TMS2 Micro-Seismic Analytical Monitor for the detection of trapped miners.

Setup and Configuration

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TMS2 Setup and Configuration

Introduction

Disclaimer: The system is an aid to detect trapped miners. The system must not be relied on solely to detect a trapped miner or the location of such as indicated. In live emergency events to date the system has detected, located and directly enabled trapped miners to be saved. However, the operator must use their judgement to make the final call to start a rescue operation.

The TMS2 is the second generation of SureWave Technology's unique micro-seismic monitoring instrumentation. The TMS2 is specifically designed for the detection of signs of life within a mine collapse situation. The MM2Tri system will detect seismic signals associated with geology faults and rock stability helping to give advanced warnings of potential collapses. Use the correct system for the required operation.

This is a wide area system capable of monitoring up to 1KM from each sensor. Trapped Miner pounding must be detected from at least two sensors to enable a location to be calculated. The location should be used as a guide only as geological features will affect the accuracy. The customoptionsTM.info setting 'HITS' prevents random mine events being recorded as an underground detection of a trapped miner. Ensure this remains set at 2 or more as required. NOTE. This is the pounding hits per event window. A 12-channel system has half the event window of a six-channel system. It is recommended to run as a six-channel system unless it's essential to cover more ground with the four sensors (12 channel only). Set the sensors to 2, channels to 6 in the customoptionsTM.info file where possible, connecting only two sensors. That said, the 12 channel, four sensor system will correctly detect pounding.

The proprietary IP can "see through" surrounding noise associated with a working mine often many times larger from that generated from the activity of interest. The system is proven to depths and surface distance of up to 1KM DEPENDING on the sensor mounting and ground conditions.

If required and arranged in advance, SureWave Technology can assist in the remote operation of the system via any IP connection.

Overview

This document outlines the basic setup of the TMS2, its sensors and cables. It is intended as a guide only and should be read in conjunction with operator training given by SureWave staff. Additional documentation may be available here: www.surewavetechnology.co.uk

Handling and Unpacking

Please observe all handling and transit warning notices.

IMPORTANT: THE SENSORS ARE FRAGILE AND MUST BE HANDLED WITH EXTREME CARE!

Dropping or subjecting the sensors to any sharp movement may decrease the sensitivity and cause permanent damage.

The TMS2 including its peripherals, sensors and interconnecting cables are supplied in a secure aluminum transit box. For larger system configurations, multiple containers may be used.

Open the box and carefully unpack it to check the contents are correct. The box contents will vary depending on your individual TMS2 system configuration.
Tri-axial Systems include:

Model TMS2/6 with 2 tri-axis sensors	**Model TMS2/9 with 3 tri-axis sensors**	**Model TMS2/12 with 4 tri-axis sensors**
1 x TMS2 (Trapped Miner System) CPU	1 x TMS2 (Trapped Miner System) CPU	1 x TMS2 (Trapped Miner System) CPU
2 x tri Axis (3 channel) sensors	3 x tri Axis (3 channel) sensors	4 x tri Axis (3 channel) sensors
2 x 75M sensor cables on reels	3 x 75M sensor cables on reels	4 x 75M sensor cables on reels
1 x 24V Battery pack	1 x 24V Battery pack	1 x 24V Battery pack
1 x Mains Power pack (12V and 24V power)	1 x Mains Power pack (12V and 24V power)	1 x Mains Power pack (12V and 24V power)
1 x interconnect cable	1 x interconnect cable	1 x interconnect cable
1 x 12V Battery charge lead	1 x 12V Battery charge lead	1 x 12V Battery charge lead
1 x USB waterproof Keyboard	1 x USB waterproof Keyboard	1 x USB waterproof Keyboard
1 x USB Memory stick	1 x USB Memory stick	1 x USB Memory stick
Selection of sensor 'spikes'	Selection of sensor 'spikes'	Selection of sensor 'spikes'
Crate	Crate	Crate
Sensor bags	Sensor bags	Sensor bags
1 x User Guide	1 x User Guide	1 x User Guide

If any components of your TMS2 system are damaged or missing, please contact us immediately upon receiving the goods.

This system can be used out in free air anywhere in the world at ambient temperatures of at least 45 to 50 deg C maximum. Operating in enclosures that prevent free air movement or that raise the air temperature to over 50 Deg. C may cause permanent damage not covered under warranty. External power must be limited to 15.0V maximum on the 12V supply or the system may switch off to protect itself.

The system requires DC CLEAN voltages of 12V and 24V. the supplied battery pack will supply 24V and an external battery should be used for the 12V. The supplied Mains power pack supplies all voltages required where mains supply is available. Use this to charge the internal batteries after use.

Ensure the internal 12V batteries and 24V battery pack are always fully charged when not in use.

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Locating the TMS2 Sensors

The sensors are fragile and need to be handled with extreme care. It is important that the sensors are located correctly as a badly positioned sensor could make the TMS2 insensitive and cause activities to go undetected. **It is recommended to inform miners to bang on the roof or a roof bolt of the mine using a crib block at repeated intervals as close as possible to 1 Second in an emergency. This is standard practice in some countries. The system will look for regular pounding and the user can set the number of pounds to be detected before indicating a trapped miner has been found.**

The sensors should be in holes which need to be as solid as possible and have an undisturbed base of solid compact material ideally down to clay or heavy compacted sand or rock. At a minimum, the hole must be deep enough for the top of the sensor to be a few inches below the surface. For permanent setups, back filling with any material is fine and recommended for permanent installations. Additionally, the supplied spikes can be fitted to the sensors to improve the ground coupling.

Two or more sensors can be placed in an area of interest on your site to determine if activity is present. Once a signal has been detected, the sensors can be repositioned closer to provide a more precise location of the activity.

It is important that the sensor is level on its surface. If fine adjustment is required, the leveling screws of the sensor can be adjusted so the visual leveling indicator aligns with its center position.

In an emergency if an approximate area of where the collapse occurred is known then a single sensor can be set up near the area to check for initial signs of life.

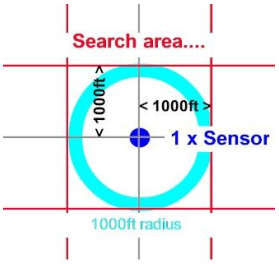


Fig1a. Single sensor

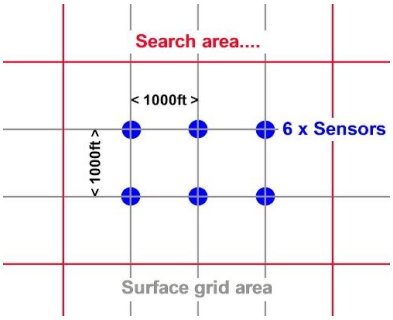


Fig1b. Array of sensors

For a wider search then more sensors can be used, when searching large areas upto four sensors can be used. We recommend that you divide your site area up using a grid pattern, 4 sensors can cover up to 3 KM^2.

When a signal is detected it will be shown on screen as a wave form, a further indication will be identified by a RED dot adjacent to the sensor that received the strongest signal. Once a signal has been identified reposition the sensors around the strongest signal to further zoom in on the signal activity. It is then possible to keep doing this until a more accurate position is known.

Each subsequent move of the sensors will end up with an improved location of the source of activity, so after the signal is detected the sensors should be moved closer to its source to further improve the location, this can then be repeated until the location is to within 10 meters.

Initially the sensors are placed 500 Meters apart, this can be used to cover a wide search area. If a signal is detected then the sensors should be repositioned 250M or 100M apart around the location where the signal was detected, this will give a better idea of where the signal originated from. When the next signal is detected the sensors should be placed 50M around the source to give better resolution of the location.

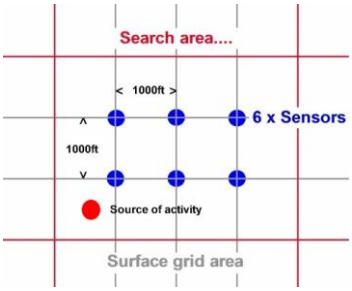


Fig1c. Array of sensors looking for a source of activity.

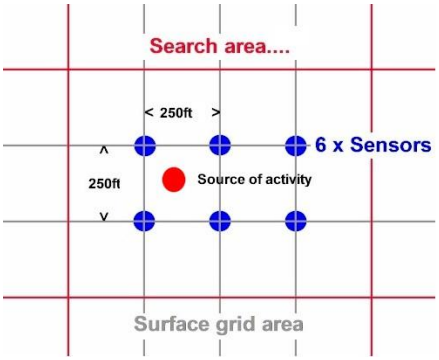


Fig1d. Array of sensors repositioned around the source of activity area.

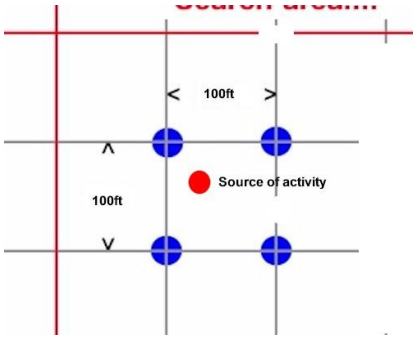


Fig1e. Array of sensors repositioned closer to the source of activity to further locate a more precise area.

Connecting the sensor cables

Run a cable from each sensor back to the TMS2. The cables connect to the Block A, Block B, Block C* and Block D* connectors on the left side of the TMS2 – see figure 1c.

Each connector can handle up to 3 channels, three, six, nine or twelve channels may be fitted to your system.

Remove the protective dust caps from each end of the sensor cables and connect one end to the TS1/3 sensor and the other end to the TMS2, ensure the cables are aligned and twist the outer edge of the connector to lock into place.

Locations are correct when between and in front of the sensors as in fig1f.

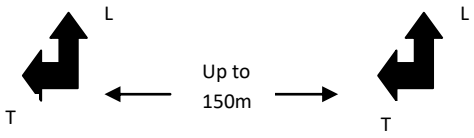


Fig1f.sensor orientation

Connecting the power supply
Once the sensors have been connected to the TMS2, connect the 24V battery pack (or external supply for permanent installation) to the 24V power connector on the left side of the TMS2. Remove the dust caps from the TMS2 and the rear of the battery pack. Align the connector then push in, rotate the body of the connector clockwise to screw the connector into place at each end.

IMPORTANT: ENSURE THE CORRECT VOLTAGE IS SET WHEN CONNECTING THE BATTERY PACK TO THE MAINS SUPPLY!
To prevent damage ensure the voltage selector on the battery pack is set to the correct voltage this can be 110V or 230V

Note: Do not charge the 24V battery pack whilst the TMS2 is monitoring, the battery pack will last approximately 24 hours from a full charge.

If the TMS2 is used as a portable device, the internal battery will supply power for a limited time (approximately 2.5 hours). For longer use connect the 12V power connector on the back of the TMS2 to a 12V DC power source such as an automobile battery for extended temporary use, or for a permanent installation use an external power supply.

IMPORTANT: IF USING AN EXTERNAL POWER SOURCE ENSURE THE POLARITY IS CORRECT!
Incorrect polarity can cause permanent damage to the TMS2 system, see figure 2a for correct polarity.

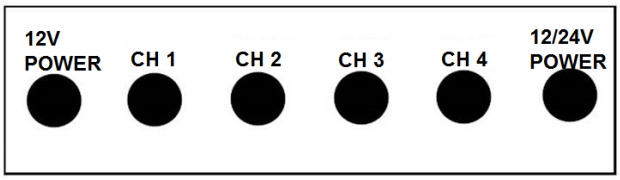


Figure 2a. *Left side socket connectors on the TMS2 unit*

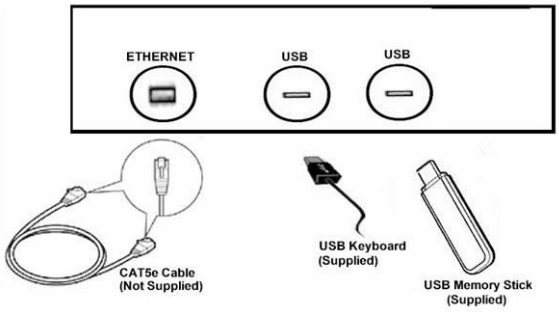


Figure 2b. *Right side socket connectors on TMS2 unit*

Network Connection – (not normally required for rapid deployment in an emergency)
The TMS2 can be connected to a network using Cat5e cabling, this will enable the TMS2 to be remotely monitored. Remove the dust cap from bottom right side of the TMS2 by unscrewing it in an anti-clockwise direction. Plug in a Cat5e cable to your network or router. See figure 2b.

The TMS2 is configured by default to pick up an IP address automatically from a DHCP server on your network or from your internet service provider, a static IP address can be used if required. See Advanced Configuration elsewhere in this user guide for information on network settings.

For sites that do not have a wired network connection a USB Wi-Fi or 3G USB modem can be used. Follow the manufacturer's instructions for installing such devices. They must be compatible with Microsoft Windows XP Embedded™

For SureWave to remotely assist in a rescue, the connection to the internet is required as above.

Keyboard Connection
A USB keyboard (supplied) can be connected to the TMS2 system. The keyboard makes it easier to change the configuration of the TMS2.

Remove the dust cap from the middle right side of the TMS2 by unscrewing it in an anti-clockwise direction. Plug in the USB keyboard, after a short delay the USB keyboard will be functional. See figure 2b.

Powering on the TMS2
Open the lid on the TMS2 by lifting the two clips in an upward direction.

Press the power button for 1 second then release (see figure 3).

After about 10 seconds the TMS2 will begin to boot up and proceed to load its operating system software.

Double click the onscreen TMS2 icon. Select launch TM2Tri (bottom option bar).

The TMS2 unique software application will begin to load automatically and the system will start monitoring. If pounding is detected the waves will be shown with the nearest sensors and location if possible shown with a red dot on the mine plans image on screen. There is an 8 second delay.

Figure 3. *Power button location*

Shutting Down the TMS2
To shut down the TMS2 press and release the power button. After a short delay the TMS2 will switch off.

For portable deployed systems unplug all cables and ensure all dust caps are refitted to the cable ends and connectors when not in use and remember to recharge the batteries if required.

Advanced Configuration
Other than setting the site image file and number of 'hits', the advanced configuration does not need to be changed. The system automatically configures itself during its use.

The advanced configuration settings allow initial setup of the TMS2 during its commissioning. The settings should not normally need to be changed once setup except in the event of portable deployment to a new site where adjustments may be required.

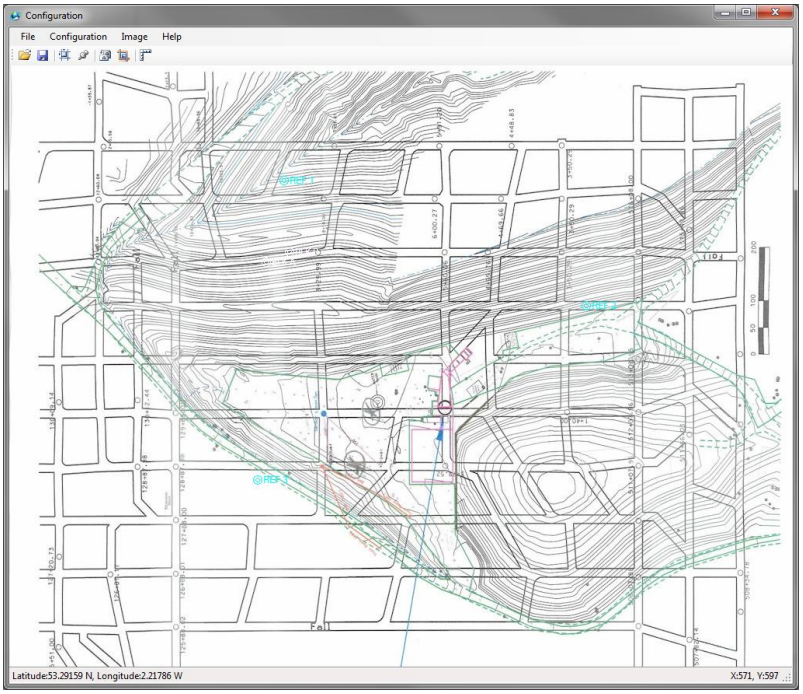
IMPORTANT: CHANGES MADE TO THE ADVANCED CONFIGURATION MAY PREVENT THE TMS2 SYSTEM FUNCTIONING. Only proceed if asked to change these parameters by SureWave Technology.

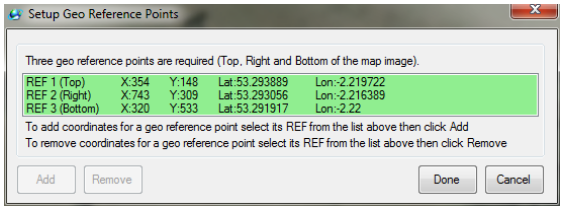
To change the configuration settings, double click on the customoptionsTM Icon The file will be displayed. See page 14 for details of possible changes.

Make sure you SAVE the file before closing!

GPS Location Configuration (option not fitted as standard)
If the GPS position of the TS1 sensors is known, they can be entered into the configuration settings. When using GPS positions the site image requires at three known fixed GPS points (top, right and bottom of site image) to ensure the site image calibration is set.

These GPS fixes should point to known landmarks on the site image. If the sensor GPS positions have been defined the software will prompt the user for two or more fixed known GPS positions for site image calibration. If GPS positions of the sensors have not been defined the software will prompt for the location of the TS1 sensors. Simply follow the on screen instructions to set the sensor positions on your site image using the touch screen interface.





To configure the GPS geo-reference points, load your site image (the site image must be in a merceator projection for GPS to work) click Configuration then click 'Geo Reference Map Image'. Follow the on screen instructions and select three known points.

To remove a geo-reference point, select the point from the list then click Remove. The screen background will show green if all the geo-reference positions are set or red if a position is missing.

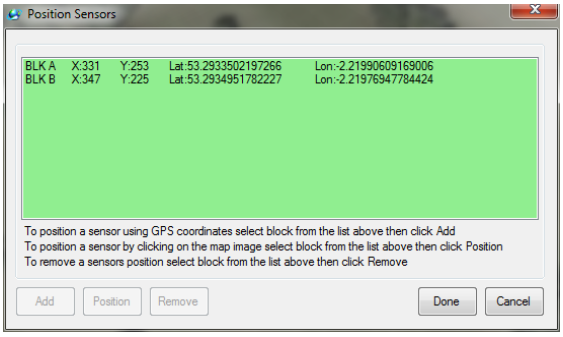
There are 2 ways to position sensors, either by clicking on the site image where the sensor is located or using GPS coordinates of the sensor.

To add a sensor position, first geo-reference your site image (if using GPS coordinates) click Configuration then click 'Position Sensors'.

To manually position a sensor by clicking on a map click Position, you will then be prompted to click the site image for the sensors position. To position the sensor with GPS coordinates click Add, you will then be prompted to enter the latitude and longitude coordinates.

To reposition a sensor, click the sensor in the list then click Remove, reposition the sensor by clicking Add or Position.

The screen background will show green if the sensor positions are all set or red if a position is missing.



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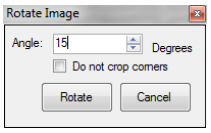
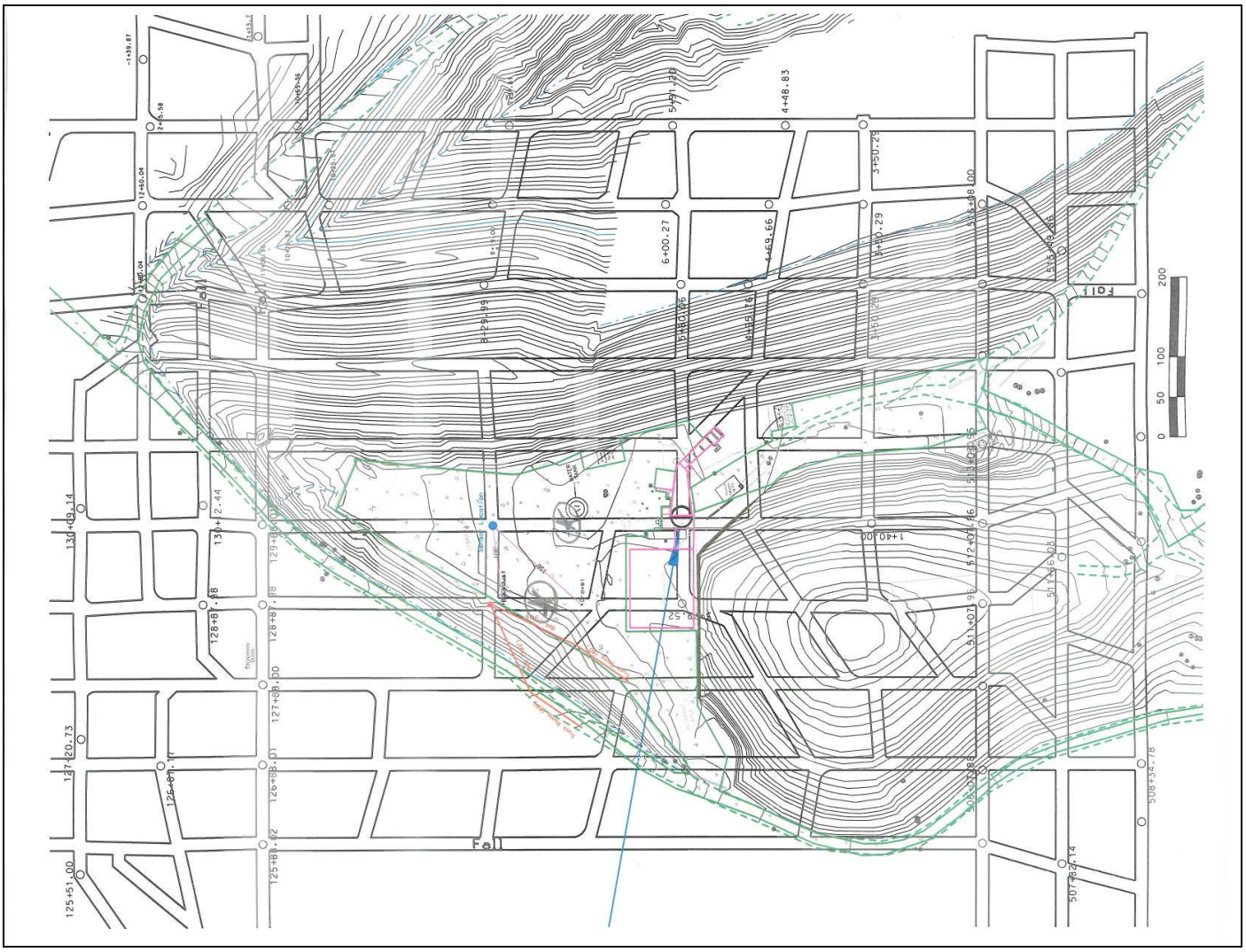
The site image needs to be rotated in order that the top of the picture aligns with the ‘L’ longitude direction on the tri-axial sensors. When using single channel sensors they should be positioned in a horizontal pattern across the site from left to right. The horizontal line of the sensors should correspond to the ‘T’ latitude direction of the site image.



To rotate the site image, click rotate, enter the angle of rotation then click Rotate.



Each event source type will be identified by the placement of a colour dot overlaid on your site image. There will be a key to these indicting the source event (where known) on the screen of the TMS2.

Remote Monitoring

Remote monitoring will not normally be required for a rapid deployment setup; however, it is available if required and may be more useful in installations where the system is permanently setup for monitoring the mine for potential stability faults (model MM2Tri).

Ensure the TMS2 system is connected to your network or internet via your ISP. If you know the IP address of your TMS2 you can connect via any web browser using TCP port 8080 for example http://192.168.0.1:8080

If you are using a Dynamic DNS service you will have been given a domain name, enter it in your web browser address bar for example http://TMS2001.surewavetechnology.com alternatively other Dynamic DNS services can be used such as TZO.com or DynDNS.com instructions and pricing is available on their websites.

Once connected to the remote web server within the TMS2 you will be prompted for your login credentials, enter your username and password then click the Login button to continue.

The default username is **admin** with the default password as **admin**

Once logged in the user will have the option to view live data, review the TMS2 system status and change their remote admin password.

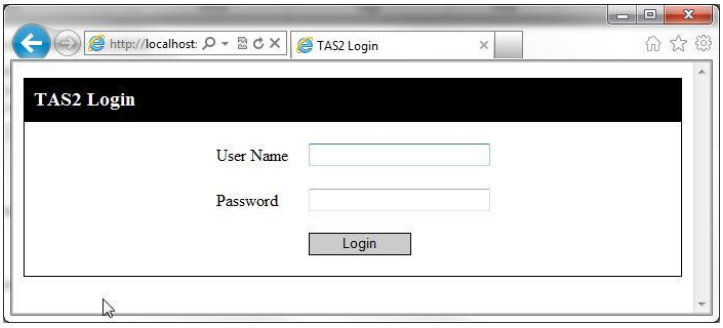


Figure 6a. *Remote monitor login screen*

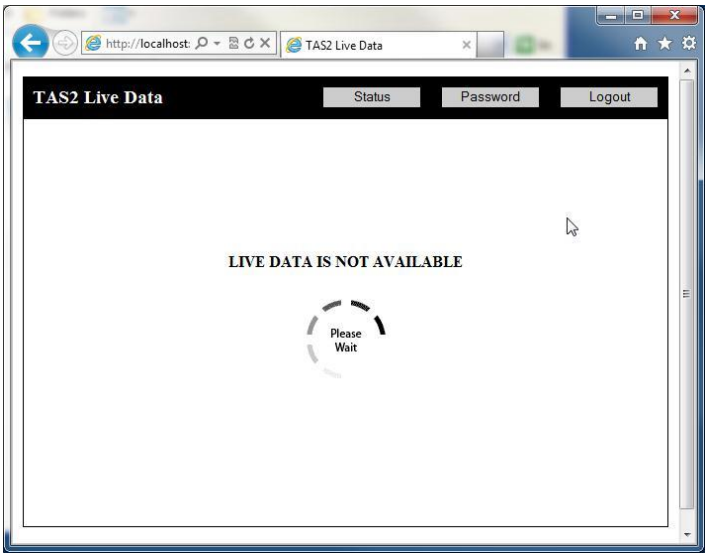


Figure 6b. Remote monitor *live data (event) screen*

The live monitoring data image will appear on screen as soon as monitoring data becomes available.

The screen is refreshed automatically every few seconds and event images are updated in near real time.

Each event source type will be identified by the placement of a colour dot overlaid on the user site image. There will be a key to these indicting the source event (where known) on the screen of the TMS2 and remote monitor screen.

To navigate to a different page, click one of the buttons on the top right of the page; Status gives battery state, CPU temperature and network IP address and Password allows the user to change their remote access admin password.

Click Logout when finished remote monitoring, the login screen will be shown again.

The status window gives up to date information on battery state, CPU temperature and network address.

If the battery is below 25% it is recommended to charge as soon as possible. In the unlikely event the CPU temperature runs above 176°F (80°C) it is recommended switch off as soon as possible to allow the TMS2 to cool down.

Click the Back button to return to the live data screen.

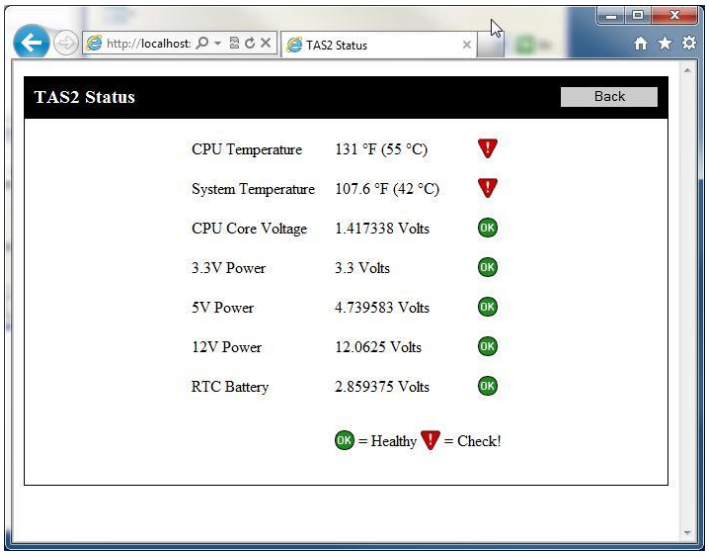


Figure 6c. Remote monitor status screen

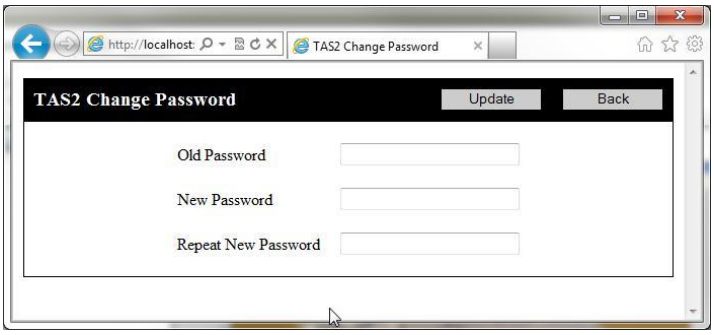


Figure 6d. *Remote monitor change password screen*

The admin password can be changed, enter your current password followed by a new password. Repeat the new password again then click the Update button to make the changes.

The new password will be applied next time the user remotely logs in.

Click the Back button to return to the live data screen.

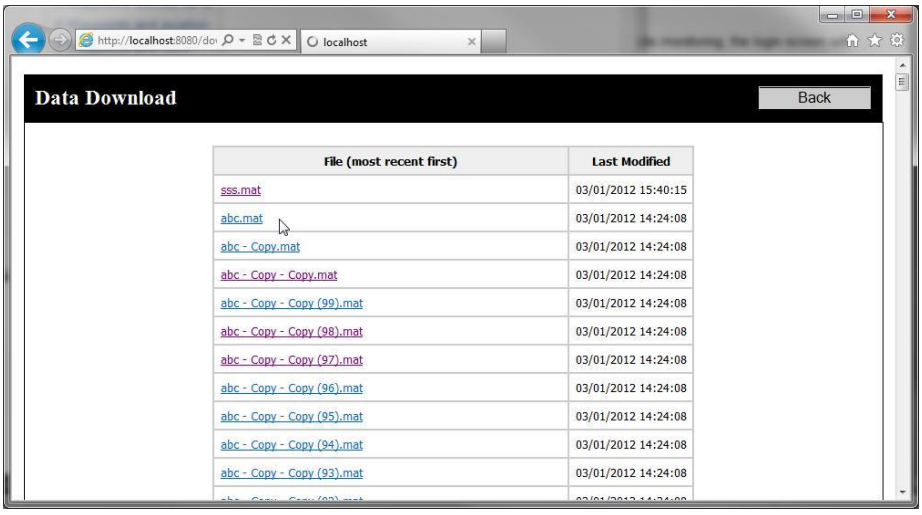


Figure 6e. *Remote monitor data download*

Data can be downloaded if required by clicking the Download Data button on the top of the screen. Click the file name click Save, choose a location to save the file to.

Troubleshooting

Problem	Possible Cause
I can't connect remotely to the TMS2 system	Ensure the network cable or USB Wi-Fi / Modem is connected and that the TMS2 is connected to the network / internet. Ensure your remote computer is connected to the network / internet. Ensure that TCP port 8080 is open on your network firewall and that your internet service provider is not blocking this port. If using Dynamic DNS check with your service provider.
I can't get the TMS2 to switch on / boot up	Ensure the battery has not run flat and charge if necessary. Replacement batteries are available from us. External battery lead has been connected the wrong way round causing in-line fuse to blow. Only replace with 10 Amp 20mm Slow blow fuse.
I don't see any events or the sensors are too insensitive	Check the position of the sensors is suitable refer to page 4 for locating the sensors. Check all cables are securely connected to the sensor and TMS2. Check the battery pack is connected or other external power source. Ensure the sensors have not been damaged due to dropping or excessive shock. Ensure the trigger value is set to 1 in the customoptionsTM.info file

TMS2 Setup and Configuration

TMS2 Technical Specifications

Features

- Portable – for rapid deployment, or permanent installation
- Multi-channel seismic inputs (6, 9 or 12 channels)
- Unique proprietary intellectual property “Sees through background noise”
- Extreme dynamic range up to 130dB
- Stable embedded platform using Microsoft Windows™ operating system
- Built in 12 inch backlit TFT monitor with touch screen technology
- Powerful user interface software makes the TMS2 effortless to use
- Multiple sensor heads cover a wide area up to 1 KM
- Full remote monitoring via wired or Wi-Fi* network connection
- Tough and rugged design. IP67 (with lid closed)
- Designed and manufactured in the UK

** Requires a USB Wi-Fi adaptor or Wi-Fi bridge when using on Wireless networks.*

Available Models

TMS2/6	TMS2 base unit with 6 monitoring channels
TMS2/9	TMS2 base unit with 9 monitoring channels
TMS2/12	TMS2 base unit with 12 monitoring channels

Portable systems are supplied with intelligent charger battery pack and battery pack interconnecting cable.
Fixed systems will require a permanent power supply of 12V DC @ 2.5A and 24V DC @ 200mA.

Specifications (when used with TS1 family of sensors)

OS Platform	Microsoft™ Embedded Windows 7™
Display	10.5” or 12” diagonal, 16.8million colour TFT with touch screen
Power Ports	1x 12V charge input, 1x 24V battery pack input
Sensor Ports	Channel2 1 thru 6 Standard, *Channel 7 thru 9, *Channel 10 thru 12 options
External Ports	2x USB2.0 and 1x CAT5e Ethernet
Dynamic Range	Up to 130dB
Power Supply	Internal 12V 7AH battery with 12V charging cable and external 24V battery pack with built in intelligent charger If powered externally 12V DC @ 2.5A and 24V DC @ 200mA
Dimensions	412 x 330 x 175mm
Weight	132Ibs (60 kg) Full system with two sensors, cables / reels, Battery pack and accessories.

** Channels 7 thru 9 only available on the TMS2/9 and TMS2/12 models. Channels 10 thru 12 only available on the TMS2/12 model.*

TS1 Technical Specifications

Features

- Manual levelling with visual levelling guide
- Single-axis (security) or Tri-axis (mines / Trapped Miner) sensor arrangement
- Multiple sensor heads cover a wide area up to 1 KM
- Tough, rugged IP67 design
- Designed and manufactured in the UK

Available Models

TS1/3	Sensor head with tri-axis sensor for location monitoring

Specifications (when used with TMS2 Micro-seismic Analytical Monitor)

Activity	**Surface Distance**
Crib block detection	1KM striking on mine roof or roof bolt with a crib block – dependant on strata, senor locations and strength of pounding
Dimensions	130mm x 120mm diameter mounted on a 180mm base plate
Weight	10lbs (4.6kg)
Detection Radius	1km

Standard Cables (depending on configuration) additional lengths on request

CABLE REEL 3	Single Axis cable reel 75Meters (10 pin male to male)

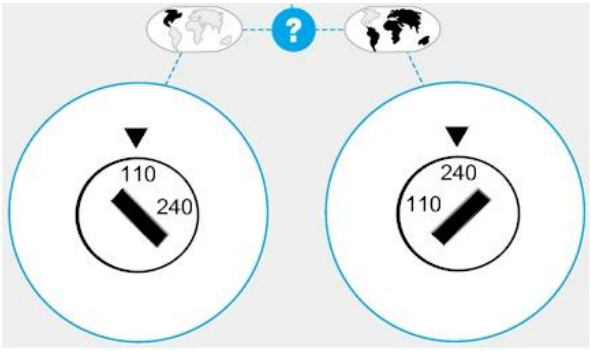
Appendix

The TMS2 system is supplied in configuration:
Tri-axial sensors positioned either as rapid deployment or permanent mounted to give accurate location.

The TS1 sensors are supplied as:
Tri-axial (three) channels

Further information is available via our website www.surewavetechnology.com

Ensure that the 120/240 voltage selector switch on the battery pack is set to the correct voltage for your region.
If you change the switch position, make sure to unplug the battery pack first.



Warning: Applying 240 volts to a system set at 110 will ruin the power supply.

The battery pack is designed to operate from 100 – 120 V AC 50 – 60 Hz or 220 – 240 V AC 50 – 60 Hz

Detailed Information

PRECISE INSTRUCTIONS FOR RUNNING AND OPERATING TMS2 system

Housekeeping and directories:

Short cuts on the desktop point to the Working Directory and the Data Files (output DIR).

SP2 programs **install** from a user directory (for example my documents). On the first run, they create a '**Working directory'** normally found here:
XP example (pre 2016 systems):
C:\DOCUME~1\ADMINI~1\LOCALS~1\Temp\Administrator\mcrCache8.1\MM2Tri0\MM2Tri
Windows7 example (Current systems):
C:\User\AppData\Local\Temp\user\mcrCache9.1\TM2Tri0\TM2tri

Please note the limited disk space on the SP2 system. This is not designed to run any user software. Remove unused images / files not used and remove csv and .mat files in the output DIR (C:\Documents) to an archive regularly. If updating any of the SP2 programs, first remove the **working** directory for example: C:\User\Appdata\Local\Temp\user\mcrCache9.1\MM2Tri0. Before starting the update for the first time, copy any image / customoptionM.info files first, and then copy back to the **working** directory after the first run.

MM2Tri:

This application runs ONLY on the SP2 system. It should be copied to 'my documents' (or administers documents) by SureWave – the **install** directory.

Once run, the **working** directory will be created. This will contain the image to use, customoptionsM.info and additional files used by the system.

To run:

Double click or tap the icon 'TMS2'. You are presented with two options:

1 'Click to change map image, sensor positions or mm2tri configuration' – post 2016 systems do not use this – see the separate icon for customoptionTM on the desktop to open the file directly.

Use ONLY for 2d jpg images to geo reference the sensor positions and manipulate the image file as required.
Follow the on screen instructions as required. For all monitoring, add the sensor positions to the customoptionM.info file as required – see below.

2 'Click to launch TM2tri'

Select to start the application. Once the program starts, the version number sensors and channels will be shown, followed by a window with the image referred to in the customoptionsM.info file in the working directory. The image file must be in the same DIR.

During monitoring, the image will update automatically to show the event locations in real time. In addition, csv files will be created containing details for each event detected. Images of the waves (Pounding) will be shown and saved in the data Files DIR.

To stop:

Click on the 'Click this to close' Button. The application will stop in around 7 seconds. The windows of the pounding and Mine / site image will remain open for inspection. Close all before proceeding.
Alternatively, if operating via a server / mapped drive:
Create 'appstop.txt' in the **install** directory – this is for full remote management. 'Appstopped' will be created once stopped. See above for open windows.

Changing the image:

Images are used by the system to display the location of events. Images can either be 2d (jpg images) or 3d (figures).

2d. These are simple jpg images obtained by the user. Google earth images can often be suitable.
Copy the image to the **working** directory. Change the customoptionM.info file to the same name.
CustomoptionM.info settings required for a 2d image with the name "coordinated.jpg" are:

map/plan name: coordinated.jpg
plotmap: 1

3d. These are 3d 'cube' figures used to show the events in 3d. These must be made from a suitable file – for example dxf compatible drawing packages. The procedure is as follows:
Output from the CAD package a dxf.CSV file in the correct format (see bench.CSV for an example).
Use Readdxfall.exe (supplied on SP2) to convert this file to a 3d.fig
Copy this 3d.fig to the **working** directory.
CustomoptionM.info settings required for a 3d image with the name 3d.fig are:

map/plan name: 3d.fig
plotmap: 2

If a mine plan is not available in 3d from a dxf file, use 'blank.fig' as the image name instead.

Recommended test procedure after a new installation:

Once the system is fully setup and running, it is recommended you tap each sensor (with your finger only) in the three directions at one second intervals. Do this for each sensor head fitted. These results (the .mat files) should be kept to show SureWave if requested.
Change user settings:

Additional settings available to the user to change are as follows. DO NOT CHANGE the RED lines unless instructed by SureWave for special monitoring requirements:

Instructions 0=off, 1=on set 0 or 1 1
sensor distance: 50 Can be set to 1 to test the sensors or must be set to 50 for normal use. The display will show the Sensor nearest the stamp
trigger: 1 If=1, automatic, or >1 ignore small activity
map/plan name: coordinated.jpg image name and type. .fig=3d, .jpg=2d
plotmap: 1 2d=1, 3d=2
ploton: 0 do not change
debugp: 0 do not change
do not change below here no!
sensorpos: 1 sensor positions read from this file(1) 0 user input at runtime via the touch screen display
Number of sensors: 3 the number of tri-axis sensors connected to the system.
SN001: 0 MUST be 0
qtytosave: 210 number of raw events to save (FIFO)
autosave: 1 save events
readold: 0 Set to 1 on a pc TO REPLAY EVENTS
speciala: 1 do not change
security: 0 do not change
pansswave: 0 1=p and s waves only 3d, 0= surface (2d) waves for Trapped Miner =0 ONLY
sitespeed: 7 do not change
Channels: 9 The number of channels in use (number of connected sensors x 3)
Log Period: 24 new log file (csv) after this number of hours
hits: 3 This is the minimum number of pounding hits per window required to record a detection.
2,0,0,0,2,3,1,5,6,4,8,9,7 sensor orientation first 4 fields ONLY
294,538,0,334,335,0,411,189,0,4,4,4,5,5,5,6,6,6,7,7,7,8,8,8,9,9,9,10,10,10,11,11,11,12,12,12 **
end: end
** sensor positions. 1x,1y,1z,2x,2y,2z,3x,3y,3z,4,4,4,5,5,5,6 etc
Do not change this file unless you fully understand and have read the instructions above. If in doubt, contact support for advice.
Modify this file in notepad only and do NOT change / delete / add tab spacing. **Always make a copy of a working file first!**

Sp2ServerLocal (NOT recommended for Trapped Miner systems):

This optional application runs ONLY on a PC – do not run on the SP2 system. This is to enable a remote user to monitor the systems output.

Note the image must be the same used on the SP2 system and therefore copy the customoptionM.info and image files to the **working** dir.

Before running for the first time, set the correct directories in the file 'ServerITFile.info as follows:

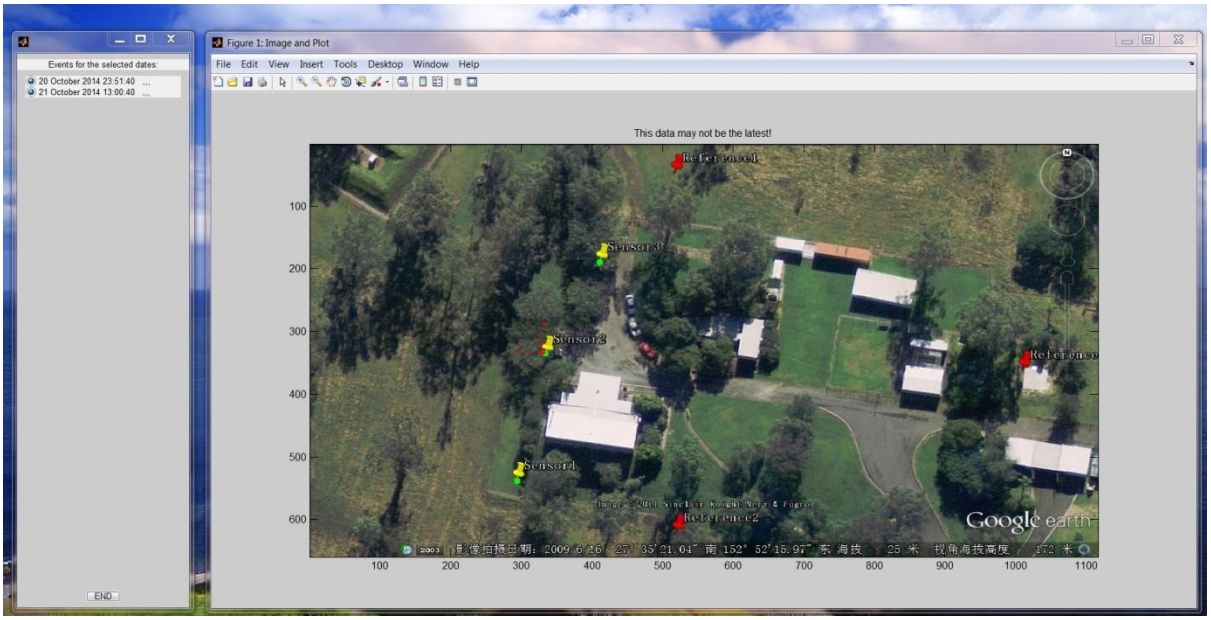
Instructions 0=off, 1=on set 0 or 1 1
Path: c:\Users\PhilipShaw\Documents\remote\ **Path to live SP2 *see below**
Email: 1
SMS: 0
Email Address: yyyygooglemail.com
Password: xxxx
Recipient: andrea@surewavetechnology.com
Email Message: Alert!
Email Subject: SP2 Alert!
end: end

*If this is a path to a live SP2 system, make sure it works and is live. Data will be automatically found in real time and moved to the local **install** dir.
If not a path to a live SP2, this is a local dir where you put the data. It MUST be a different directory to the **install** directory.

TMS2 Setup and Configuration

To run:

Double click the Sp2ServerLocal icon or the .exe file directly.



Any csv files in the install directory will be available and shown in the left panel.

To add data file when there is no live IP connection to the remote systems:

If the Path specified in the ServerITFile.info is correctly pointing to a live SP2 system, data will be found and added automatically.
Alternatively, for systems not connected to the server, copy (and delete from the SP2) the csv file and paste into the Path dir specified above on the local PC. When the file has been added, create a blank file 'dataready.txt'. The system will automatically list the new data and move to the **install** dir. The file 'dateready.txt' will be deleted by the application.

Click the radio button next to the date file name to select / deselect the files for viewing.

The MM2Tri application will make a csv file containing the following information depending on the settings in the customoptionsM.info file:

Pandswaves=0 setting:

site.jpg SensorB X=373 SensorB Y=345

Date Time	Category	X	Y	Z	Aazem	Aelem	Bazem	Belem	Cazem	Celem	AMag	BMag	CMag
30-Oct-2014 09:39:15	Unknown	2.98E+02	3.44E+02	0	-4.88E-01	2.78E-02	7.50E-03	8.25E-02	4.70E-01	2.87E-02	4.11E+05	4.86E+05	9.63E+05
30-Oct-2014 09:39:22	Unknown	2.98E+02	3.42E+02	0	-1.39E+00	3.74E-03	4.28E-02	3.20E-02	7.40E-04	3.47E-02	4.18E+05	2.76E+05	7.37E+05

Pandswave=1 setting:

SensorB X=334 SensorB Y=335 SensorB Z=0

Date/Time	loc_x	loc_y	loc_z	seismic_moment	magnitude	sourceradius	stressdrop	slip
31/10/2014 14:09	3.50E+02	5.24E+02	-2.58E+01	3.39E+12	2.35E+00	6.15E+01	6.38E+06	3.61E-02

Note that only true P and S wave events will generate the extra source mechanic parrameters.

Dual Use (set up for two different types of monitoring) NOT TMS2 systems:

Version 1.13 onwards allows Dual function monitoring by a second setting under the following parameters: Trigger, Hits, pandswaves and dist. To use this option, set the SplitUse value to 1 or 0 if not required. The second function locations are plotted in Blue on the image.

Here is an example CostomoptionsM.info file with the second use values in RED

```
Instructions 0=off, 1=on set 0 or 1 1
sensor distance:    50  20
trigger:    10  11
map/plan name:  SecondMT.jpg
splitUse    1
plotmap:    1
ploton: 0
debugp: 0
do not change below here    no!
sensorpos:  1
Number of sensors:  2
SN001:  0
qtytosave:  210
autosave:   1
readold:    0
speciala:   1
security:   0
pansswave:  1   0
sitespeed:  7
Channels:   6
Log Period: 24
hits:   1   2
2,0,0,0,2,3,1,5,6,4,8,9,7
294,538,0,334,335,0,411,189,0,4,4,4,5,5,5,6,6,6,7,7,7,8,8,8,9,9,9,10,10,10,11,11,11,12,
12,12
end:    end
```

TMS2 Setup and Configuration

Common issues and additional Trouble shooting:

1 Image not correct on SP2

Make sure the customoptionM.info file in the **working** dir has the same file name and plotmap is 1 (2d jpg) or 2 (3d fig).

2 Image not correct on the server

Make sure the same image is used as on SP2. Check the image is in the server **working** dir.

3 Locations not showing on the server when new csv files added to the **Path** dir.

Check that the sensor locations are correct for the image x and y scales used. These can be any scale and do not have to include a zero in the scale.

4 Applications not standard mine / slope monitoring or surface stamps to test, do not appear to work correctly.

The system can be used for several other types of seismic monitoring but may need special configuration or in extreme cases, custom changes. Contact your support channel for expert guidance on this. Do not attempt the make changes yourself.

5 Surface testing does not appear to locate correctly.

The system is a Trapped Miner detection system. It automatically tries to ignore surface noise / events to detect only underground trapped miner pounding at around 1 second intervals. A surface wave 'test' setup can be used for simple tests with limited accuracy for the event location. In the customoptionM.info file:
Set the pandswave field to 0;
Use a 2d jpg file with plotmap=1;
Arrange the sensors such that at least two sensors pick up the events.

6 SP2 stops working unexpectedly:

a. Flat battery – charge the system and ensure a permanent supply from an external battery 12V. Check the fuse in the external lead. Replace only with a 6.3A 20mm fast blow fuse.
b. The system MUST be connected to an external 12V battery NOT a generator or similar. Solar panels are ideal to provide permanent power, however, connect the solar panels to a battery and SP2 to the battery **not the load terminals** of the charge controller.
c. The system will create 'events' if the 24V battery pack is on charge from a mains supply. Only use with an external battery (2x12V=24V) and solar panels as above.
d. The system has run out of disc space. Ensure csv files are removed to the server or USB achieve. Do NOT put user applications on SP2 unless SureWave approve.
e. Any other unexpected system errors should be noted (try and get a screen dump – alt print screen and paste into a word document or paint image using a USB device to copy of the system) and send details to: philip@surewavetechnology.co.uk
f. Check the sensors are correctly seated on solid material and covered as described on page 4 otherwise wind noise will prevent operation.
g. Ensure all connectors are fully connected and have 'clicked' into place without dust or other material preventing a full connection.
h. Ensure the sensors have not been damaged due to dropping or sharp knocks.
i. Contact SureWave support (philip@surewavetechnology.co.uk) for support.

7 Locations do not match the known mine locations

a. Make sure the sensor positions are correct. The sensors must be arranged as A on the left, B on the right and C further to the right. 'L' should point from the sensor line towards the area to be monitored. If this is not possible, 360 coverage is required, the sensor fields may need additional info including the angle each sensor is in (L to the Y axis). Try and get the L lined up with the Y axis to avoid this.
b. The trigger value is incorrect. Unless set to '1' (Automatic), make sure the value is not set so low its constantly being exceeded by background man made events.
c. Report any other issues to SureWave.

SOFTWARE RELEASE HISTORY: (TM2TRI.EXE)

version	Date	Details
1.13	19.06.2015	RELEASE VERSION
1.14	22.06.2015	SAVE DATA IN SUB DIR (DATE/TIME) ADD DATE/TIME TO WAVES AND SAVE
1.15	11.11.2016	12 channel version available
1.16	02.02.2017	customoptionsTM.info controls the sensors and channel numbers, no need to reprogram
1.17	03.04.2017	12 channels trapped Miner version improvements for Windows 7 released.
1.18	12.04.2017	Displays all triggered events

SOFTWARE RELEASE HISTORY: Sp2ServerLocal.exe

version	Date	Details
1.0	2011	Release version
		N/A

TMS2 MANUAL VERSION HISTORY:

version	Date	Details
1.2	17.08.2016	Latest version
2.0	12.04.2017	Tidy up and explain options clearer.

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