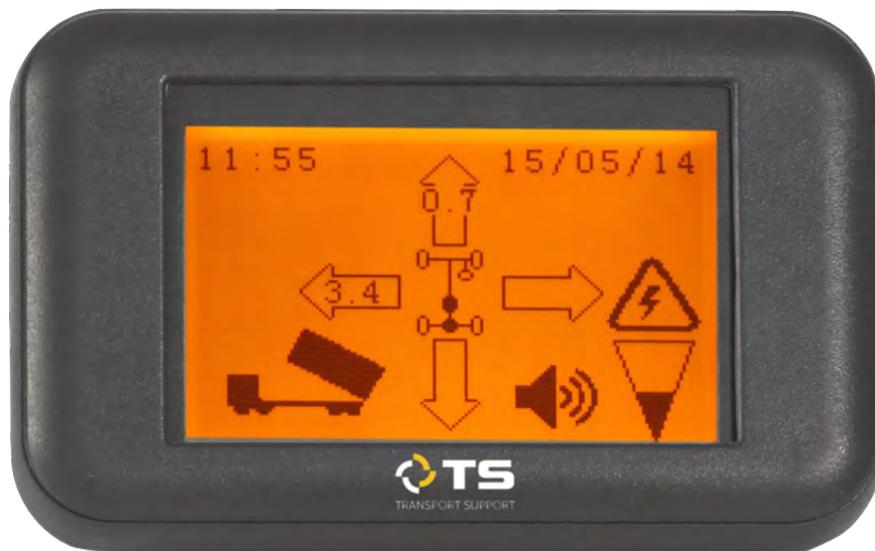


Transport Support TSafe Vehicle Safety System Operating Manual



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Introduction

TSafe is a modular safety system that combines all the best features of our best selling vehicle safety products. TSafe can be an Inclinometer, a high voltage overhead cable detector or both, combined with wireless capability and full event data recording. The TSafe display has a fully touch screen 3.5" back-lit display and a built in spoken audio voice warning .

Inclinometer

The TSafe system features a new two axis inclinometer that can monitor the vehicles angle left to right and front to back up to a maximum of 23 degrees in 0.1 degree increments, to enable the TSafe system to be used on almost any type of vehicle from a small tipper to a large quarry dump truck. We have also incorporated a body raised sensor which allows separate alarm angles to be programmed for body up or down positions.

High Voltage Detection System - HVDS

Building on our vast experience of Overhead Power Cable Detection the new TSafe system has our most advanced HVDS yet. New detection circuitry gives almost double the detection range, sensitivity and noise rejection over our existing HVDS unit. The TSafe's HVDS can be fully adjusted to suit the operating environment and gives a visual indication of detected signal strength and range. A new high gain detection antenna further improves the systems detection capabilities giving full 360 degree high voltage cable detection out to 25mtrs on 11Kv overhead power lines.

Wireless

The TSafe sensor modules can be either hard wired or wirelessly connected back to the in cab display making installation and servicing very simple. There is also the ability to add up to 4 HVDS nodes to expand the High Voltage Detection Coverage on large vehicles and cranes.

Data Recording

The system has detailed event logging which records all alarm warnings, parameter and setting against a time and date stamp. In the event that an incident did happen then this data can be reviewed just like a black box flight recorder.

Component Parts

Please note: Not all of these components will be in your kit as some parts are optional.
Please check the system specification and your packing list supplied with the kit.



TSafe head unit - Touch screen display that is visible to the driver and gives audio/visual warning for the various TSafe sensors on the vehicle.



ECU - The ECU is used to connect the display unit with any other sensors connected to the TSafe system. The ECU has a built in HVDS sensor, data ports, relay and auxiliary outputs. This unit can be supplied with or without wireless connectivity. (both versions are pictured here, only one type will be supplied in this kit)



TSafe Inclinometer sensor - 2 Axis Inclinometer sensor for use with the TSafe system. Gives inclination measurement left to right and front to back up to 22.9°. The unit is hard wired for power and data but can also be supplied as a wireless version. (both versions are pictured here, only one type will be supplied in this kit if an Inclinometer has been specified)



Main High Voltage Detection Antenna



External Warning Sounder



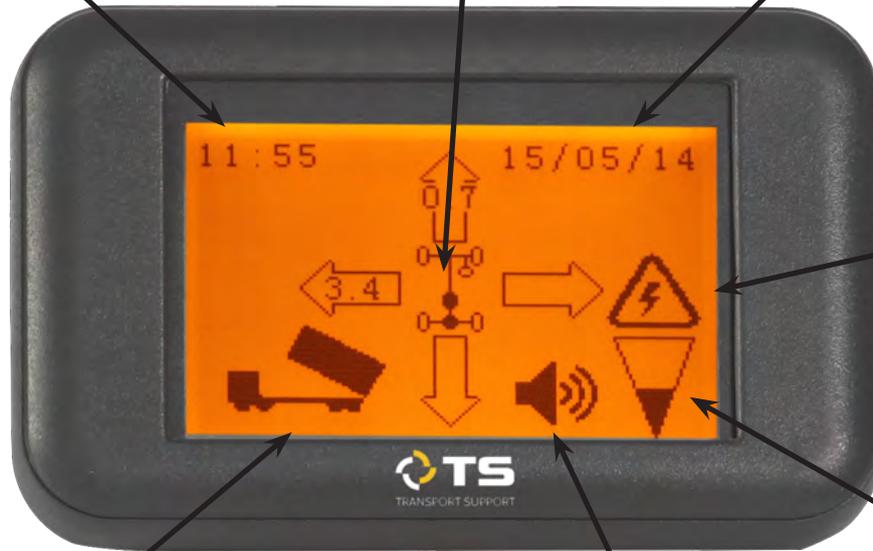
HVDS Node - The HVDS Node gives remote HVDS sensing to the TSafe system. It works as a complete HVDS giving 360° overhead high voltage cable detection and transmits its data (hard-wired or wirelessly) to the TSafe ECU. Up to 3 nodes can be connected to a TSafe system giving 4 High voltage detectors in total.

Menu System

Inclinometer indicator
Show the current inclination of the vehicles chassis in the X and Y axis. i.e. left/right and front/back

Current Time (24hr)

Date (DD/MM/YY)



HVDS Active
This will flash when overhead cables are detected

HVDS Sensing Level
Shows the detected signal level of the overhead power line

Body raised indicator
Shows the body raised status of the vehicle

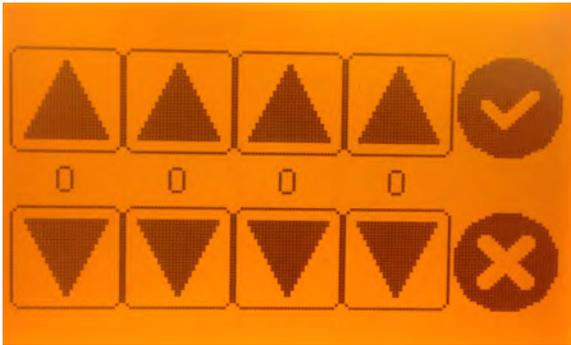
Mute button
Pressing the screen here will mute the audio alarm

Menu Map

The TSafe system uses a resistive touch sensitive screen that requires a slight finger pressure to operate.

From the Main Screen (tap anywhere on the screen except over the 'MUTE' symbol to enter set-up mode)

Pass Code Entry Screen - Enter 4 digit managers code to enter system set-up
The default code is '0000'



Left Key
Moves menu left to next option



Right Key
Moves menu right to next option

By pressing the left or right keys you can scroll through the various menu options. If the screen is not touched then the system will automatically revert to the home screen after 25 seconds.

Functions available in the managers mode:



SET TIME



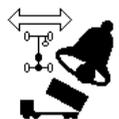
SET DATE



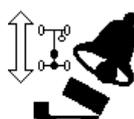
ADD A DEVICE



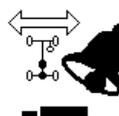
REMOVE A DEVICE



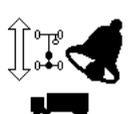
SET INCLINOMETER LIMIT
LEFT/RIGHT WITH BODY
RAISED



SET INCLINOMETER LIMIT
FRONT/BACK WITH BODY
RAISED



SET INCLINOMETER LIMIT
LEFT/RIGHT WITH BODY
DOWN



SET INCLINOMETER LIMIT
FRONT/BACK WITH BODY
DOWN



SET HVDS LIMIT



OUTPUT OVERRIDE



SET PASS CODE

Setting the system time and date

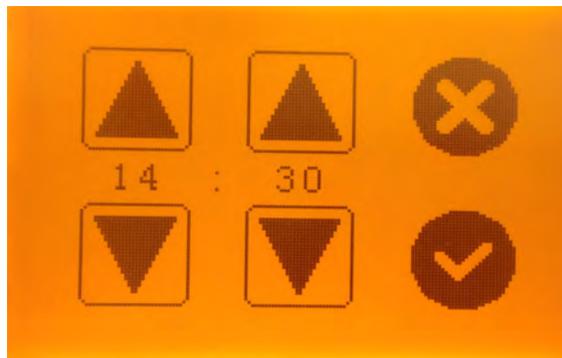
1. Setting the system time

- 1.1 From the Home Screen, tap anywhere on the screen except over the 'MUTE' symbol to enter set-up mode.
- 1.2 Enter 4 digit managers code to enter system set-up

Select the Time menu



TIME SET MENU BUTTON. Press symbol to enter time setting



- 1.3 Using the up down arrow keys set the current time (24hr clock) then press the  to confirm.

Note: The screen will return to the 'Home' view after pressing the confirm button.

2. Setting the system date.

- 2.1 Enter set-up mode and scroll through the menu to the set date button

Select the Date menu



DATE SET MENU BUTTON. Press symbol to enter date setting



- 2.2 Using the up down arrow keys set the current date (DD/MM/YYYY) then press the  to confirm.

Note: The screen will return to the 'Home' view after pressing the confirm button.

3. Pairing, Adding and Removing Devices

TSafe is a modular system that comprises of a number of individual components and optional modules. As a basic system the TSafe always has an ECU and a display unit as a base. In this configuration the system will only work as a High Voltage Overhead Cable detector (HVDS). To this basic set up can be added an Inclinometer sensor and up to three extra HVDS nodes. These can be either hard wired (as standard) or wireless (optional).

Each component of the system must be paired to the in-cab display unit on installation or when extra modules are added. If your system has been supplied as a kit for a new installation then it will already be paired up to the modules supplied in that kit.

The adding/removing devices procedure will need to be carried out when:

- A new module is added to an existing installation (Add a device)
- A module is damaged or faulty and needs to be replaced (Remove a device and Add a new one)
- A module is swapped i.e. if the trailer with an inclinometer sensor is swapped for an different trailer with a different inclinometer sensor. (Remove a device and Add a new one)

3.1 Pairing (Adding) a device

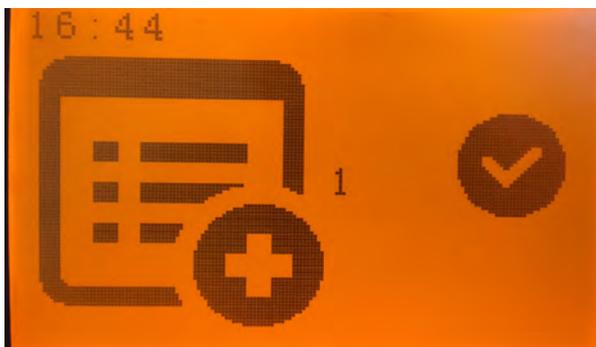
3.1 Enter set-up mode and scroll through the menu to the ADD DEVICE button

Select the ADD DEVICE menu



3.2 Connecting the ECU to the display. Make sure that the ECU and display are connected together via the supplied 4 pin RS485 cable and that the red status indicator is flashing on the ECU. If the

displayed number at the side of the add device symbol reads '1' as below, press the  button to confirm and pair the units.



If the number at the side of the add device symbol reads '0' then you will need to briefly press the 'RESET' button located on the side of the ECU. When the reset button is pressed the red status light will stop flashing while the button is depressed. When the reset button is released '1' should appear at the side of the add device symbol showing that the ECU has been recognised as a new device. Press accept to confirm and pair the units.

3.3 Adding the Inclinometer Sensor

Before trying to connect/pair an Inclinometer sensor make sure that it is **NOT** connected to the ECU or if it is working in wireless mode, that the power to the sensor is **OFF**. The easiest way to do this is to disconnect the Suzi cable between cab and trailer (if a Suzi is being used).

Follow step 3.1 to enter ADD DEVICE menu.

The number at the side of the add device symbol should read '0'. Now connect the sensor to the ECU's RS485 port, if the system is already installed and there is a Suzi cable between tractor and trailer connect it now. Once the Inclinometer sensor is connected a '1' should appear at the side of the add device symbol showing that the Inclinometer Sensor has been recognised as a new device.. Press accept to confirm and pair the units.

3.4 Adding extra HVDS Nodes

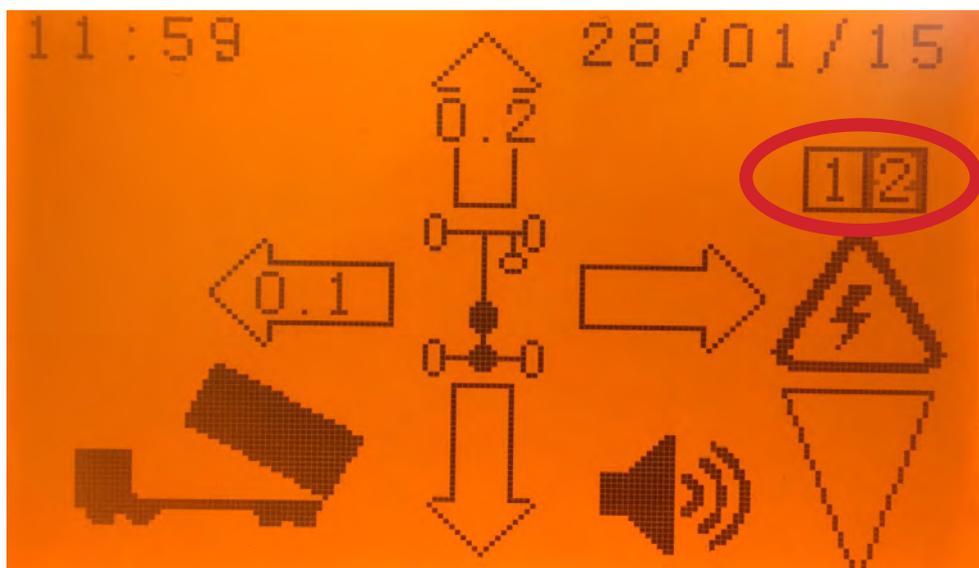
The TSafe system can accept up to 3 extra HVDS nodes giving a total of 4 HVDS detectors including the one that is built into the ECU. Extra HVDS nodes are added to the system in much the same way as adding an inclinometer sensor.

Before trying to connect/pair an HVDS Node sensor make sure that it is **NOT** connected to the ECU or if it is working in wireless mode, that the power to the sensor is **OFF**.

Follow step 3.1 to enter add device menu.

The number at the side of the add device symbol should read '0'. Now connect the sensor to the ECU's RS485 port, or if the HVDS Node is operating wirelessly power it up now. Once the HVDS Node Sensor is connected a '1' should appear at the side of the add device symbol showing that the Inclinometer Sensor has been recognised as a new device. Press accept to confirm and pair the units.

Note: When multiple HVDS nodes are connected to the TSafe system they will be indicated on the main display above the HVDS Signal Strength meter.



Display showing two HVDS Nodes connected

The TSafe system will cycle through each connected node every 0.25 seconds. The node that is currently being scanned is highlighted.

3.5 Removing a paired device

It is sometimes necessary to remove a module that has already been paired to the TSafe System such as when swapping trailers for inclinometer operation or when replacing a faulty or damaged module.

To remove a device that has already been pair to the TSafe system you must first disconnect it form the ECU's RS484 port or switch off the power supply to that module.

Enter set-up mode and scroll through the menu to the REMOVE DEVICE button

Select the REMOVE DEVICE menu.



The number of devices that are currently paired to the TSafe System but are NOT connected will now be displayed at the side of the REMOVE DEVICE symbol.



Press accept to confirm and un-pair the unit.

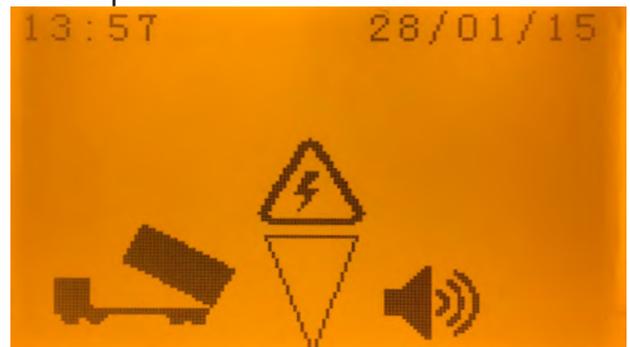


IMPORTANT NOTE!

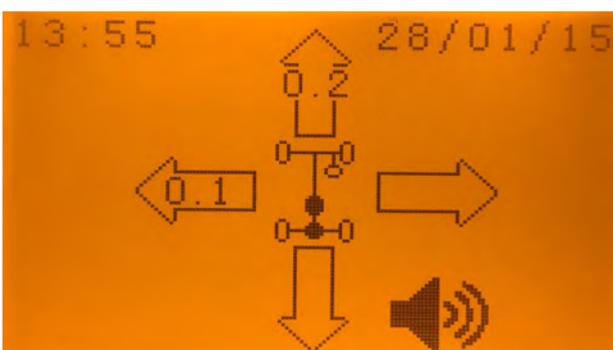
The TSafe has a display which automatically adapts to the way it is configured and to the number and type of sensor modules connected to it, to give the operator the optimum view of the information.



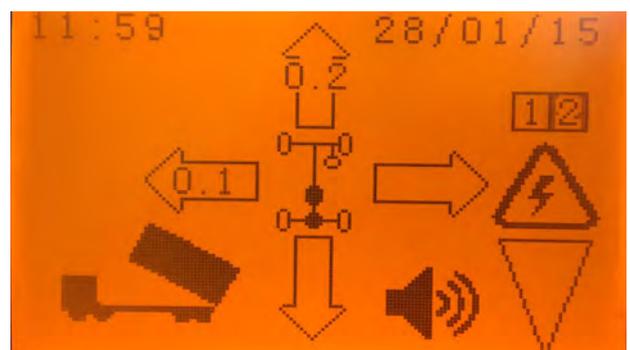
No Devices Connected



One HVDS (ECU) Connected



Inclinometer Only Connected



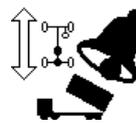
Inclinometer & Two HVDS Sensors Connected

4. Setting Inclinometer Alarm Angle Thresholds

When the TSafe is being operated as an Inclinometer system, the vehicles angle can be measured in two axis, Left to Right (Roll) and Front to Back (Pitch). The TSafe's menu system allows for 4 separate alarm angles to be set. The combinations are as follows



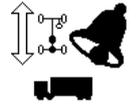
SET INCLINOMETER LIMIT
LEFT/RIGHT WITH BODY
RAISED



SET INCLINOMETER LIMIT
FRONT/BACK WITH BODY
RAISED



SET INCLINOMETER LIMIT
LEFT/RIGHT WITH BODY
DOWN

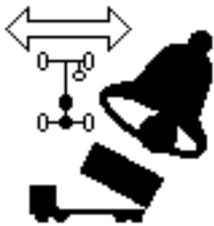


SET INCLINOMETER LIMIT
FRONT/BACK WITH BODY
DOWN

4.1 Enter set-up mode and scroll through the Inclinometer limit setting that you wish to adjust.

Select the required menu

e.g. Left/Right (Roll) limit with body raised



Use the   keys to adjust the angle. Once the desired angle is reached, press  to confirm and store the setting.

The alarm limit can be set anywhere from 0.1° to 22.9°. Each press of the up or down key will increment the setting by 0.1°. When 22.9° is reached the setting will roll back to 0.0°

4.2

VERY IMPORTANT INFORMATION

The TSafe system will normally be factory set to 5° Left/Right Roll as standard. This means that when the inclinometer sensor detects that the chassis of the vehicle reaches 5° or above the alarm will sound in the cab and if a tipping cut-out valve is fitted the tipper body will be prevented from being raised.

It is the sole responsibility of the operator to ensure that the Inclinometer alarm limit is set to an angle which is below the maximum angle that the vehicle and/or trailer is capable of operating at. Failure to do so may result in an overturn accident before the TSafe system has alarmed. Contact your vehicle/trailer manufacturer for advice on the maximum safe working limit.

It is also important to not set the alarm limit too low. The Inclinometer sensor is a very sensitive instrument which can detect variations in angle of 0.1°. It is not recommended that the alarm limit is set below 1° except for special applications. It is also normal for the inclinometer reading to jump around by a few point of a degree. This is the sensor detecting very small movements caused by wind and vibration. **Please contact Transport Support for further advice.**

5. Setting the Overhead High Voltage Detection Alarm - Overview

When the TSafe is being operated as an overhead high voltage power cable detector (HVDS), a signal strength meter will be displayed on the main screen. In the centre of the screen when no inclinometer is fitted or to the right of the screen when operating with an inclinometer.



The overhead high voltage detection system (HVDS) works by detecting the electrical field and frequencies that are emitted by overhead high voltage cables. In general most overhead power lines will emit a field which will extend out from them. The greater the voltage and to some degree the current draw on the overhead lines, the greater this field will extend out from them. The HVDS will detect this field and trigger an alarm condition when the detected signal reaches or exceeds the pre-set limit.

Due to the nature of overhead power lines, different voltages, cable configuration etc it is not always possible and is certainly not recommended to set a detection range in meters as each power line will emit a field out to a different range.

It is therefore recommended that vehicles which are constantly moving from site to site, such as aggregates tippers, are set to a high sensitivity (As factory set) and not adjusted. This will give optimum cable detection performance and alert the operator to the presence of overhead power lines.

If TSafe is being used on a vehicles or machine which remains stationary at one particular site such as excavators and cranes, it can be adjusted so as to give an indication of proximity to the particular overhead power lines that are closest to the vehicle.

5.1 Setting the Overhead High Voltage Detection Alarm Threshold

Enter set-up mode and scroll through the menu to the SET HVDS LIMIT button

Select the SET HVDS LIMIT menu

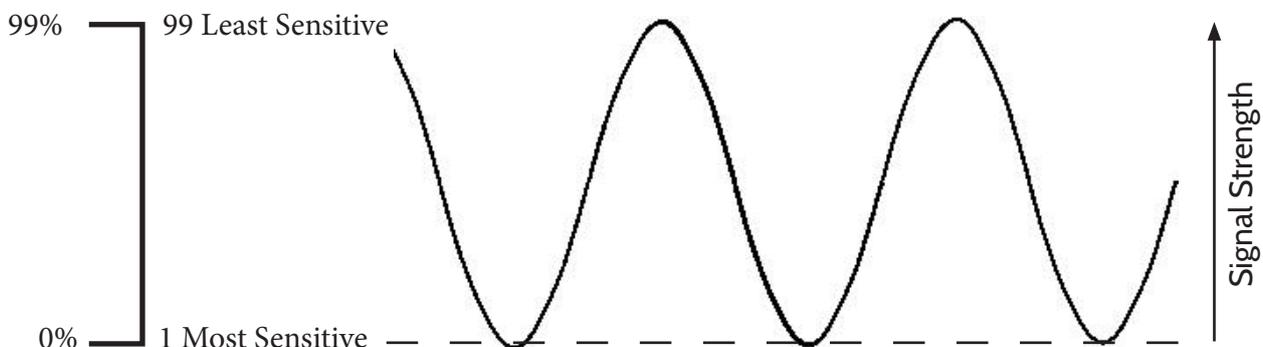


Use the   keys to adjust the setting.

Once the desired setting is reached, press  to confirm and store the setting.

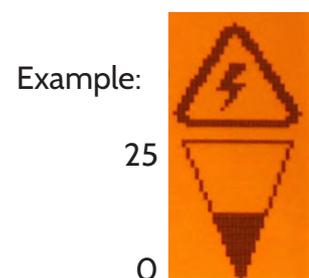
The alarm limit can be set anywhere from 0 to 99. Each press of the up or down key will increment the setting by 1. When 99 is reached the setting will roll back to 0.

It is important to note that the **lower** the setting number the higher the sensitivity of the detector. For example, if the HVDS alarm was set at 20 it would have to detect a high voltage signal 20% above background noise before the alarm triggered.



Note: The alarm setting will be the same across all HVDS nodes that are connected to the TSafe system.

The TSafe's HVDS signal strength meter proportionally adjusts to the alarm setting. Therefore, if the alarm limit was set to 25 then the bottom of the scale would be 0 and the top of the scale would be 25.



6. Manual Override

The TSafe system is equipped with two auxiliary relay outputs which can be set up to switch when one of the alarm states is activated. This feature is normally used to trigger external devices such as a tipper cut-off valve for use on an aggregate tipper to prevent the body being raised when the vehicle is at an unsafe camber angle or external warning devices such as beacons and sounders.

It is possible to set these relay outputs to MANUAL or AUTOMATIC mode so as to override an external device connected to it.

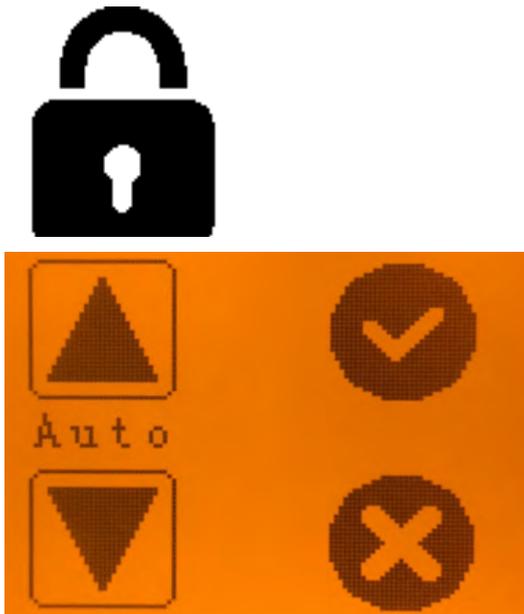
IT IS IMPORTANT TO NOTE THAT THE TSAFESYSTEM AUTOMATICALLY RECORDS ALL SETTING CHANGES TO ITS INTERNAL MEMORY AGAINST A TIME AND DATE STAMP. IT IS ALSO VERY DANGEROUS TO OVERRIDE ANY SAFETY DEVICE. TRANSPORT SUPPORT DOES NOT RECOMMEND ACTIVATING THE TSAFE OVERRIDE MENU WITHOUT PERMISSION AND EXPERT ADVICE.

OVERRIDING THE TSAFE SYSTEM COULD RESULT IN A SERIOUS ACCIDENT

6.1 Auxiliary relay outputs

Enter set-up mode and scroll through the menu to the SET HVDS LIMIT button

Select the SET HVDS LIMIT menu



Use the   keys to adjust the setting.

Once the desired setting is reached, press  to confirm and store the setting.

Auto = TSafe automatically controls the relay outputs
Tilt = RLY 1 Permanently Active. (RLY 2 OFF)
HVD = RLY 2 Permanently Active. (RLY 1 OFF)
BOTH = RLY 1 and RLY2 Permanently Active.

Note: When the system is set to 'Auto' the TSafe system will automatically control RLY 1 & 2. RLY1 will switch when the inclinometer limit alarm is activated and RLY 2 will switch when the HVDS limit is activated. The relay contacts are Normally Open (NO) and close during alarm an state.

The relays will switch for the duration of the alarm and switch back when the alarm stops. If you are using Wireless HVDS Nodes that have AUX RLY 1 & 2 available then these will also switch at the same time the outputs on the ECU.



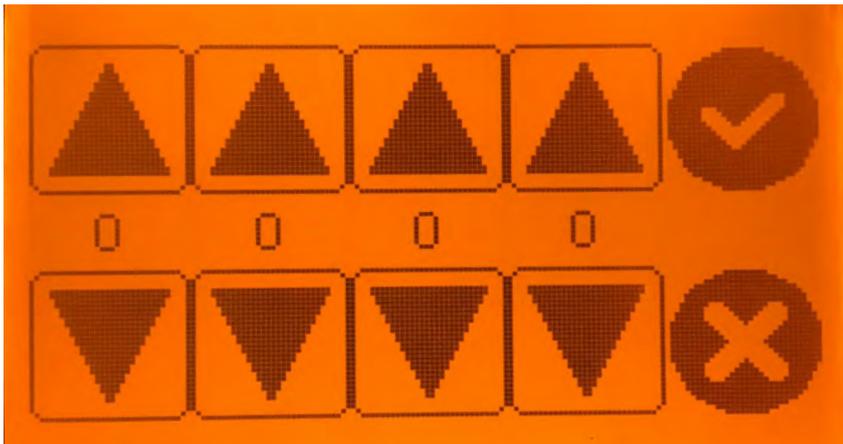
7. Management Lock Code

TSafe is protected by a 4 digit PIN to prevent unauthorised access to the menu and system settings. The default system PIN is '0000' unless it has been ordered with a specific pre set PIN (contact your manager or Transport Support for further details).

IT IS RECOMMENDED THAT YOU CHANGE THE DEFAULT PIN PRIOR TO MAKING THE SYSTEM OPERATIONAL TO PREVENT UNAUTHORISED ACCESS TO THE SETTINGS. TSAFE WILL AUTOMATICALLY STORE ALL CHANGES TO ITS SETTINGS AND PIN CHANGES. THIS INFORMATION CAN BE RETRIEVED FROM MEMORY TO TRACE ANY ATTEMPT AT UNAUTHORISED ACCESSES TO THE SYSTEM SETTINGS.

Enter set-up mode and scroll through the menu to the SET PASS CODE button

Select the SET PASS CODE menu



Use the   keys to adjust the number for each of the 4 digits of new PIN Code .

BE SURE TO MAKE A NOTE OF THE NEW NUMBER! IF THE PIN IS LOST OF FORGOTTEN AND IT HAS BEEN CHANGED FROM THE PRE-SET FACTORY CODE. THEN THE DISPLAY UNIT WILL NEED TO BE RETURNED TO TRANSPORT SUPPORT FOR UNLOCKING. CHARGES MAY APPLY.

Once the desired PIN is set, press  to confirm and store the new PIN number.

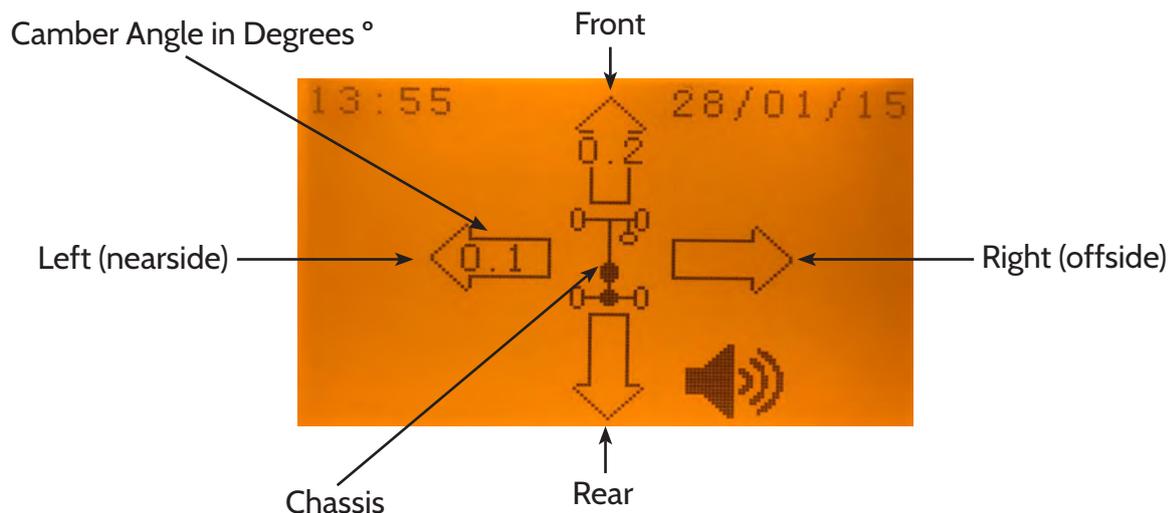
At this point a log of the PIN change will be automatically recorded in the systems memory.

8. System Operation

TSafe System Operation

8.1 Inclinator Operation

When fitted with a TS Inclinator sensor, the TSafe system will give full vehicle or trailer stability warning and also indicate to the operator the exact angle of the chassis in both axis. The Inclinator sensor measures the lean of the chassis Left to Right (known as Roll) and front to back (known as Pitch). These measurements and any alarm warnings are displayed on the TSafe's home screen in a simple 4 point graphic.



The vehicles camber angle will be displayed as a positive (+) value in degrees of angle in the arrow that points in the direction of lean. The directions that are in negative values will remain blank.

When the angle reaches 10% below the alarm limit (see section 4) the arrow(s) pointing in the direction of lean will begin to flash. This is to warn the operator that they are reaching the maximum safety limit.

If the inclinometer alarm limit is reached or exceeded the arrow(s) pointing in the direction of lean will turn solid black and the alarm will sound.

Alarm

The TSafe has a spoken voice warning alarm which gives the message "TILT WARNING" followed by a pulsed 'beep' tone when the alarm angle is reached or exceeded. A high intensity red LED will also flash on the front of the TSafe Display.

IF THE TSAFE GIVES AN ALARM INDICATING THE AN UNSTABLE VEHICLE AND HAS BEEN REACHED OR IF IT IS WARNING YOU THAT YOU ARE CLOSE TO THE SAFE WORKING LIMIT

STOP!

SLOWLY LOWER THE BODY IF IT IS BEING RAISED AND REPOSITION THE VEHICLE USING THE TSAFE AS A GUIDE TO A SAFE WORKING CAMBER.

REMEMBER! THE LOWER THE ANGLE, THE SAFER IT IS...

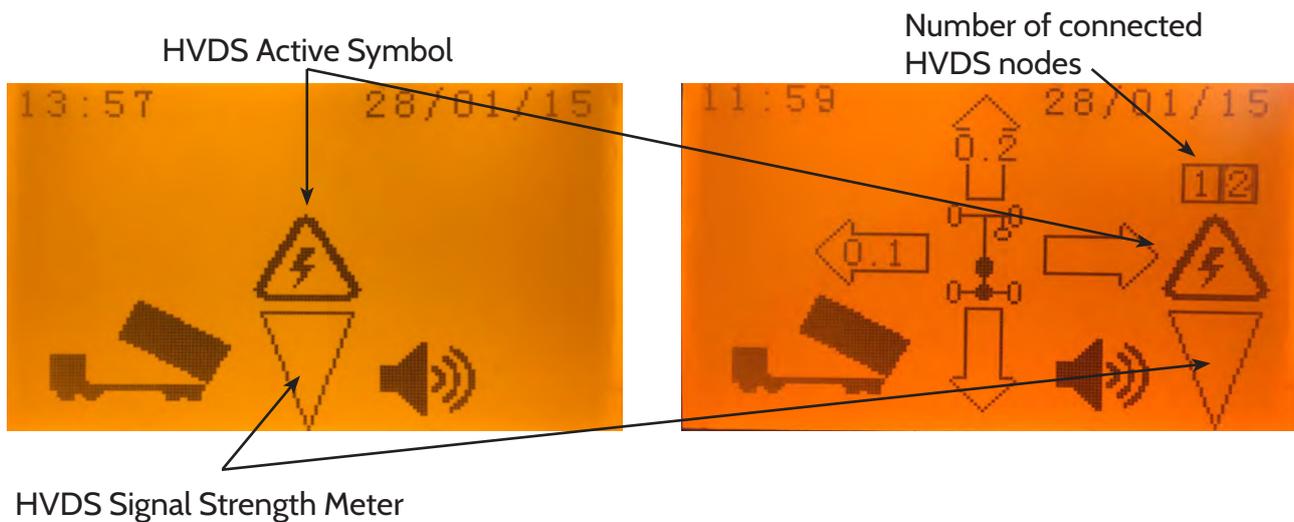
8.2 HVDS Operation

TSafe also features a High Voltage Overhead Power Cable Detector (HVDS) which is intended to prevent vehicles and machinery with a variable height from coming into contact with overhead power transmission lines.

Overhead power cables are detected via signals received from the TSafe's HVDS detection antenna or via remote HVDS sensor nodes which can be paired to the TSafe System. Each TSafe ECU has built in HVDS circuitry to give all round protection to the vehicle or machine that it is installed on.

TSafe can be used solely as a high voltage detection system without any Inclinator features.

When operating as a HVDS the TSafe display will show a High Voltage symbol above a signal strength meter.



When overhead power cables are detected the signal strength will be indicated on the signal meter.

The High Voltage Symbol will begin to flash when the detected signal is 10% below the pre-set maximum HVDS limit (see section 5).

If the alarm limit is reached or exceeded then the High Voltage Symbol will turn black and the warning alarm will sound.

The alarm is a spoken voice which gives the message “High Voltage Warning” followed by a pulsed ‘beep’ tone. The high intensity red LED will also flash on the front of the TSafe Display.



This alarm will continue whilst the TSafe is detecting overhead power lines.

IF THE TSAFESYSTEM GIVES AN OVERHEAD CABLE WARNING, STOP AND DO NOT RAISE THE BODY OR ANY PART OF THE VEHICLE. GET OUT AND VISUALLY CHECK YOUR PROXIMITY TO ANY OVERHEAD CABLES. KNOW YOUR MINIMUM SAFE WORKING DISTANCE FROM OVERHEAD LINES.

When multiple HVDS nodes are connected to the TSafe system they will be indicated on the main display above the HVDS Signal Strength meter. The TSafe system will cycle through each connected node every 0.25 seconds. The node that is currently being scanned is highlighted.

The FIRST HVDS node to detect a high voltage signal will lock on to it and the corresponding number on the display will be highlighted.



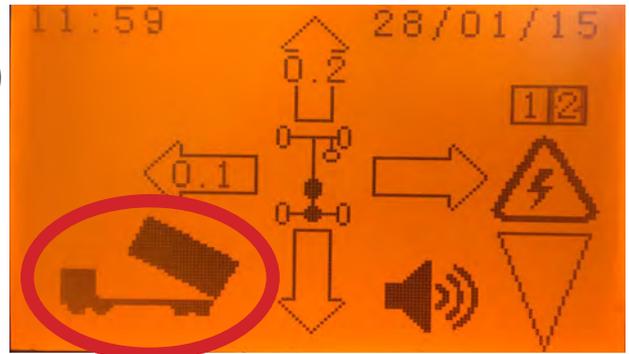
8.3 Body Raised Indicator

The TSafe system also incorporates a body raised indicator which is primarily intended for use on tipper vehicles but can be adapted for use on cranes and other vehicles or machines with a variable height. (contact Transport Support for details).

The Body Raised indicator can also control when the TSafe system activates its alarm so that an audible alarm is only heard when tipping commences. TSafe senses the position of the body (i.e. raised or lowered) via an inductive proximity sensor (a sensor which detects the presence of metal).

Body raised or lowered will be indicated on screen in the bottom left corner. The symbol will show body up when the tipper body has moved more than 30mm (maximum) away from the body raised sensor.

When in body UP mode the Tsafe display will be at full brightness and the audio alarm will be active. Once the body is fully lowered to the chassis the indicator will show body DOWN. When the body is down the display will automatically go into a standby mode where the display back-light drops to 50% and the audio alarm is disabled.



If the body is raised then the TSafe will automatically come out of standby mode and the display back-light will go to full brightness. When the body is raised all off the audio alarms become active but can be muted by pressing the audio alarm mute button.

8.4 Audio Alarm Mute

The TSafe has an audio alarm mute which can be activated once an alarm has been triggered.

The audio alarm can be muted temporarily by pressing the MUTE button 

Audio mute will be indicated by the MUTE symbol  Pressing this again will activate the audio alarm.

It is not possible to lock the TSafe system into audio alarm mute. The mute will always cancel once the system goes back under the safe alarm limits. If the system is not currently in an alarm state and mute is activated then it will automatically cancel after approximately 5 seconds.

This is a safety feature to prevent an alarms status being ignored.

Even when the audio alarm is muted there will still be a visual indication of an alarm.

9. Technical Specifications

General

Operating Voltage	10-28v DC
Nominal Operating Current	400mA
Communications	RS485 Bus
Memory	SD Card up to 32GB
Wireless Standard (if fitted)	433Mhz FM (UK) 868Mhz & 915Mhz available on request

Inclinometer

Sensor Operating Temperature	-30°C to +55°C
Inclinometer Measurement Range	± 22.9°
Inclinometer Resolution	+/-0.1°

Cut-Off Valve

Valve Operating Voltage	12 or 24v DC
Valve Operating Current	170mA
Valve Operating pressure	0-125 P.S.I
Valve Operating Temperature	0° To +50°C

Voice Warning Sounder (optional)

Operating Voltage	12-24v DC
Nominal Operating Current	500mA
Sound Level	100db
Frequency	Speech M.I.R.A. tested for on and off highway (sounder only)

HVDS Node (optional)

Supply Voltage	10-28v DC
Nominal Operating Current	100mA
Optional Internal Battery Pack	12v DC Li-ion Cell

Protection Ratings:

External Electronic Connections	IP68
Sensor Casing	PVC IP68
In Cab Display	ABS IP55
ECU	Aluminium IP55
HVDS Node	Aluminium IP68

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