoneridge Approved Printer parts is shown below. This list is correct at the time of publication only - please contact Stoneridge directly for availability and prices (Note: see also *Appendix 8 - Stoneridge Electronics Aftermarket Contact Details*).

Printer Approved Parts	Part Number
Printer Paper Cassette	6800-001
Printer Paper Roll	6800-002
Printer Head Cleaning Pen	6800-003

Appendix 6 - National Enforcement Agencies

A list of National Enforcement Agencies is shown below. These agencies **must** be contacted **directly** on any matter relating to the legal implications of Digital Tachograph systems.

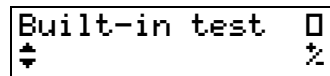
Enforcement Agency Name	Country	Telephone Number	Address
Vehicle & Operator Services Agency	UK	+44 (0)870 6060440	Berkeley House, Croydon Street, Bristol, BS5 0DA.
	Austria		
	Belgium		
	Cyprus		
	Czech Republic		
	Denmark		
	Estonia		
	France		
	Finland		
	Germany		
	Greece		
	Hungary		
	Italy		
	Latvia		
	Lithuania		
	Luxemburg		
	Malta		
	Netherlands		
	Poland		
	Portugal		
	Ireland		
	Slovakia		
	Slovenia		






Enforcement Agency Name	Country	Telephone Number	Address
	Spain		
	Sweden		

Appendix 7 - Troubleshooting

(a) Built-In Tests

If there is a suspected problem with a VU then the functionality of different parts of the VU can be checked via the 'Built-in Test' sub-menu. This menu is accessed via the main menu/settings sub-menu as described in *section 5 Settings Menu*, i.e. press the 'enter' button when the settings sub-menu display shows the 'Built-in Test' option (i.e., "*** Settings Built-in test**"). The 'Built-In Test' sub-menu display will be similar to that shown opposite. Press the 'up' or 'down' buttons to highlight the required sub-function and then the press the 'enter' button to initiate the test. The functions available in the sub-menu are listed below. It should be noted that the 'Built-in Test' mode is not active when a vehicle is moving and tests will automatically stop if a card is inserted. A 'Built-in Test' can be stopped at any time by pressing the 'cancel' button.



Display Pictogram	Test Type	Description	Action to be Taken
	Display Test	This is used to test the VU display. Selecting this test will result in the display going all light for 1 second, all dark for 1 second and finally a pattern of rows of dark and light squares will be displayed for 1 second.	If the display is unreadable the VU should be decommissioned.
	Invert Display Test	This is used test the inversion of the VU display. This test causes the display to invert (i.e. dark becomes light / light becomes dark) for 2 seconds before returning to the original display.	As for the display test.
	Printer Test	This is used to print a test printout. Selecting this test will result in a default printout being emitted from the VU.	The paper cassette and paper should be checked and replaced if necessary. If the printer still fails the VU should be decommissioned.
	Keypad Test	This is used to check the operation of the VU buttons. If this test is selected the user will be prompted to press all of the buttons in turn from left to right - each button press must be done within 2 seconds or the test will automatically fail.	If a button fails the fascia should be wiped gently with a damp cloth and mild detergent solution. Repeated failure of a button will mean that the VU should be decommissioned.
	Smartcard Test	This is used to check VU inserted smartcards. For the smartcard test to be carried out a card must already be inserted in the required slot. When the Smartcard test is initiated the VU will read the inserted card and then display the owners name for 2 seconds.	See below.

In the case of the smartcard test if it can be clearly identified that a smartcard is faulty (either by checking that the suspected card is faulty in a number of different VUs or by checking if a suspected VU is faulty by trying other 'known good' cards in it), then the VU **must not** be decommissioned but a new smartcard should be applied for and the relevant authority contacted for advice (see *Appendix 6 - National Enforcement Agencies*).

(b) Opening the Smartcard Drawers With No Power or Whilst Disconnected

In the event of a VU drawer failure or power failure, in order to gain access to any smartcards located in a VU, the smartcard drawers may only be opened after removing the unit from the dashboard to gain access to the drawer release mechanisms that are located via the bottom panel of the VU.

Note: see *section 9.7 Removing the VU*, for information on how to remove a mounted VU.

If a VU is out of its mounting cage the drawers should only be opened without power connected. As shown in Figure 20, on the bottom of the VU there are 2 small breakout slots. Use a thin sharp tool (e.g. a small screwdriver) to carefully penetrate the thin breakout slot behind the Card drawer that is to be opened. If a drawer eject tool is inserted in the penetrated slot as shown and light pressure is applied followed by angled movement of the eject tool towards the display side of the VU, the appropriate drawer will unlock and spring out as shown.

Note: This method must only be used when there is **no power** present.

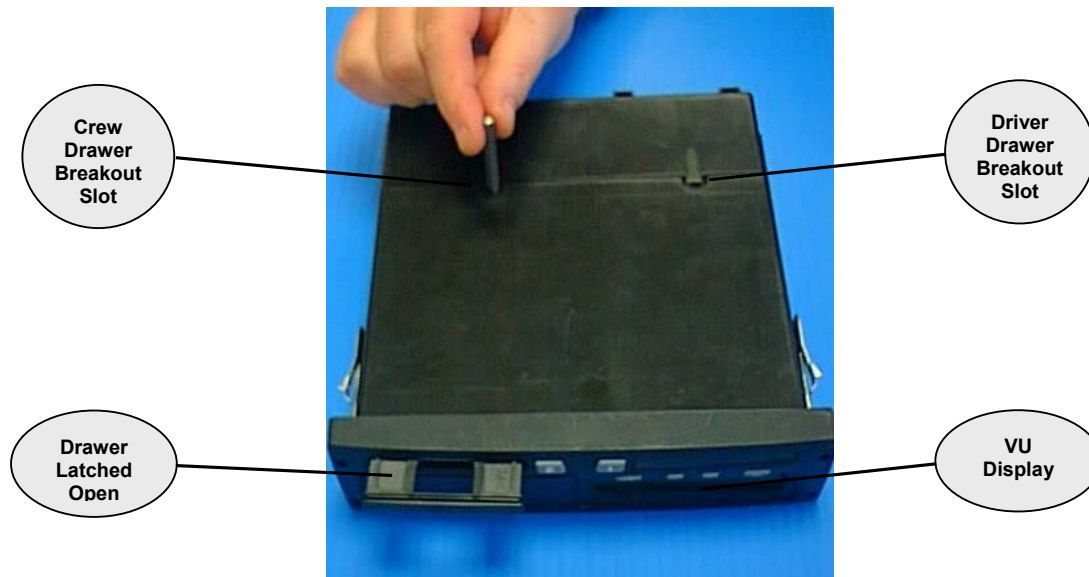


Figure 20 Opening the Smartcard Drawers Without Power

Warning: When the card has been ejected as described above, the unit will be decommissioned since there is a hole in the cover.

Appendix 8 - Stoneridge Electronics Aftermarket Contact Details

Any queries on the Stoneridge Electronics Digital Tachograph VU discussed in this manual should be made to one of the Stoneridge Electronics Aftermarket contacts listed below:

UNITED KINGDOM:

Stoneridge Electronics Ltd
Charles Bowman Avenue
Claverhouse Industrial Park
Dundee
Scotland DD4 9UB
Tel.: +44 (0)871 700 7070
Fax: +44 (0)870 704 0002
E-mail: sales@elc.stoneridge.com

GERMANY / DEUTSCHLAND:

Stoneridge GmbH
Paradiesweg 11
D-73733 Esslingen
Tel.: +49 (0)711-99 33 82-0
Fax: +49 (0)711-99 33 82-12
E-mail: info@elc.stoneridge.com

FRANCE:

Stoneridge Electronics France
Zone Industrielle De St Etienne
Chemin De Cazenave
64100 Bayonne
Tel.: +33 (5) 59 50 80 46
Fax: +33 (5) 59 50 80 41
E-mail: info@elc.stoneridge.com

SPAIN / ESPAÑA:

Stoneridge Electronics España
Avda. Severo Ochoa 38,
Pol. Ind. Casa Blanca
28108 ALCOBENDAS
MADRID
Tel.: +34 (91) 662 32 22
Fax: +34 (91) 662 32 26
E-mail: info@elc.stoneridge.com

See also at [http://www.stoneridge-electronics.com/“Aftermarket Division”](http://www.stoneridge-electronics.com/Aftermarket%20Division).

Appendix 9 - Technical Data

(a) VU Technical Parameters

The technical parameters for the Stoneridge Electronics VU are listed below.

Operating Voltage Range	24Volt System: 18-32Volts 12Volt System: 9.4-16Volts
Normal Operating Temperature	-25°C to +70°C
Storage Temperature	-40°C to +85°C
Weight	Less than 700g (including paper roll)
Dimensions	188 x 218 x 59 mm
Current Consumption (System On)	65mA @24V (approx); 100mA @12V (approx)
Current Consumption (Ignition off)	40mA @24V (approx); 60mA @12V (approx)
LCD	Dot-Matrix LCD (19 x 98 pixels); Visible Area 72x16.6mm; 2 Rows x 16 Characters
Printer	Paper Width 57-58mm; Paper Roll Diameter 30mm (max); 24 Characters per Line.

(b) Calibration and Download Front Connector

The calibration and download front connector is a 6-pin connector and the pin pitch is 2.54mm. The connector is located behind the paper cassette (see *4 Description of the Controls* for details). The pin-out connections, as viewed from the front of the connector, are shown in Figure 21. The functional descriptions of the pins are also listed below.

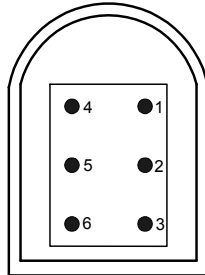


Figure 21 Calibration and Download Front Connector Pin-out

Pin	Name	Functional Description
1	Battery minus	Connected to battery minus, A5.
2	Data comms.	The software and hardware configuration of this serial comms interface is in accordance with ISO 14230. This is used for bi-directional K-line I/O.
3	RxD comm.	Serial Data to recording equipment, VU. Complies with RS232 specifications at baud rates from 9600 -> 115200 bps.
4	Calibration I/O.	Calibration Signal Input/Output.
5	Battery plus.	Permanent Power Output. Voltage range is battery supply – 3V @ 40mA.
6	TxD comm.	Serial Data from recording equipment, VU. Complies with RS232 specifications at baud rates from 9600 -> 115200 bps.

(c) Rear Socket Connections

The rear connector is a 32-pin device and the connector pin-outs according to the ISO16844 connector format, and as viewed from the rear of the unit, is shown in Figure 22.

Pin numbers marked as striped pins in Figure 22 below (B5, D3 and D8), describe optional pins/functions added by Stoneridge to the connector format ISO16844-1. The functional descriptions that follow for these pins are in **bold** and *italic* format.

Pin numbers marked as black pins in Figure 22 below (B8, C1 to C8 and D1, D2, D4, D6 and D7) describe optional pins/functions defined by ISO16844-1. The functional descriptions that follow for these pins are in **bold** format.

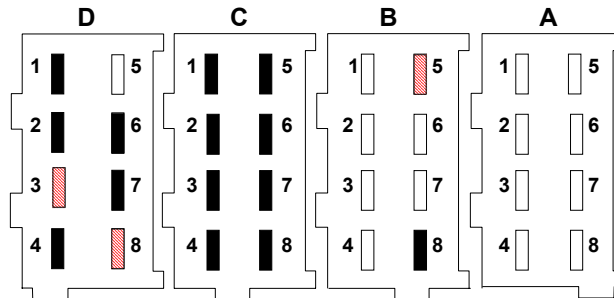


Figure 22 Rear Socket Connections – Optional Functions

It should be noted that the corresponding plugs for connection to sockets A, B, C and D are keyed and colour coded (White, Yellow, Red and Brown respectively) to prevent incorrect insertion.

Pin	Name	Functional Description
A1	Battery plus +	Permanent power supply line powering the VU.
A2	Illumination	Connection to illumination power supply. For this VU it is an analogue input.
A3	Ignition supply	Power supply line connected to the vehicle ignition supply and used to power appropriate input / output interfaces.
A4	CAN_H	CANbus HIGH signal line.
A5	Battery minus -	Return line for the permanent power supply (A1).
A6	Ground, GND	Return line for ignition supply, normally connected to local chassis ground.
A7	CAN_GND	CANbus GND line, which is connected to VU GND (A5) via a series combination of a 1Ω Resistor and 680nF capacitor.
A8	CAN_L	CANbus LOW signal line.
B1	Positive supply to motion sensor	Motion sensor supply signal that is derived from the permanent power supply.
B2	Battery minus to motion sensor	Return Line for motion sensor supply (B1).
B3	Motion sensor speed signal	Real time speed signal from the motion sensor.
B4	Speed data signal	Encrypted Channel (bi-directional) from the motion sensor. Is used to verify the signal integrity.
B5	General purpose input	Input signal to indicate an event to the processor.

Pin	Name	Functional Description
B6	Speed pulse output	Positive going pulse output signal triggered by each pulse from the motion sensor. Can be used as an alternative customer variant V-Pulse signal.
B7	Speed pulse output	Positive going pulse output signal triggered by each pulse from the motion sensor. The standard ISO V-Pulse signal.
B8	Distance signal, 4 pulses / m	An output string of positive going pulses generated at a rate corresponding to 4 pulses per metre.
C1	NC	This pin is not connected.
C2	Battery minus -	Return line for the battery supply.
C3	Revs signal input	This input signal is monitored by the processor and is used to determine engine speed. The input line is connected to the W terminal of the alternator, KL_W.
C4	NC	This pin is not connected.
C5	CAN_H	Alternative CANbus HIGH signal line.
C6	CAN_GND	Alternative CANbus GND line, which is connected to VU GND (A5) via a series combination of a 1Ω Resistor and 680nF capacitor.
C7	CAN_L	Alternative CANbus LOW signal line.
C8	Internal resistor to CAN_H	Connected to CAN_H on A4 via a 120Ω resistor.
D1	Status input 1	Input, which signals that an event may be recorded.
D2	Status input 2	Alternative event input, which signals that an event may be recorded.
D3	Positive supply	An output supply suitable for status inputs.
D4	General Tachograph warning output	This is a general open collector output controlled by the processor.
D5	Over speed output	An output which is active when an over speed condition is detected.
D6	Speedometer output	An open collector output or an ISO16844 output controlled by the processor. It is a rectangular waveform that is used to drive a vehicles' speedometer.
D7	Data comm. I/O K-line	The software and hardware configuration of this interface is in accordance with ISO 14230.
D8	Serial data output line	<i>Serial data output channel continuously transmitting speed, distance, time, date, engine revs, driver and crew duty information in a Stoneridge Electronics proprietary format.</i>

Note: the CANbus (Controller Area Network) is a versatile vehicle communications system. It is a serial bus system that is used as an open communication system for intelligent devices. It functions as an interface between the VU, the vehicle instrument cluster and other systems within a vehicle. Different vehicle manufacturers have different CANbus specifications and thus VUs are not interchangeable between different manufacturers vehicles. The CANbus transmission lines CAN_H and CAN_L are protected against short circuits and electrical transients, which may occur in an automotive environment. In case of short circuit (CAN_H to CAN_L or Ground and vice-versa) the protection circuit recognises this fault and the CAN transmitter output stages are disabled. It should also be noted that CANbus via the rear connector could be used for programming a VU with calibration parameters instead of the front calibration (6-way) connector.

(d) Diagnostic Trouble Codes (DTCs)

A list of the Stoneridge Digital Tachograph DTCs is shown below. For all DTCs that are stored in a VU, a check should be made to determine whether the DTC is still active or is inactive. The reason for the DTC should be determined and appropriate action taken as described in the table that follows.

DTC	DTC Description	Suggested Action To Be Taken
0x2007	Sensor power supply above maximum value.	Check vehicle and motion sensor power supply levels. Check motion sensor operation and all wiring – replace sensor if faulty. If DTC remains active for no apparent reason decommission VU.
0x2003	Sensor power supply below minimum value.	As DTC 0x2007.
0x2004	Sensor power supply no signal	As DTC 0x2007.
0x0007	VU power supply above maximum value.	Check vehicle power supply levels. Check power supply input to VU. Check all connections and VU operation. If DTC remains active for no apparent reason decommission VU.
0x0003	VU power supply below minimum value.	As DTC 0x0007.
0x0004	VU power supply no signal.	As DTC 0x0007.
0x0200	Error on Driver Card in slot 1.	Remove card and check. Replace card if necessary (see note 1 below). Check VU with known good Driver or Workshop card. If DTC remains active for no apparent reason decommission VU.
0x0300	Error on Driver Card in slot 2.	As DTC 0x0200.
0x0660	Printer Paper is out.	Replace paper if necessary. If DTC still active replace paper cassette. If DTC remains active for no apparent reason decommission VU.
0x2180	No Speed signal from Sensor	Check motion sensor operation and all wiring – replace sensor if faulty. Check for evidence of tampering. If DTC remains active for no apparent reason decommission VU.
0x2280	Invalid speed signal or data link error.	As DTC 0x2180.
0x2380	Data link error between speed sensor and vehicle unit.	Check motion sensor operation and all wiring – replace sensor if faulty. Check for evidence of tampering. Re-Pair the motion sensor and VU. If DTC remains active for no apparent reason decommission VU.
0x2452	Speed Sensor – VU signature mismatch.	The sensor ID is not the same as during calibration. Check sensor operation. Re-Pair the motion sensor and VU. Re-calibrate the VU system. If DTC remains active for no apparent reason decommission VU.
0x0800	Time / date error.	Check VU UTC time accuracy and re-calibrate if necessary. If DTC remains active for no apparent reason decommission VU.
0x0900	Ignition off, but speed pulses are present.	Check motion sensor operation and all wiring – replace sensor if faulty. Check for evidence of tampering. Check speed pulses are not being injected through front connector. If DTC remains active for no apparent reason decommission VU.
0x0A70	CANbus internal error.	Check CANbus settings. Check all wiring. Check CANbus present in vehicle. If DTC remains active for no apparent reason decommission VU.
0x0B78	CANbus off.	As DTC 0x0A70.
0x1177	No signal between VU and CAN communication instrument.	Check VU CANbus wiring. Check CANbus settings. Check CANbus present in vehicle. Check instrument cluster operation. If DTC remains active for no apparent reason decommission VU.

DTC	DTC Description	Suggested Action To Be Taken
0x0C31	Checksum error in VU Program memory.	Decommission VU.
0x0D33	Read/Write Error in VU Calibration Memory.	Decommission VU.
0x0D40	Calibration Error.	Re-calibrate the VU system. If DTC remains active for no apparent reason decommission VU.
0x0700	Printer Error.	Check printer function. Replace paper cassette and paper if necessary. If DTC remains active for no apparent reason decommission VU.
0x0400	Error in Card 1 Reader.	Decommission VU.
0x0500	Error in Card 2 Reader.	Decommission VU.
0x0F00	Keyboard Error.	Check VU button function (see <i>section Appendix 7 - Troubleshooting</i> for more details). If button repeatedly fails or DTC remains active for no apparent reason decommission VU.
0x2508	Internal Sensor Error.	Check motion sensor operation and all wiring. Check for tampering. Replace sensor if required.
0x3000	B7 Speed Pulse Output.	Check wiring. Check external equipment connected to B7 output for faults. If DTC remains active for no apparent reason decommission VU.
0x0139	Internal Error in VU.	Decommission VU.
0x1260	Driving Without a Card (Driver or Workshop)	Highlight that driving must be done with a valid Driver or Workshop card inserted. Report as necessary. Clear the DTC in the VU.

Notes:

1. Where it can be clearly identified that a smartcard is faulty (either by checking that the suspected card is faulty in a number of different VUs or by checking if a suspected VU is faulty by trying other 'known good' cards in it), then a new card should be applied for and the relevant authority contacted for advice (see *Appendix 6 – National Enforcement Agencies*).
2. If a VU is found to be faulty or damaged beyond repair it must be decommissioned.

Appendix 10 - VU Driving Display and Main Menu Navigation

The diagram below gives an overview of the driving displays (left hand side) and main menu structure (right hand side) for the VU and shows how to navigate between them using the 'up', 'down', 'enter' and 'cancel' buttons. It should be noted that the main menu structure is the same for both operational (driver card inserted) and calibration (workshop card inserted) modes of operation.

Note: Any 'Begin' or 'End' place location changes done via the main menu will **only** effect the Driver smartcard locations. If the Crew smartcard 'Begin' or 'End' place locations require changing, these must be done whilst inserting or removing the Crew smartcard from the VU respectively.

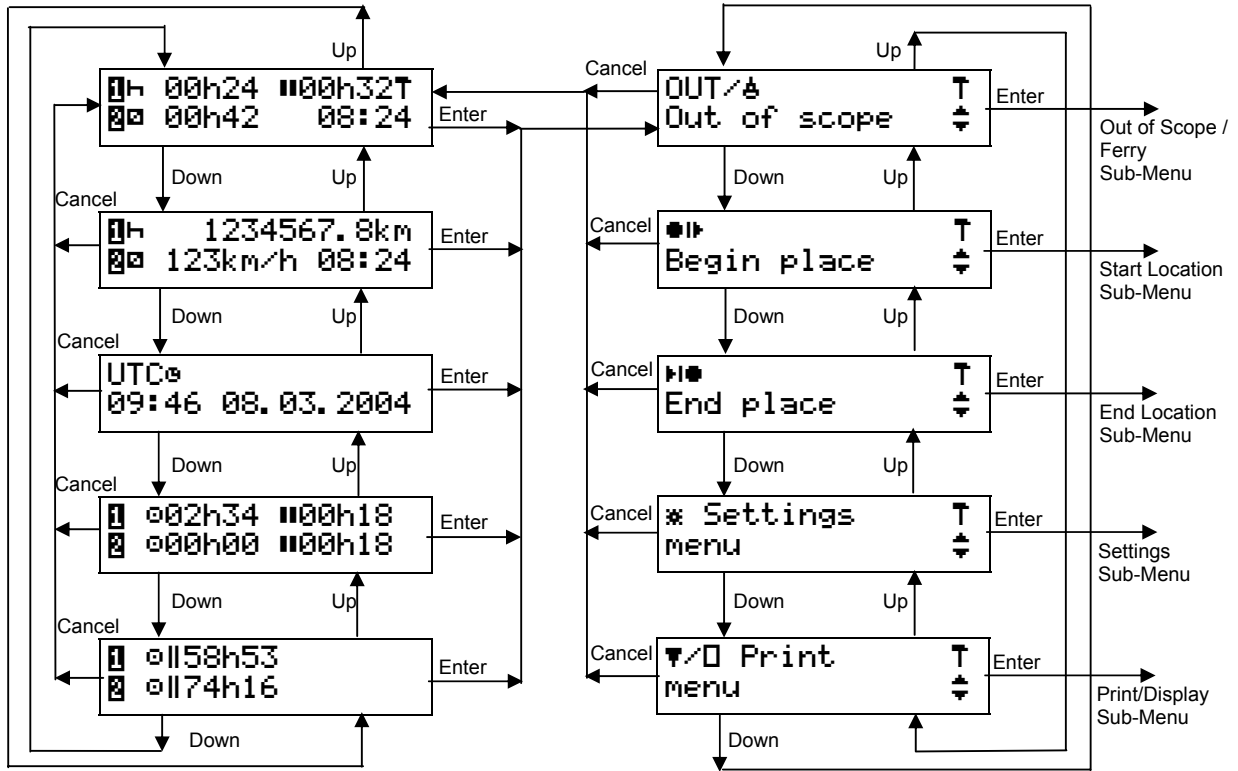


Figure 23 Driving Displays and Main Menu Navigation

Appendix 11 - Glossary of Terms

Listed below are explanations of common terms that are used throughout the manual.

VU – this is the Digital Tachograph radio sized vehicle unit.

Crew – this is the currently off-duty driver or co-driver in a dual-driver vehicle.

Available – this is in-active time spent as Crew in a moving vehicle or time spent whilst a Driver is waiting to start driving (e.g. waiting for passengers to arrive or for paperwork to be completed etc).

Work – this is non-driving active work (e.g. loading a vehicle).

Long Press – this is pressing and holding a VU button for two seconds or more.

Short Press – this is pressing and releasing a VU button in less than 1 second.

Daily Work Period – this is the time from the start to the end of a drivers' working day.

Out of Scope – this is any driving carried out on a road that is not covered by EU Drivers' hours laws.

UTC – this is Universal time coordinated and is an incremental count of the number of elapsed seconds since 1st January 1970.

Local Time – this is the time shown on the VU standard driving display and is the current time of the country in which driving is being done.

Card Insertion Time – this is the time at which a smartcard was inserted into a VU i.e. when the drawer was closed.

Card Withdrawal Time – this is the time at which a smartcard was withdrawn from a VU i.e. when the drawer was opened.

IDE – Intelligent dedicated equipment. This is equipment that enables interaction with a VU via the front calibration/download connector.

Tachograph Workshop – for the purposes of this manual, this is defined as any premises that have been approved to fit, replace, calibrate and inspect Stoneridge VUs.

Motion Sensor – this is used to provide a VU with encrypted speed signal pulses from the vehicle gearbox. Thus a motion sensor is also referred to as an encrypted sender.