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TEST EQUIPMENT RENTAL SERVICES

# UltraTEV Monitor™

## Operating Manual

# UltraTEV Monitor™ Operating Manual

Product Code: UTM2
Version: 4
October 2016

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# 1 Important Information

- Care must be taken where work is performed in tight corners, where the proximity of other earth planes will affect the reading. If possible maintain a distance of more than 30cm from metal work which runs perpendicular to the sensor faceplate.
- Strong electromagnetic fields from mobile phones, RF transmitters, VDUs and un-screened electronics in the frequency range DC to 1GHz can have an effect on the readings. A measure of local fields can be obtained by holding the UltraTEV Monitor in free-air at least 1 metre away from any conducting surface.
- The UltraTEV Monitor must be used in accordance with local safety rules and procedures.
- The UltraTEV Monitor is designed for use at ground potential only.
- The UltraTEV Monitor™ is designed and tested for indoor use only.
- When testing electrical plant ensure that the metalwork is earthed before applying the Nodes/Probes.
- Maintain safety distances between structures at high voltage and the UltraTEV Monitor and its operator at all times.
- Do not operate the UltraTEV Monitor or its accessories in an explosive atmosphere.
- The UltraTEV Monitor contains no user serviceable parts, always return to EA Technology or your local distributor for service and repair.
- Do not hard wire the unit to the mains supply without providing a means of emergency disconnection
- In the event that the supplied wall plug is changed, EA Technology assumes no legal responsibility for the safety of the instrument or persons using the instrument.
- EA Technology RFCTs are designed to be installed by suitably competent operators on cable earth/ground straps which are suitably and efficiently connected to earth/ground to maintain safety.
- RFCTs, connecting leads and test equipment do not provide protection against high voltage.
- Operators must ensure that the cable earth/ground conductor is capable of carrying the prospective earth/ground fault current for the time required for protective devices to operate and without giving rise to dangerous voltages or creating danger. The integrity of earth/ground conductors and connections should be confirmed by the operator prior to installation of the RFCT.

- Under no circumstances are earth/ground connections to be loosened, disconnected or otherwise altered to allow installation of this equipment. It is acknowledged that connecting RFCTs within High Voltage cable enclosures is the only means of connection in some situations. This is not a preferred method due to the closer proximity to high voltage conductors. To avoid danger, the operator's safety rules must be observed and careful consideration given to the placement, installation and ongoing inspection of sensors, connecting leads and test equipment.

  The operator is responsible for assessing risks and ensuring that the RFCT, the connecting leads and the test equipment are connected safely.

If PD is detected in plant connected directly to the High/Extra High Voltage power system, the authority responsible for the plant should be notified immediately[1]

**For Application Information, please contact:**

product-support@eatechnology.com

[1] If no PD is detected, this does not necessarily imply that an item of HV/EHV Plant is free from PD. PD can vary in its magnitude and severity and insulation structures can fail through causes other than those attributable to partial discharges.

# 2 Introduction

## 2.1 General

Partial discharges are electric discharges that do not completely bridge the electrodes. The magnitude of such discharges is usually small; however they do cause progressive deterioration of insulation that may lead to eventual failure.

Non-intrusive partial discharge detection provides a means for identifying these potential sources of insulation failure that result not only in loss of supply to customers, but can also endanger staff.

A partial discharge emits energy in the following ways:

**Electromagnetic:**

- Radio
- Light
- Heat

**Acoustic:**

- Audio
- Ultrasonic

**Gases:**

- Ozone
- Nitrous oxides

The most practical techniques for non-intrusive testing are based on the detection of the radio frequency part of the electromagnetic spectrum and ultrasonic emissions. The UltraTEV Monitor has been specifically developed to enable electromagnetic and ultrasonic activity to be monitored in a single simple to use instrument.

## 2.2 Airborne Ultrasonic Discharge Activity

Acoustic emissions from partial discharge activity are normally at a frequency too high for the human ear, i.e. ultrasonic. As the partial discharge progresses towards failure the frequency sometimes decreases into the audible range.

Using an instrument to detect the ultrasonic signal has several advantages: instruments are more sensitive than the human ear, are not operator dependent and ultrasonic frequencies are more directional. The most sensitive method of detection is using an airborne ultrasonic microphone. This method is very successful at detecting partial discharge activity provided there is an air path between the source and the microphone. However, in the case of sealed switchgear with no air path, an ultrasonic contact probe can be magnetically attached to the external surface of the switchgear to monitor internal activity.

## 2.3 Electromagnetic Discharge Activity

When partial discharge activity occurs within high voltage switchgear it generates Transient Earth Voltages (TEV) and electromagnetic waves in the radio frequency range.

The TEV signals are high frequency and therefore travel in the skin of the switchgear and can only escape from the inside of the switchgear through openings in the metal casing. These openings may be air gaps around covers, gasket materials or other insulating components.

In addition when the electromagnetic wave propagates from the partial discharge site it also impinges on the metal casing of the switchgear producing a Transient Earth Voltage (TEV).

The partial discharge activity may be detected non-intrusively by placing a probe on the outside of the switchgear whilst the switchgear is in service.

## 2.4 Cable Discharge Activity

Partial discharge can occur in voids in cable insulation in a similar way to internal discharges in switchgear insulation. Cross Linked Polyethylene (XLPE) cable joints are particularly prone to partial discharge, more so than Paper Insulated Lead Covered (PILC) joints, but less in both cases than the cables themselves.

Because cables are usually buried access is only available from either end, so the previously discussed ultrasonic and TEV measurement techniques cannot be used. Partial discharge activity can be accurately assessed in a cable using 'off-line' measurement techniques. The most successful of these is VLF mapping which will also give the location of any partial discharge activity as well as magnitude. However taking a cable 'off-line' can be inconvenient and expensive, so partial discharge can be detected in 'live' cables using a RFCT on the earth connection or strap between the cable sheath and the earthed switchgear.

# 3 The UltraTEV Monitor™

## 3.1 Configuration Options

The UltraTEV Monitor™ is available in a number of different hardware and software configurations to suit different requirements.

The Hub is available in either a Wall-Mounted or Portable version. The Wall-Mounted Hub is designed for permanent or semi-permanent installations and has the following features:-

- Supports up to 60 Nodes
- Connects to SCADA
- Can control extra devices through SCADA interface
- Wired LAN, Wi-Fi and 3G connectivity
- Intuitive web interface, including simple system commissioning

The Portable Hub is design for temporary or semi-permanent installations and has the following features:-

- Supports up to 20 Nodes
- Small, light and robust
- Quick to set up
- Simple to extract data
- Wired LAN, Wi-Fi and 3G connectivity
- Intuitive web interface, including simple system commissioning

## 3.2 UltraTEV Cloud versus Standard

The UltraTEV Monitor™ software is available in either a Standard or UltraTEV Cloud version. The main difference between the Standard and UltraTEV Cloud version is that when using the UltraTEV Cloud version, the user communicates with an EA Technology server. The server handles communication with the Hub. With the Standard version, you communicate directly with the Hub.

The UltraTEV Cloud version does not store data on the device and requires an internet connection to operate. Initially setting up the cloud based Hub will require a direct connection but after that, you will be able to connect to the UltraTEV Cloud server from anywhere on the internet. This means that no analysis functionality is present on the device itself; instead all analysis of data is performed using the web portal to the UltraTEV Cloud.

The Standard version is used by connecting to the Hub. This can be done locally or through a remote / internet / corporate connection if available. Analysis can be done on the Hub directly. Alternatively, collected data can be downloaded and analysed using the PDDAS application.

## 3.3 Portable System Outline

The UltraTEV Monitor system consists of a Hub Unit, laptop-style power supply and between 1 and 20 Nodes with associated peripherals. The Nodes each contain TEV and temperature sensors. Further TEV, Cable PD and ultrasonic sensors may be connected to the Nodes to match the requirements of the substation.

The Hub Unit is a specialised data acquisition unit responsible for data collection, processing, interpretation and presentation to the user. In some variants the Hub may be responsible only for controlling the flow of data from Nodes to the UltraTEV Cloud.

Figure 1: Portable UltraTEV Monitor Hub Unit1

## 3.4 Portable Power Supply Operation

The Power Supply provides power to the Hub Unit, which in turn powers the Nodes.

The green Power indicator on the Hub Unit is illuminated when the Power Supply is connected to the mains.

There is a 5A fast-acting fuse on the power input to the Hub Unit. If the Hub does not power on when connected to the mains, unplug any power cables to the Hub Unit and check if this fuse is blown. A flat-bladed screwdriver is required to open the fuse holder.

## 3.5 Portable Hub Unit Operation

### 3.5.1 Hub Status LEDs

The status LEDs are mounted on the front panel of the Hub Unit as shown in Figure 2:

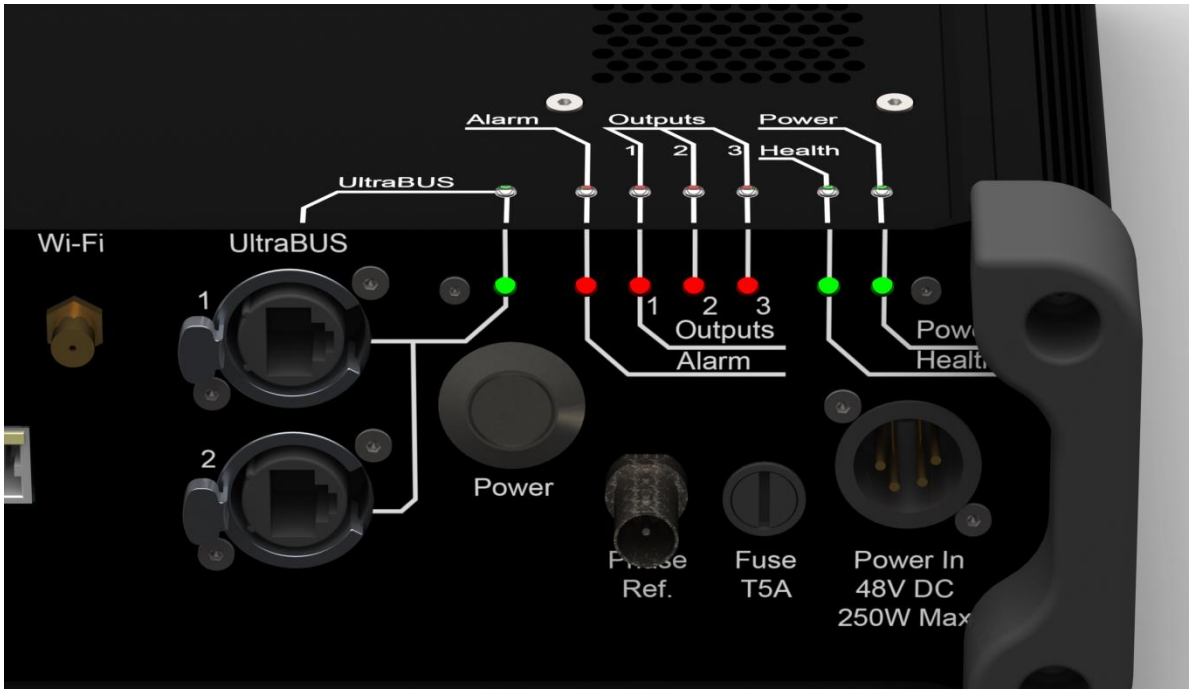



Figure 2: Monitor Hub status LEDs

The functionality of these status LEDs is as follows:

- **Power:** This green LED is normally lit and indicates that the Hub Unit is correctly powered.
- **Health:** This green LED will flash while the system is starting up, and will remain constantly lit while the monitor is functioning.
- **Alarm/SCADA:** These LEDs indicate the state of the Alarm and SCADA Outputs. If an Alarm condition is detected, the corresponding LED on the front panel will change from clear to red. The following functionality is preprogramed for each output:
    - **Alarm:** LED will illuminate (or output will switch to an Alarm condition) when any alarm is raised on the Monitor)
    - **SCADA Output 1:** LED will illuminate when a Red threshold alarm is raised
    - **SCADA Output 2:** LED will illuminate when an Amber threshold alarm is raised
    - **SCADA Output 1:** LED will illuminate when a Health alarm is raised (including sensor disconnect)

    There are three cases where all SCADA LEDs will illuminate and when all outputs will be switched into Alarm condition:

    - Red, Amber and Health alarm are raised at the same time
    - UltraTEV Monitor HUB was shut down
    - UltraTEV Monitor HUB software failed to respond

    Please refer to Section 12 for information on alarm configuration.

- **UltraBus:** This green LED is normally lit while the system is logging data and indicates that the UltraBus ports are powered. If the UltraBus ports are not powered then this LED will be off.

Note: Do not connect or disconnect any nodes while this LED is illuminated.

### 3.5.2 Hub Connectors

The connections on the Hub Unit are on all on one face of the Hub Unit (see Figure 3):

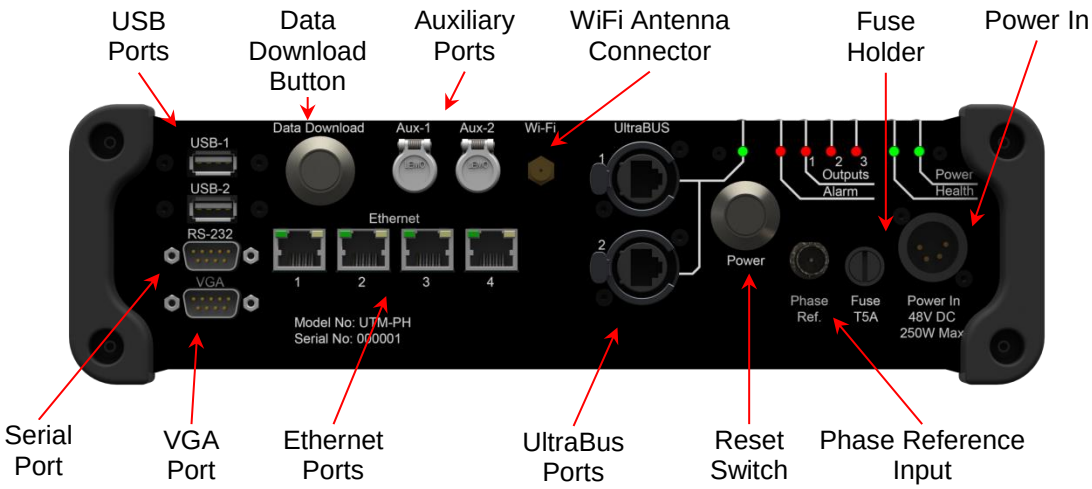



Figure 3: Hub Unit Connectors

- **VGA Port:** A port is provided for connection to a VGA monitor. This allows for a local view of the Monitor status.
- **Serial Port:** An RS232 serial communication ports is provided to allow future system expansion.
- **Ethernet:** Four Ethernet ports are provided. Port 1 is for connection to a LAN, port 4 is dedicated for system configuration and maintenance and allows a laptop to be connected; the laptop then provides the screen/keyboard interface to the hub. The other two ports are provided to allow future system expansion.
- **USB Ports:** Two standard USB ports are provided. (**NOTE:** USB cables must not be greater than 3m in length and ideally less than 1m.)
- **Auxiliary Ports.**: These ports are provided for future expansion
- **Wi-Fi:** Screw the included Wi-Fi antenna to this connector to connect to a Wi-Fi network.
- **Power Inlet**: This port connects to the laptop-style power supply and provides power to the Hub Unit and the Nodes.

### 3.5.3 Start Up and Shut Down Procedures

With the Monitor Hub, Power Supply and relevant Node strings connected, the following procedure should be followed to activate the system:

1. Apply power to the Power Supply and ensure the green Power LED on the Hub Unit is ON
2. The Monitor Hub should now become active. This can be verified by monitoring the status of the LEDs on the front panel (see Figure 2) which should show the following.

- System Power – ON
- Monitor Health – FLASHING during boot sequence, ON when monitoring.
- Alarm and Outputs (1-3) – OFF
- UltraBUS Power – OFF and consequently ON when in monitoring state
- **NOTE:** When the UltraBUS Power LED is illuminated **DO NOT** connect/disconnect any of the UltraBUS power connectors.

If the Hub Unit does not automatically start, press the Reset button. The boot sequence should start immediately.

3. Alarms are configurable from the software by the end user. If any of the Alarm and Output LEDs are ON, please analyse your settings in the software.
4. When the Monitor Health LED changes from Flashing to a steady state ON, the system will be recording data.
5. To configure the Hub please refer to Section 11

The Monitor Hub may be shut down by one of the following two procedures.

1. If a remote connection can be established with the Monitor Hub then the procedures detailed in the Software User Manual should be followed.
2. Alternatively the user may shutdown the Hub by pressing the Reset Button. The table below details how this button can be used:

| Hub Unit state | Procedure | Function |
|---|---|---|
| ON | Short 1s press | Sends the signal to shut down and then auto restart the Monitor. In order to power off the monitor permanently, the mains power must be disconnected while the unit is shutdown, before it restarts. Once the Health LED goes out completely, power can be safely removed. |
| | Long 10s press | Force switch off. **Apply only if 1s press did not work.** |
| | Long 10s press, 1s no press, 1s press | Reset – Unit is forced to switch off and then restarted. **Apply only if 1s press did not work.** |

Table 1: Reset button functionality

- **Health:** This green LED will flash while the system is starting up, and will remain Power Supply Operation
- **UltraBus:** These sockets are for connection to the daisy chained Node communication bus.

These sockets are **NOT** compatible with Ethernet devices. Damage may be caused to external Ethernet devices if they are plugged in to these sockets.

### 3.5.4 Hub Controls

The Hub Unit is controlled via a web-based user interface. For details on how to connect, please refer to chapter 10.1, Connecting to the UltraTEV Monitor.

The Monitor is designed to be switched on and running all the time. It can be shut down from the web interface, and will restart while it is plugged in to the mains. However, should the web interface be unavailable, the Hub Unit is equipped with a reset button.

The Hub Unit also features a Data Download Button. Simply insert a USB stick into either USB port, press the Data Download Button, and the Hub will copy the Monitor database onto the USB stick for later analysis.

## 3.6 Wall Mount System Outline

The UltraTEV Monitor system consists of a Hub Unit, a separate Power Supply and at least one or more Nodes with associated peripherals. The Nodes each contain TEV and temperature sensors. Further TEV, Cable PD and ultrasonic sensors may be connected to the Nodes to match the requirements of the substation.

**The Hub Unit** is a specialised data acquisition unit responsible for data collection, processing, interpretation and presentation to the user. In some variants the Hub is unit may be responsible only for controlling the flow of data from Nodes to the UltraTEV Cloud.

Figure 4: UltraTEV Monitor Hub Unit

**The Power Supply** is responsible for powering the Hub Unit and measurement Nodes.

Figure 5: UltraTEV Monitor Power Supply

## 3.7 Power Supply Operation

There are two formats of Power Supply available, both units have equivalent functionality with the key difference being there supply voltage. The standard unit is powered by 110-230Vac whilst the optional unit is powered by 48VDC.

### 3.7.1 Standard Power Supply (110-230Vac)

The Power Supply provides power to the Hub Unit, which in turn powers the Nodes, it also supplies a mains phase reference signal.

There is no switch on the hub, and as such it should only be connected to a switched mains socket. Do not remove the yellow and black Power In plug from the Power Supply without switching off the mains first.

A Mains Power green indicator on the front of the Power Supply is illuminated when the Power Supply is connected to the mains.

WARNING: Mains Power indicator is connected to the 100mA fuse. If the indicator is off, switch off the Power Supply and check the 100mA fuse. If the fuse has blown, the Power Supply could still be active even if the indicator is off.

The Power Supply is equipped with 5 fuses on the bottom panel (see Figure 6). The mains input is double pole fused, protecting both the live and neutral lines. There is also a small fuse to protect the phase reference transformer and the indicator LED. The power out to the Hub Unit has two fuses, one on the 48V line out to the UltraTEV Nodes, one on the 12V to power the Hub Unit.

Figure 6: Power Supply bottom panel showing fuses

### 3.7.2 Optional 48V Power Supply

The 48V power supply provides the same output functionality as the standard power supply whilst utilising a lower input voltage. Whilst the performance of the power supply is the same, the connectivity is slightly different.

An external 110-230Vac to 48V (supplied with the unit) connects between the mains supply outlet and the 48V input.

An external phase reference (supplied with the unit) must be connected between a mains power outlet and the Aux-3 input.

Figure 7 - Optional 48V Power Supply Top Panel

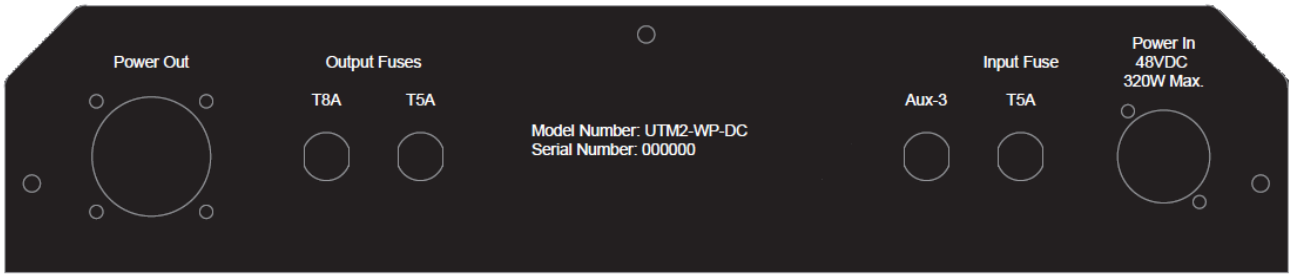



Figure 8 - Optional 48V Power Supply Bottom Panel

Figure 8 outlines the connectivity of the optional 48V Power Supply.

## 3.8 Wall Mount Hub Unit Operation

### 3.8.1 Hub Unit Status LEDs

The following status LEDs are mounted on the front panel of the Hub Unit as shown in Figure 9:

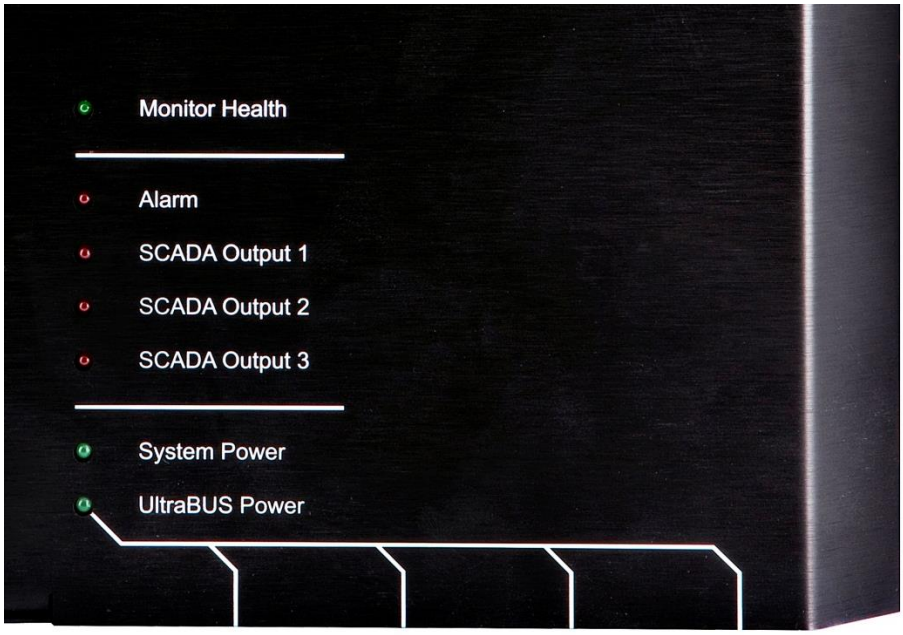



Figure 9: Monitor Hub status LEDs

The functionality of these status LEDs is as follows:

- **Monitor Health:** This green LED will flash while the system is starting up, and will be lit solidly while the monitor is functioning.
- **Alarm/SCADA:** These LEDs indicate the state of the Alarm and SCADA Output contacts. These are normally in the "Clear" state (Section 8.1) and the corresponding LED will NOT be illuminated. If any of the contacts change to the active state, or an Alarm condition is detected, the corresponding LED on the front panel will light red. The following functionality is preprogramed for each output:
    - **Alarm:** LED will illuminate (or output will switch to an Alarm condition) when any alarm is raised on the Monitor.
    - **SCADA Output 1:** LED will illuminate (or output will switch to an Alarm condition) when a Red threshold alarm is raised.
    - **SCADA Output 2:** LED will illuminate (or output will switch to an Alarm condition) when an Amber threshold alarm is raised.
    - **SCADA Output 1:** LED will illuminate (or output will switch to an Alarm condition) when a Health alarm is raised (including sensor disconnect).

    There are three cases where all SCADA LEDs will illuminate and when all outputs will be switched into Alarm condition:

    - Red, Amber and Health alarm are raised at the same time
    - UltraTEV Monitor HUB was shut down
    - UltraTEV Monitor HUB software failed to respond

    Please refer to Section 12 for information on alarm configuration.

- **System Power:** This green LED is normally lit and indicates that the Hub Unit is correctly powered.
- **UltraBus Power:** This green LED is normally lit while the system is logging data and indicates that the UltraBus ports are powered. If the UltraBus ports are not powered then this LED will be off. Do not connect or disconnect any nodes while this LED is illuminated.

### 3.8.2 Hub Unit Connectors

The connections on the Hub Unit are on both the top and bottom faces of the enclosure. On the lower face are shown below.

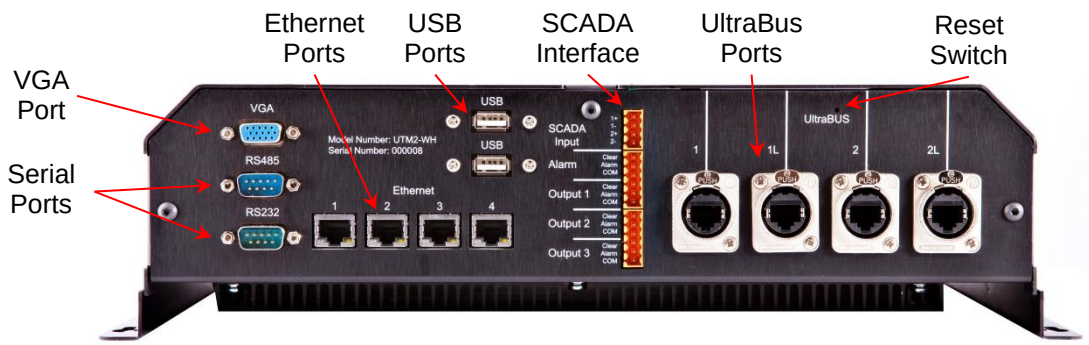



Figure 10: Hub Unit Bottom Connectors

- **VGA Port:** A port is provided for connection to a VGA monitor. This allows for a local view of the Monitor's status.
- **Serial Ports:** Serial communication ports, RS232 and RS485, are provided to allow future system expansion.
- **Ethernet:** Four Ethernet ports are provided. Port 1 is for connection to a LAN, port 4 is dedicated for system configuration and maintenance and allows a laptop to be connected; the laptop then provides the screen/keyboard interface to the hub. The other two ports are provided to allow future system expansion.
- **USB Ports:** Two standard USB ports are provided. (**NOTE:** USB cables must not be greater than 3m in length and ideally less than 1m.)
- **SCADA:** Volt free contact outputs and opto-isolated inputs are provided to allow the Hub Unit to be connected to a local SCADA system.
- **UltraBus:** These sockets are for connection to the daisy chained Node communication bus.
- **Reset Switch:** This button is hidden behind a small hole in the case and will need a small screwdriver or stiff wire to press. The switch is only a few millimetres behind the hole, **DO NOT** insert anything more than a few millimetres into this hole.

These sockets are **NOT** compatible with Ethernet devices. Damage may be caused to external Ethernet devices if they are plugged in to these sockets.

On the upper face there are the following connectors:

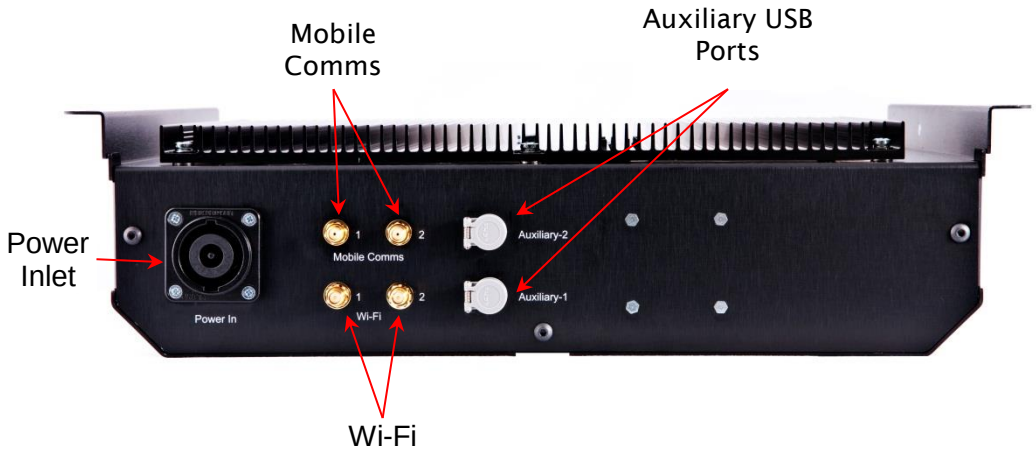



Figure 11: Hub Unit Top Connectors

- **Mobile Comms:** For both Wi-Fi and 3G Comms two ports, primary and secondary (1 & 2) as shown in Figure 11, are provided to allow the connection of external antennas to the (optional) internal 3G/Wi-Fi modem.

  With the antennas screwed into their respective connectors wireless communication with the Hub may be optimised by varying the antennas angle of inclination and/or orientation. Dual antennas provide a better signal. In the event of only a single antenna being used, the antenna must be connected to the mobile comms Primary (1) port.
- **Wi-Fi:** As above, if only one antenna is used, it must be connected to the Wi-Fi Primary (1) port.
- **Power Inlet**: This port connects to the 'Hub Power' port on the Power Supply using the interconnecting power cables provided.
- **Auxiliary Ports**: These ports are provided for future expansion.

A heat sink runs across the rear of both units. For correct operation the enclosures **MUST** be mounted so that the heat sink fins are vertical. There must be a minimum of 200mm clearance at the top and bottom of each unit.

### 3.8.3 Hub Start Up and Shut Down Procedures

With the Monitor Hub, Power Supply and relevant Node strings connected, the following procedure should be followed to activate the system:

1. Apply power to the Power Supply and ensure the green Mains Power LED is ON
2. The Monitor Hub should now become active. This can be verified by monitoring the status of the LEDs on the front panel which should show the following.
    - System Power – ON.
    - Monitor Health – FLASHING during boot sequence, ON when monitoring.
    - Alarm and SCADA Outputs (1-3) – OFF.
    - UltraBUS Power – OFF and consequently ON when in monitoring state.
    -

When the UltraBUS Power LED is illuminated **DO NOT** connect/disconnect any of the UltraBUS power connectors.

3. Alarm and SCADA outputs are configurable from the software by the end user. If any of the Alarm and SCADA Outputs LEDs are ON, please analyse your settings in the software.
4. When the Monitor Health LED changes from Flashing to a steady state ON, the system will be recording data.
5. To configure the Hub please refer to Section 11

The Monitor Hub may be shut down by one of the following two procedures.

3. If a remote connection can be established with the Monitor Hub then the procedures detailed in Section 17 should be followed.
4. Alternatively the user may manually force the Hub into a shutdown state by pressing the Reset Button, see table below.

The following table details the button actions:-

| Hub Unit state | Procedure | Function |
|---|---|---|
| ON | Short 1s press | Sends the signal to shut down and then auto restart the Monitor. In order to power off the monitor permanently, the mains power must be disconnected while the unit is shutdown, before it restarts. Once the Health LED goes out completely, power can be safely removed. |
| | Long 10s press | Force switch off. **Apply only if 1s press did not work.** |
| | Long 10s press, 1s no press, 1s press | Reset – Unit is forced to switch off and then restarted. **Apply only if 1s press did not work.** |

Table 2: Reset button functionality

The Hub Unit is equipped with an auto-start system that will switch the Monitor on automatically if mains power is connected to the Power Supply. If the Monitor is required to be switched off for any length of time, mains power should be disconnected after shutting down the Monitor.

### 3.8.4 Hub Unit Controls

The Hub Unit is controlled via a web-based user interface. For details on how to connect, please refer to chapter 10.1, Connecting to the UltraTEV Monitor.

The Monitor is designed to be switched on and running all the time. It can be shut down from the web interface, and will restart while it is plugged in to the mains. However, should the web interface be unavailable, the Hub Unit is equipped with a reset button that is accessible as shown in Figure 10.

# 4 UltraTEV Monitor™ Nodes and Sensors

## 4.1 UltraTEV Monitor Node

The Node is housed in an injection moulded plastic case with the facility for attaching to the switchgear either using built in magnets on ferrous material or with tie wraps using the slots provided. Views of the front and back of the unit are included below.

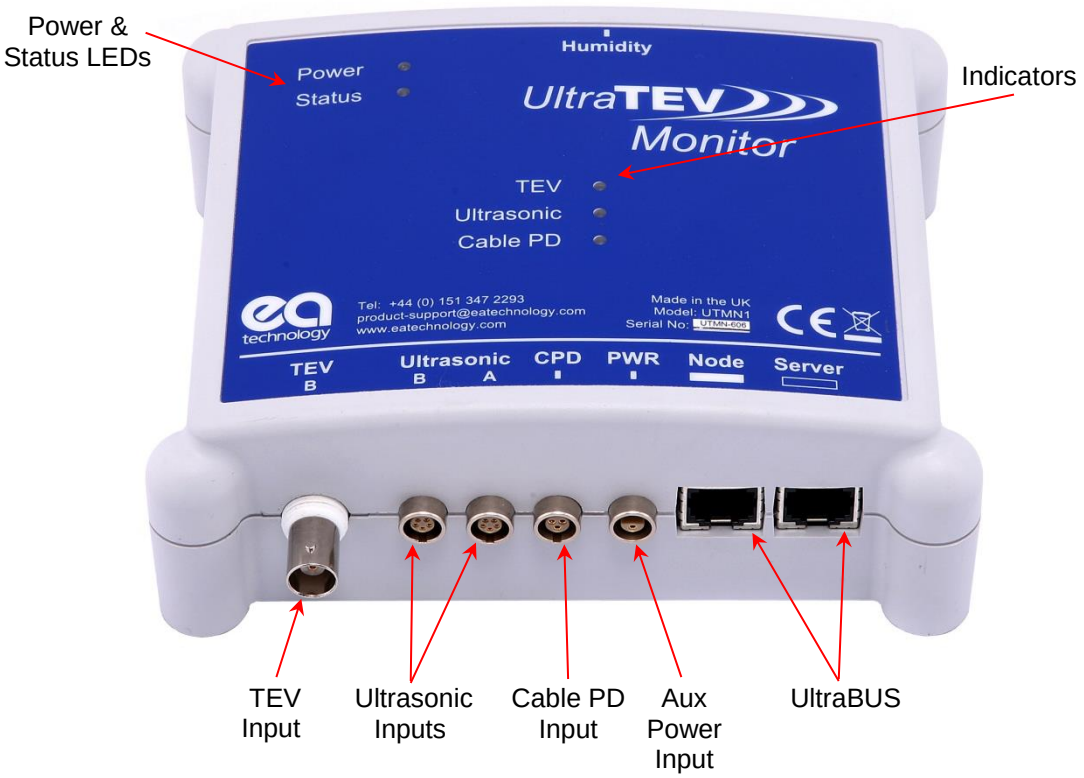



Figure 12: UltraTEV Monitor Node top and connectors

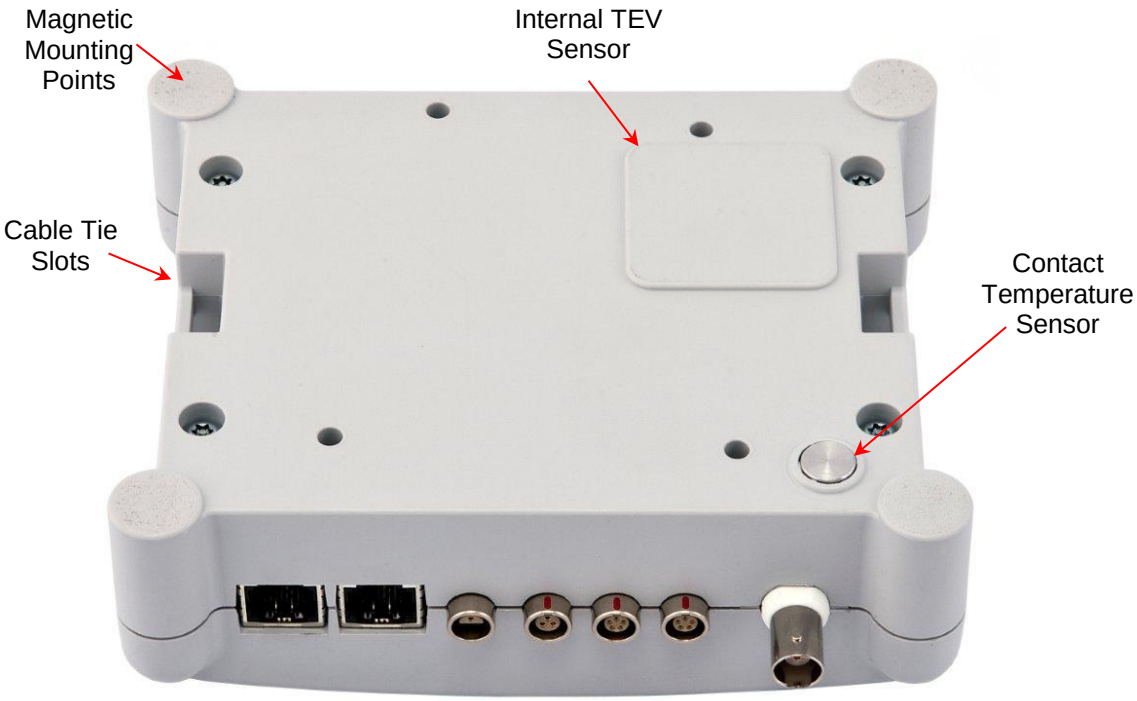



Figure 13: UltraTEV Monitor Node bottom

### 4.1.1 Node Indicator LEDs

- **Power:** On start-up, this indicator will be RED while the start-up sequence checks that all of the internal power rails are the correct voltage. On satisfactory completion of these checks (between 5 and 10 seconds) the indicator will change to GREEN. If any voltage rail moves out of specification during operation, the LED will change to RED and an alarm will be raised by the Hub Unit.
- **Status:** On power up, the Status indicator will be RED while the Node communication circuits are checked and time bases are synchronised. This will take about 10 seconds. The indicator light will change to GREEN on successful completion. If any of these parameters moves out of specification during operation, the LED will change to RED and an alarm will be raised by the Hub Unit.
- **TEV:** The TEV LED shows the status of the TEV input based on alarm criteria defined at the Hub Unit. If an alarm is active the LED will be RED, otherwise, the LED will be GREEN.
- **Ultrasonic:** The Ultrasonic LED shows the status of the Ultrasonic inputs based on alarm criteria defined at the Hub Unit. If an alarm is active the LED will be RED, otherwise, the LED will be GREEN. If no ultrasonic sensors are connected, the LED will be turned OFF.
- **Cable PD:** The Cable PD LED shows the status of the Cable PD inputs based on alarm criteria defined at the Hub Unit. If an alarm is active the LED will be RED, otherwise, the LED will be GREEN. If no Cable PD sensor is connected then the LED will be turned OFF.

### 4.1.2 Node Connections

The UltraTEV Monitor has a number of connections (see Figure 12 for connector positions).

- **TEV Sensor:** This input is for the connection of an external TEV probe or antenna.

- **2 x Ultrasonic Sensor:** These inputs are for the connection of external ultrasonic probes. The Monitor supports the connection of both air and contact probes.
- **Cable PD Sensor:** This input is for the connection of an external RFCT for the detection of Cable PD.
- **Node Communication:** This socket is for connecting to a Node further downstream along the daisy chain. Always connect from the Node socket to the Server connection of the next Node.
- **Server Communication:** This socket is for connection to upstream (towards the Hub Unit) Nodes along the daisy chain or to the Hub Unit itself.

The two communication ports on the Node make use of Ethernet style sockets but these are **NOT** Ethernet and should not be connected to Ethernet systems.

### 4.1.3 Node Internal Contact Temperature Sensor

The Monitor includes a contact temperature sensor which measures the surface temperature of whatever surface the Node is mounted on. The temperature sensor is visible as the aluminium disk on the rear face of the Monitor Node. The temperature is logged every 3 seconds and the average value recorded at the Hub Unit.

### 4.1.4 Node Internal TEV Sensor

The internal TEV sensor is located in the top right corner on the face that touches the switchgear. This sensor is always considered to be active and therefore its corresponding data is always logged.

## 4.2 Node Sensors

### 4.2.1 External TEV Probe/Aerial

The external TEV probe or antennas are tried and tested designs, originally developed for the PD Monitor. They attach to the switchgear using either a magnetic base or an optional cable tie base. TEV probes are used where additional switchgear measurement points are required whilst aerials are used for detecting external interference. The probe or aerial is connected to the Node using standard BNC terminated 50Ω coaxial cable.

For both sensor types, the length of the coaxial cable must be entered into the Hub Unit during the system discovery stage of system installation. All cables supplied with the instrument are marked with their individual lengths to aid this.

A single TEV probe or antenna may be connected to each Node.

### 4.2.2 Ultrasonic Sensors

The Ultrasonic Sensor is housed in a plastic case similar in size to a key fob with the sensor at one end. There are a number of different mounting options as follows: clamp, clamp with goose neck or simply using double sided sticking pads. The clamp can either be attached using the built in magnets on ferrous material or by using tie wraps with the slots provided.

The lead from the back of the sensor connects to the Node. Plug in extension leads are available should they be required.

### 4.2.3 Ultrasonic Contact Probe

In some instances there is no direct air path between the PD source and the instrument for ultrasonic signals to pass along. In such cases the UltraTEV Monitor Contact Probe should be used to detect ultrasonic signals inside these sealed enclosures. It clamps onto a ferrous surface using built in magnets.

### 4.2.4 Cable PD Sensor

The cable PD sensor is a Radio Frequency Current Transformer (RFCT). When installed around the earth connection or strap between the cable sheath and the earthed switchgear, it allows the high frequency current transients that are generated by PD activity within the cable or cable joints to be detected. The RFCT detects partial discharge pulses in the range of 200 kHz to 20MHz.

A single cable PD sensor may be connected to each Node.

EA Technology RFCTs are designed to be installed by suitably competent operators on cable earth/ground straps which are suitably and efficiently connected to earth/ground to maintain safety.

**RFCTs, connecting leads and test equipment do not provide protection against high voltage.**

### 4.2.5 External Temperature/Humidity Sensor

It has been shown that stratification of the air within substation environments can lead to variations in relative humidity, therefore the UltraTEV Monitor allows multiple temperature and humidity sensors to be connected, one per Node. The sensor plugs into the socket on the top face of the Monitor. It can be mounted onto ferrous surfaces using the integral magnetic mount or tie wrapped in place.

# 5 Non Standard Installation within HV Cubicles

In certain circumstances, it may be necessary to mount sensors inside a cubicle with exposed conductors. This is not preferred due to the potential safety issues and difficulty in servicing the equipment.

EA Technology equipment should be treated as if it provides **NO** insulation barrier against High Voltage. The purpose of this section is to provide some guidance in the placement of mounting of these sensors but under no circumstances should contravene required safety practices.

## 5.1 Safety Approvals

Installation of this equipment may require approvals for safety prior to energisation. It is the responsibility of the installer or user to obtain all necessary national safety agency, state, local, and corporate approvals. EA Technology does not assume liability for installation practices. Safety approval of a licensed engineer or Nationally Recognised Testing Lab is highly recommended and may be required by law in some regions.

## 5.2 Sensor Wiring Precautions

All installation, maintenance, and repair/replacement in an HV compartment must take place with exposed conductors de-energized, locked and tagged out. **Never** open a cubicle door where energised exposed conductors exist.

All wires must be routed to avoid being snagged or forming tripping hazards. Wires for equipment mounted on hinged panels or doors should allow easy operation and be protected against pinching and abrasion. Wiring must be placed and secured so that under no failure mode does any part of the wiring come within unsafe distances of the energized conductors. Wires that exit the cubicle are to be secured so that the cables cannot be moved by pulling from the outside.

## 5.3 TEV Sensors

TEV sensors must be installed using secondary methods of securing them. Using the threaded hole in the magnet or eliminating the magnet and mounting the unit with the three holes that were securing the magnet are potential mounting methods. Any time a threaded fastener is used; either locking compound or nylon locking nuts are recommended. Sensors and wiring must be placed so that under no failure mode does the sensor come within unsafe distances of the energized conductors.

TEV sensors can be mounted on any inside wall of the enclosure.

## 5.4 Ultrasonic Microphones

Ultrasonic Microphones must be installed using secondary methods of securing them. Using the tie wrap slots in the microphone base or eliminating the base and mounting the unit with a longer bolt are potential mounting methods. Any time a threaded fastener is used; either locking compound or nylon locking nuts are recommended. Microphones and wiring must be placed so

that under no failure mode does the microphone come within unsafe distances of the energized conductors.

The microphones should be aimed so that they are pointing at the point where the conductor becomes exposed. Exact aiming is not critical.

## 5.5 RFCT

RFCT sensors are to be mounted on the ground straps of the HV cables. Under no circumstances are they to be mounted around the conductors, insulated or not. Sensors and wiring must be placed so that under no failure mode does the sensor come within unsafe distances of the energized conductors.

The RFCT should be secured with tie wraps or otherwise so that once installed, they cannot be accidently dislodged. They should be installed such that they are protected from water that may collect on the floor of the cubicle.

The polarity arrow on the sensor needs to face the same direction on all RFCT in a given system. Convention is that the arrow points toward the cable termination and away from ground.

EA Technology RFCTs are designed to be installed by suitably competent operators on cable earth/ground straps which are suitably and efficiently connected to earth/ground to maintain safety.

**RFCTs, connecting leads and test equipment do not provide protection against high voltage.**

# 6 Installing the Portable UltraTEV Monitor™

## 6.1 Mounting the Hub Unit and Power Supply

The Hub Unit can be placed in any orientation when operating, as long as the air vents on the top are not obstructed. The Hub is shipped with a wall-mount bracket kit that screws into the side of the Hub to allow it to be fixed to a wall. It is also shipped with a magnetic clamp system to attach to steel switchgear panels, without having to drill any holes.

The magnets are extremely powerful neodymium magnets, care should be taken when handling them.

Figure 14: Hub Unit with Wall Mount Brackets

Figure 15: Hub Unit with Magnetic Brackets

Suitable provisions should be taken when routing any cables attached to the Hub to ensure that they do not create a hazard.

## 6.2 Earthing

Both the Hub Unit and the Power Supply have M4 earth studs on the left side of their casing to allow the UltraTEV Monitor to be bonded to an external ground system. Both the Hub Unit and Power Supply cases must be bonded to earth when the UltraTEV Monitor™ is installed in a substation.

## 6.3 Connecting the Nodes

The UltraBus communication cables to the Nodes are wired in a daisy chain manner, i.e. each Node has two connections, one for connection to the previous Node or Hub Unit (Server) and one for connection to the next Node. The connections are made using CAT 7 Screened Twisted Pair (STP) Ethernet cable. The cables supplied with the Monitor are colour coded to the colour blocks on the Node label to simplify connection. If additional cables are required, they are available from EA Technology.

Figure 16: Details of Node Ethernet cable colour coding

No specific Node connection order is required although a linear flow along the switchgear will make the system easier to set up. Each Hub Unit can support up to 20 Nodes. Please contact EA Technology if you require a larger system.

Up to 10 Nodes can be connected in a string from the 'Out' UltraBUS port on the Hub. To connect between 10 and 20 an extra loopback cable is required from the last Node in the string to the 'Loop' UltraBUS port on the Hub.

Two ferrite chokes should be fitted on the cable that connects the first Node in the string to the Hub Unit. One choke should be fitted at each end of the cable as shown in Figure 17 and Figure 18. To install, release the clips on the side of the choke and loop the cable through the core once before clicking the choke closed.

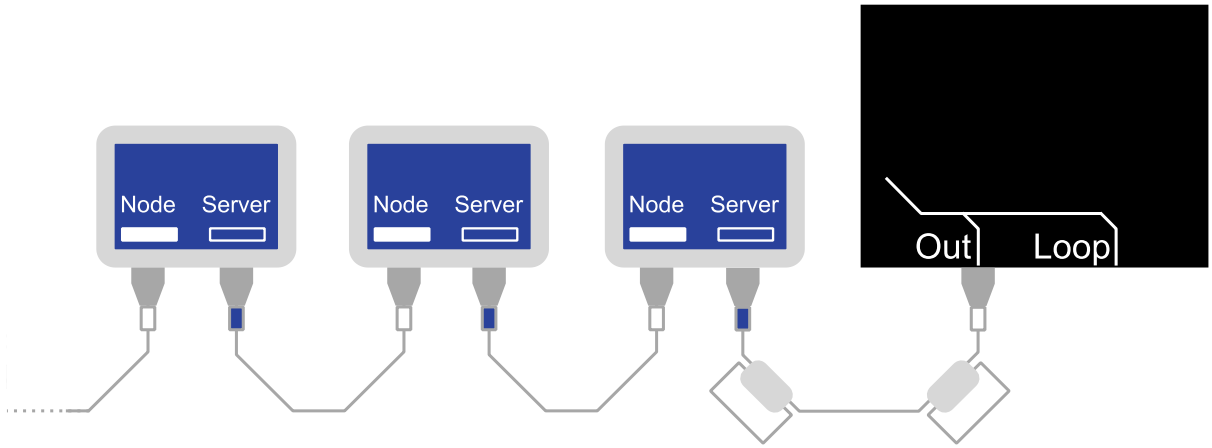



Figure 17: A single string can be used for up to 10 Nodes

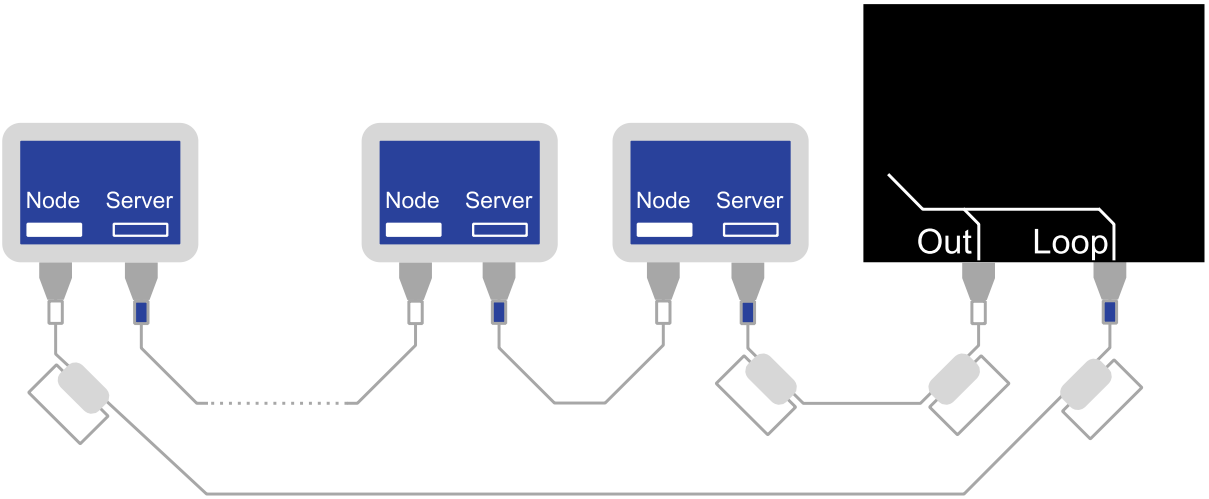



Figure 18: Use Loopback to connect 10-20 Nodes

Do not remove or insert UltraBUS cables if the UltraBUS indicator is ON

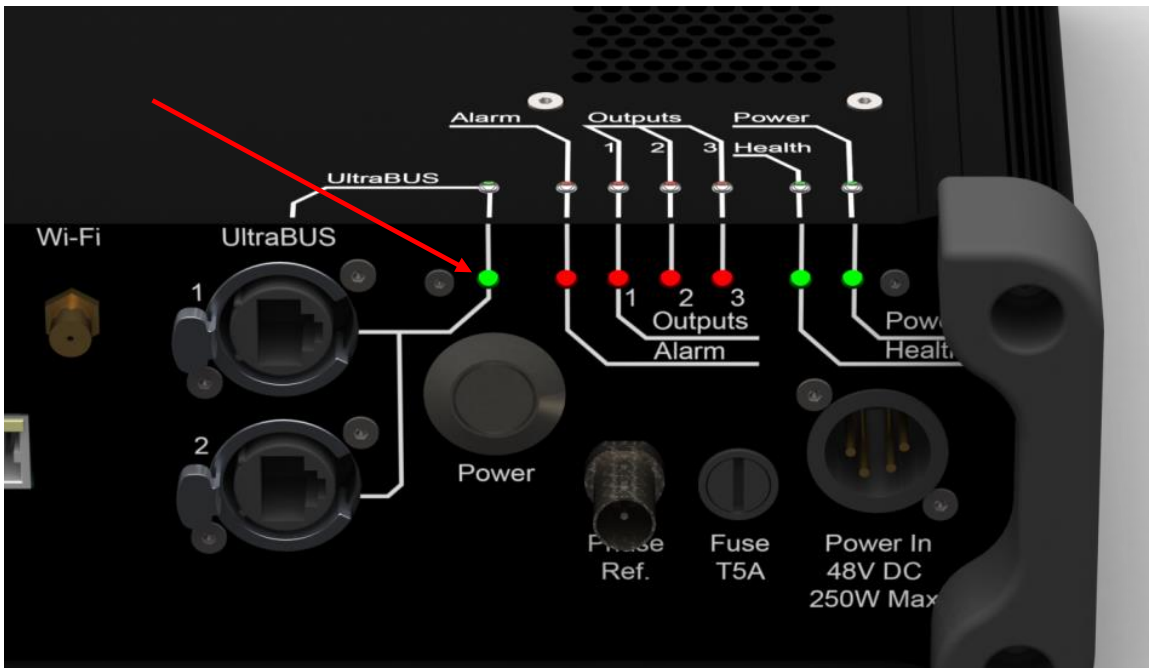



Figure 19: UltraBUS Power indicator

# 7 Installing the Wall Mount UltraTEV Monitor™

## 7.1 Mounting the Hub Unit and Power Supply

The Hub Unit and Power Supply are housed in a pair of aluminium enclosures and should be positioned in a convenient location on the substation wall. When choosing the location, bear in mind that a power connection is required.

A heat sink runs across the rear of both units. For correct operation the enclosures MUST be mounted so that the heat sink fins are vertical. There must be a minimum of 200mm (7.9 inches) clearance at the top and bottom of each unit.

**Note:** The optional 48V power supply does not have a heat sink.

Figure 20: Diagram showing main Power Supply and Hub Unit connections, and minimum clearances for installation vertically

If necessary the Hub Unit and Power Supply may be installed next to each other horizontally, but must be installed the correct way up to allow sufficient cooling. To ensure the interconnector cable will reach, do not space the units more than 50mm (2 inches) apart horizontally.

Contact EA Technology Product Support if any other form of installation is required:

product-support@eatechnology.com

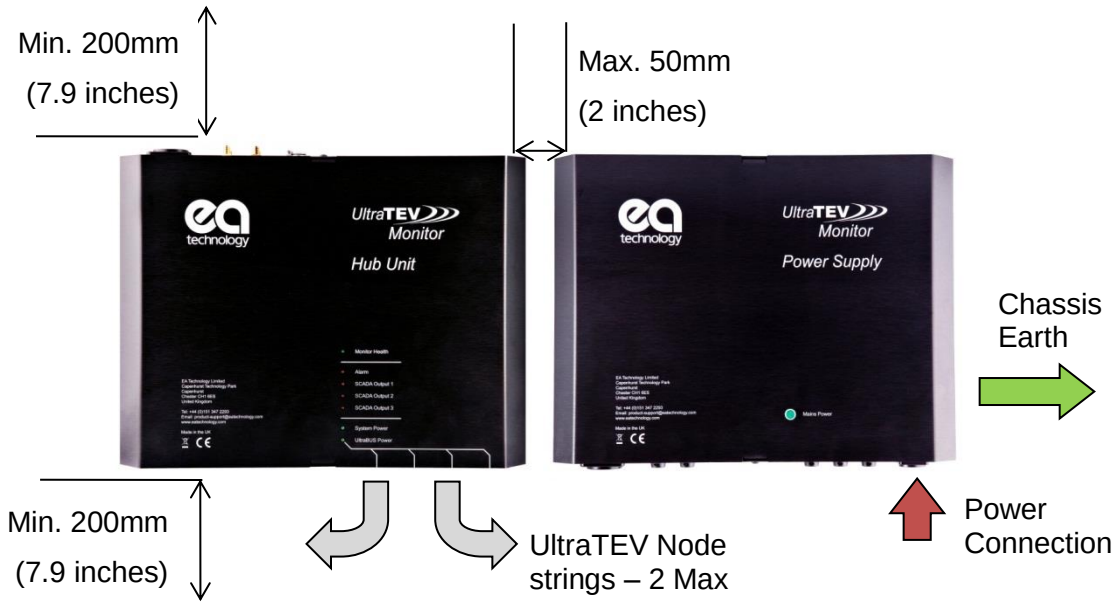



**Figure 21: Diagram showing main Power Supply and Hub Unit connections, and minimum clearances for installation horizontally.**

Keyhole slots are provided at the edges of each enclosure and these should be used to attach the units to the wall or to a suitable mounting plate. Ensure that the wall is suitably strong enough to support the Hub Unit and Power Supply. Use the screws and Rawlplugs supplied with the Monitor (Red Rawlplugs for 6mm drill and 5mm screws), or alternative comparable wall fixings.

A cable must also be connected from the Hub Unit to the first Node in the chain. Additional cables may be needed for LAN/WAN or SCADA connections. Suitable provisions should be taken when routing these cables to ensure that they do not create a hazard.

## 7.2 Earthing

Both the Hub Unit and the Power Supply have M4 earth studs on the left side of their casing to allow the UltraTEV Monitor™ to be bonded to an external ground system. Both the Hub Unit and Power Supply cases must be bonded to earth when the UltraTEV Monitor™ is installed in a substation.

## 7.3 Connecting the Nodes

The UltraBus communication cables to the Nodes are wired in a daisy chain manner, i.e. each Node has two connections, one for connection to the previous Node or Hub Unit (Server) and one for connection to the next Node (see Figure 23). The connections are made using CAT 7 Screened Twisted Pair (STP) Ethernet cable. The cables supplied with the Monitor are colour coded to the colour blocks on the Node label to simplify connection.

If additional cables are required, they are available from EA Technology.

Figure 22: Details of Node Ethernet cable colour coding

No specific Node connection order is required although a linear flow along the switchgear will make the system easier to set up. Each standard Hub Unit can support up to 48 Nodes. The connection method depends on how many nodes are used. Each string can support 15 nodes in an open-ended configuration, and 30 nodes in a loopback configuration:

Please contact EA Technology if you require a larger system.

Figure 23 and Figure 24 show how the open-ended and loopback strings are connected:

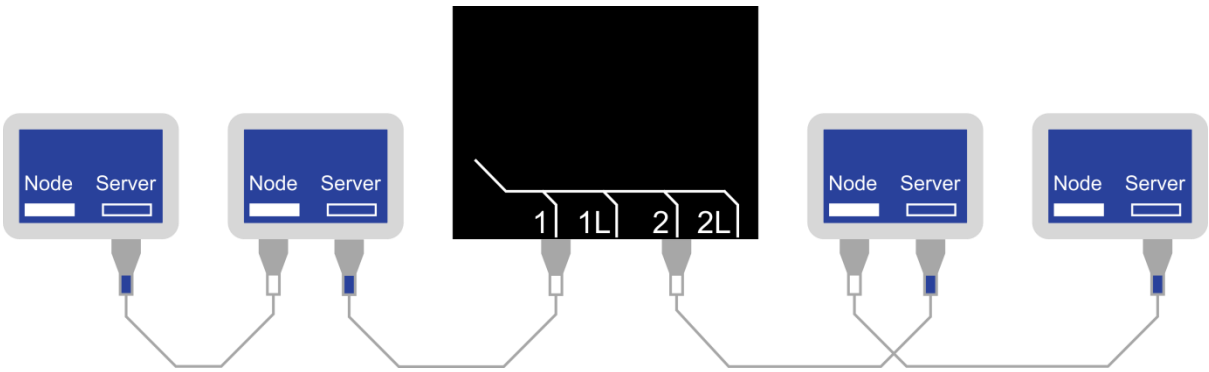



Figure 23: Example open-ended set up of two strings on UltraBUS channels 1 and 2 (maximum 15 Nodes per string)

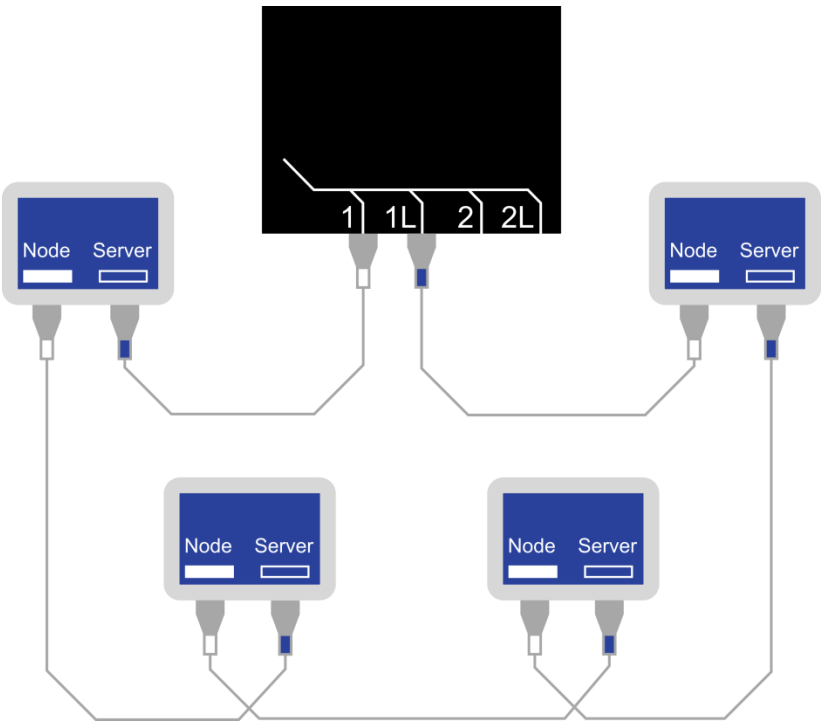



Figure 24: Example loopback set up on UltraBUS channel 1 (maximum 30 Nodes per string)

Two ferrite chokes should be fitted on the cable that connects the first Node in the string to the Hub Unit. One choke should be fitted at each end of the cable as shown in Figure 25. To install, release the clips on the side of the choke and loop the cable through the core once before clicking the choke closed.

Figure 25: Hub Unit with two Nodes, showing noise suppression ferrites chokes.

UltraBUS connections should only be made while the system is either inactive or turned off. The inactive state is indicated by the UltraBUS Power Status LED on the Hub Unit being OFF. This status LED is on the front of the Hub Unit as shown in figure 26.

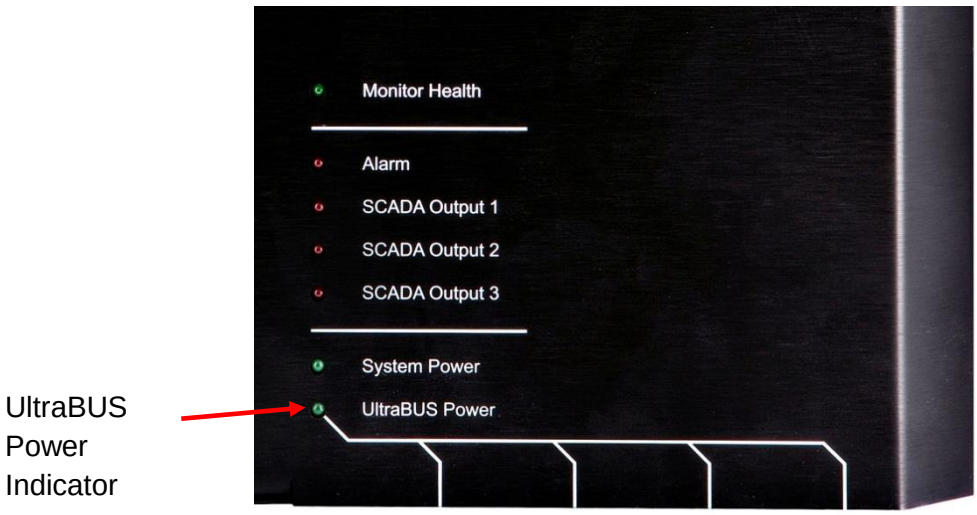



Figure 26: UltraBUS Power indicator

Do not remove or insert UltraBUS cables if the UltraBUS indicator is ON.

# 8 Wall Mount SCADA Interface

The Monitor contains several SCADA interfaces to enable the user to incorporate the Monitor within a separate control system. Each Hub Unit is equipped with 4 configurable Outputs and 2 isolated Inputs. Further information regarding these inputs and outputs is given below. Please see the section 12 for further details of alarm settings.

## 8.1 Outputs

The SCADA relay outputs are configured as shown in Figure 277. In normal operation the contacts are held in the "Clear" state (appropriate LED indicator is switched off). In the event of an alarm condition, or power loss, the outputs will switch into the alarm state (with appropriate indicator being in ON state – unless power has been lost).This is shown in Figure 288 as the "Alarm" state. All outputs are electrically isolated from the Hub Unit itself.

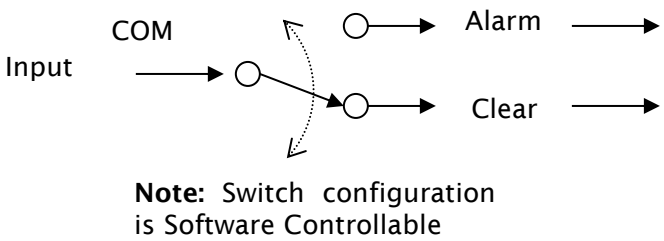



Figure 27: SCADA Relay Configuration – Normal operation

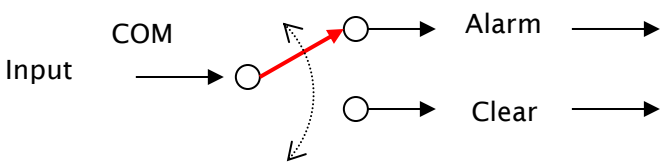



Figure 28: SCADA Relay Configuration – Alarm, Fault Condition or power loss.

## 8.2 Inputs

The Monitor Hub Unit incorporates two electrically isolated inputs which can be used to detect the presence of a DC voltage (12-90V) applied to the input terminals. See section 17.3.12 Hub Isolated Inputs for input specifications.

# 9 Network Communications

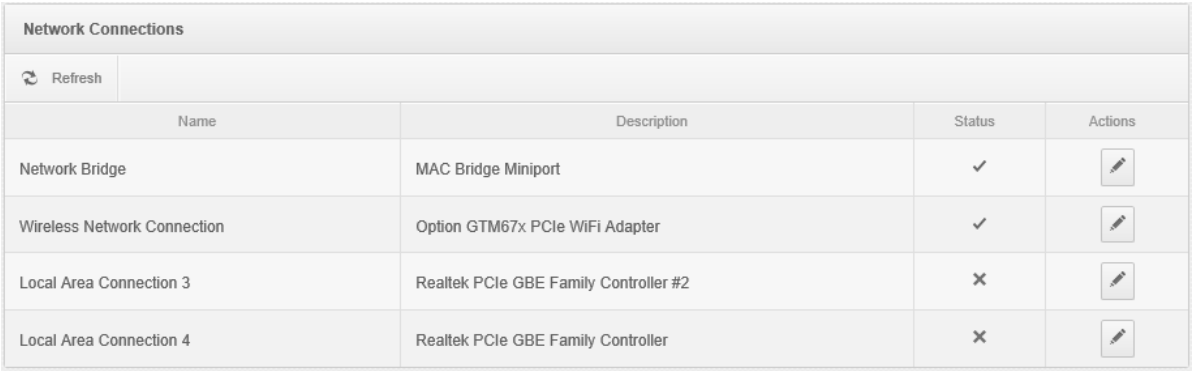
UltraTEV Monitor Hubs do NOT have malware protection software preinstalled.

Please contact EA Technology if you require any additional protection to be installed with the unit.

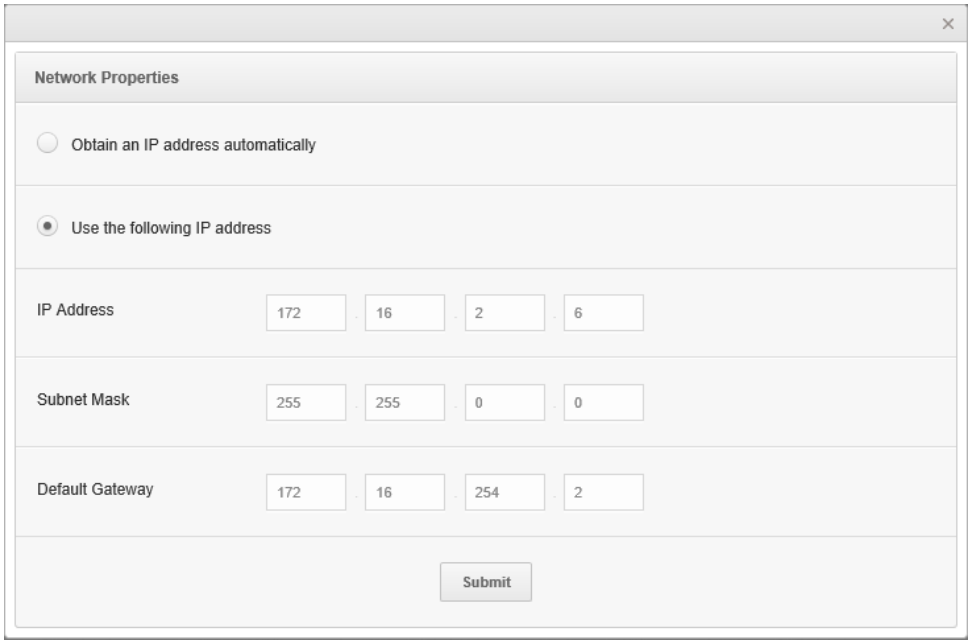
## 9.1 Connecting to a Network using an Ethernet cable

Connect Ethernet cable (minimum CAT5e) between your network and the Hub Unit Ethernet port 1. Depending on the network you have connected to, you may require additional information from your IT department to establish communications with the Monitor.

In the Standard, you can configure the network Connections in Admin, Network Settings.




Click in Actions and you can select an IP address automatically or configure a static IP address.



## 9.2 Connecting to Network using Wi-Fi

To connect to the network using Wi-Fi you must first configure the Hub for your Wi-Fi network. Do to this; you will need to temporarily connect a VGA display, USB keyboard and mouse. Do not connect these until after the Hub has fully booted. In this mode, the user is 'client' with no password. You can then use standard MS Windows 7 Wi-Fi configuration methods.

Note: do not reboot the Hub with the keyboard and mouse connected or it may not boot correctly. Once you've made the Wi-Fi connections, these devices will no longer be needed.

## 9.3 3G Communications (Wall-Mount Only)

To connect the UltraTEV Monitor Hub to the internet using 3G communications, you will require a valid SIM card and Mobile Broadband Access Point Name (APN) settings that should be requested from your 3G SIM card provider.

To configure UltraTEV Monitor Hub to work on your preferred 3G network and to gain remote access to your data, please contact EA Technology Product Support.

To obtain remote access to your data, in certain circumstances, you may need to request a static IP address from your 3G SIM card provider.

# 10 Configuring the UltraTEV Monitor™

All initial configuration of the UltraTEV Monitor™ is performed locally via a web interface. This can either be via a direct connection to port 4 of the device or through a local network / Wi-Fi connection. Once the system has been configured, access to the UltraTEV Cloud version will be via the UltraTEV Cloud web portal only.

## 10.1 Connecting to the UltraTEV Monitor™

To connect to the local user interface, there are a couple of options; the first being via a corporate LAN. Ethernet ports 1 and 2 are bridged internally. Port 1 can be connected to a corporate LAN if available and port 2 can then be connected to a laptop. This laptop will then also be able to connect to the corporate LAN. To use this option, the hub will have to be preconfigured by EA Technology. Once you know the IP address of the hub, type this into your internet browser's address bar.

The second option is more straight-forward. A direct Ethernet connection can be achieved by plugging a laptop into Ethernet port 4. Providing that your laptop is set to be dynamically allocated an IP address (as is normally the case), it should be allocated an IP address by the Hub. In this scenario, type the address **192.168.0.200** into your internet browser's address bar.

In either option, you will first access the login screen. Use the following credentials to access the web-site:

Username: localuser

Password: eatl/eatl

## 10.2 The Local UltraTEV Monitor™ Web-Interface

The UltraTEV Monitor has two different configurations, Standard or UltraTEV Cloud™ enabled.

Once connected and logged in, you will be greeted with the main home page. Figure 299 shows how the main navigation bar looks. You can see the monitoring status indicator. This will be green if everything is running, orange if only some services are running and red if no services are running. See section "Device Management and Settings" for more details on this. Please note that for devices connecting to UltraTEV Cloud™, there will be no analysis option on the device itself. Please see section 16 UltraTEV Cloud™.

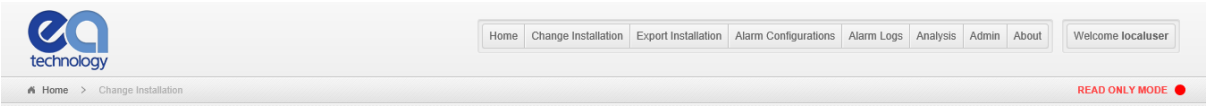



Figure 29: UltraTEV Monitor Web-Interface

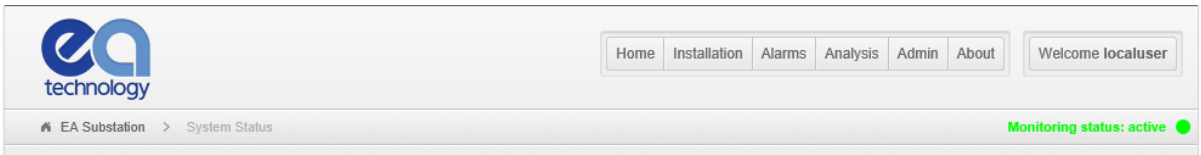
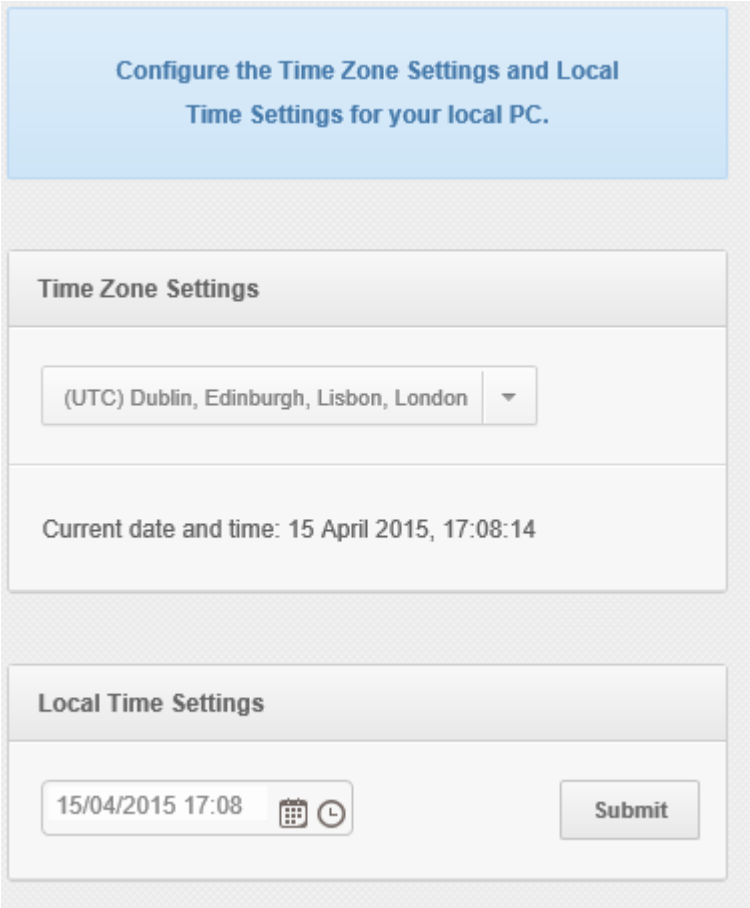



Figure 30a: UltraTEV Monitor Web-Interface Stand-Alone

You can change the machine to your time zone or correct the local time. If you change the local time, you need to do another installation after.



## 10.3 System Discovery

System Discovery is the process where the connected hardware is discovered by the hub and configured accordingly to the layout of the system. When using UltraTEV Cloud™, the initial part of the system discovery process is performed on the web portal, please see section 17 UltraTEV Cloud™. After logging in, there may already be a previous installation setup. In order to setup a new installation, click on the Change Installation button. As Figure 31 shows, you need to give a name to the new installation and then hit Submit. When using UltraTEV Cloud™, this information is pre-configured and a configuration file is used.

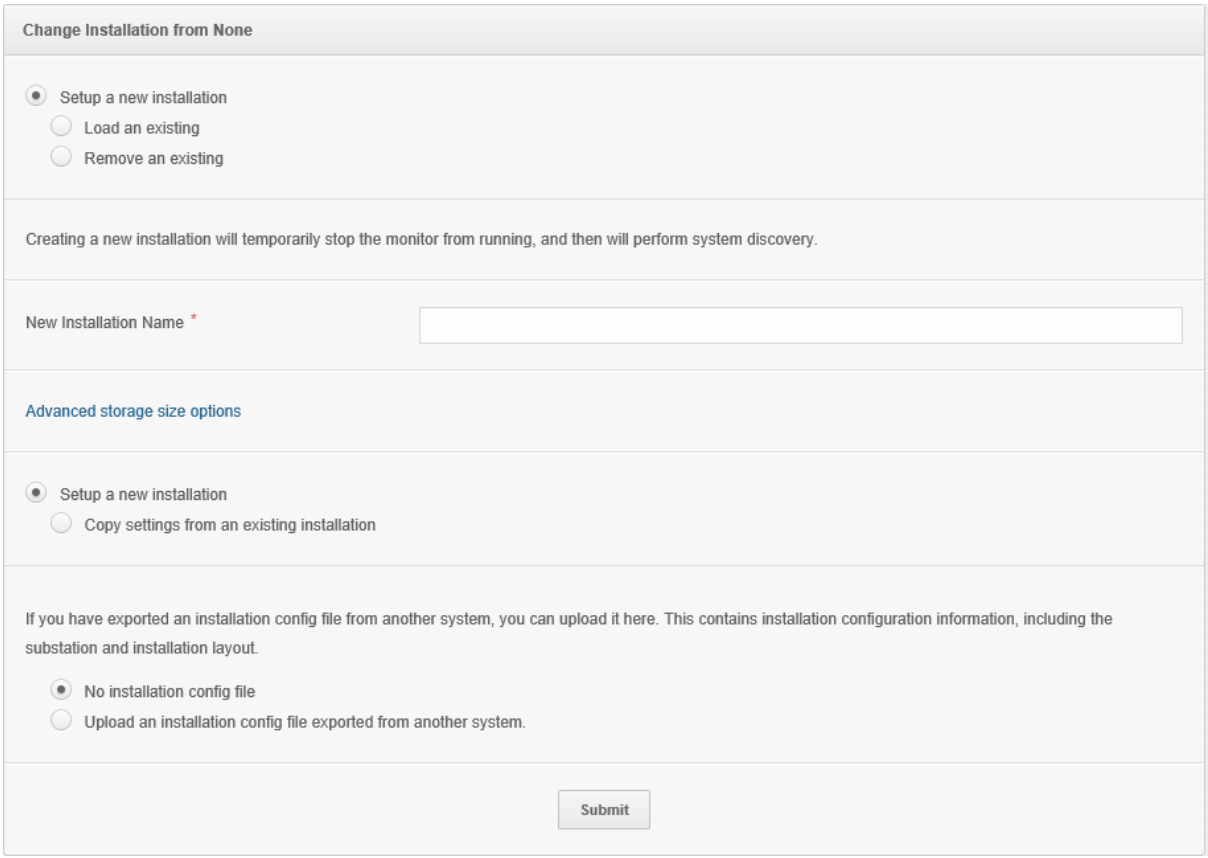



Figure 31: Change installation

The next step, shows the installation information screen, see Figure 31. Upon clicking Submit, there will be a delay as the UltraTEV Monitor™ talks to the connected nodes and sensors to discover what is connected.

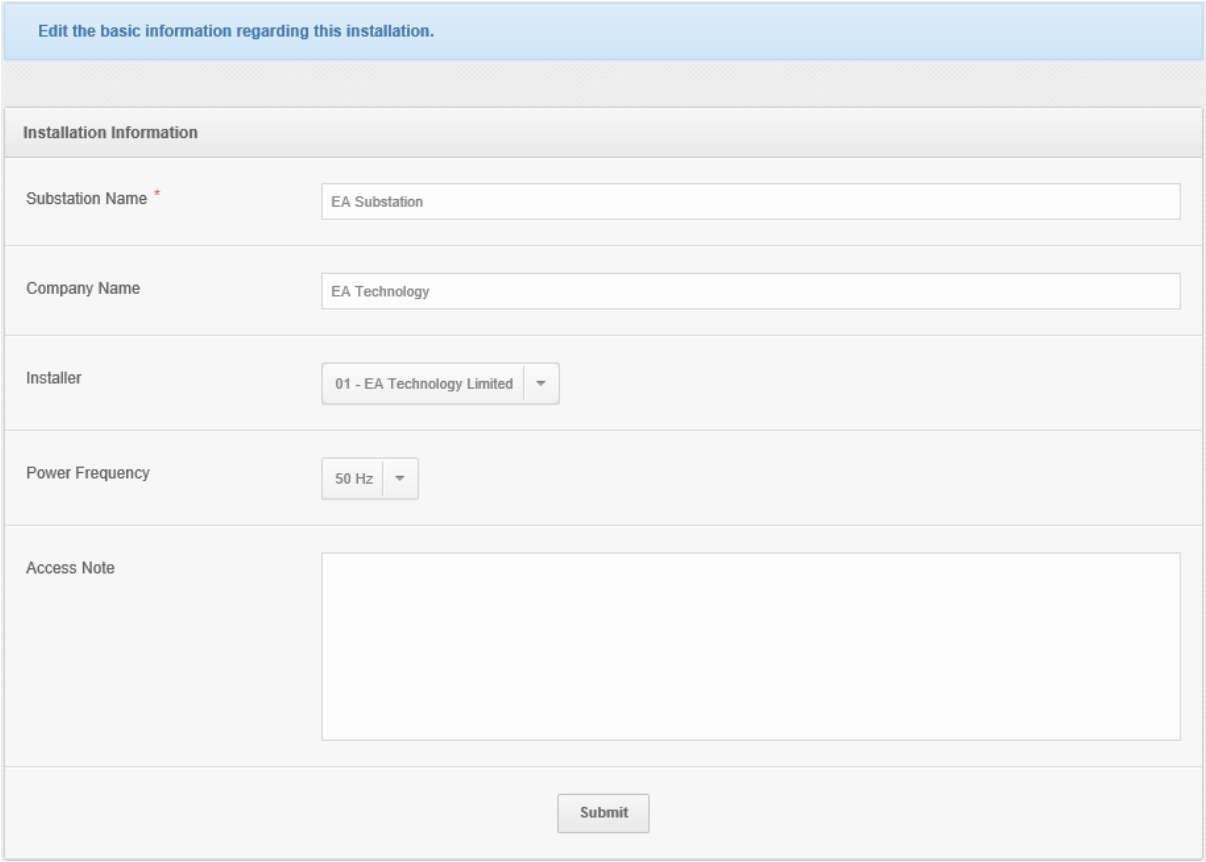



Figure 32: Basic installation information

After the Nodes and Sensors are discovered, the results will be as shown in Figure 333, or Figure 344 if using a configuration file. At this stage there are four options.

| | |
|---|---|
| Breakdown | Use this option if you want more detail of the Nodes and Sensors found during system discovery. |
| Power off the Nodes | Use this option if you want to change any of the Nodes around or check connections before rediscovering. |
| Rediscover | Use this option if you are convinced everything is connected correctly having checked the connections. |
| Continue | Use this option if you want to continue with what has been discovered. |

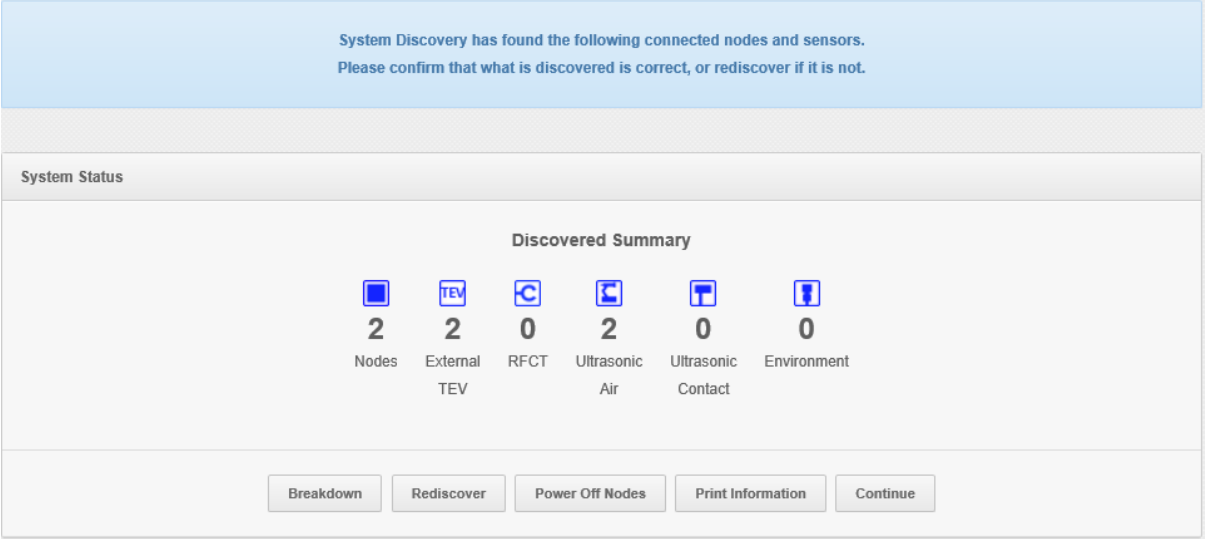



Figure 33: System Discovery results

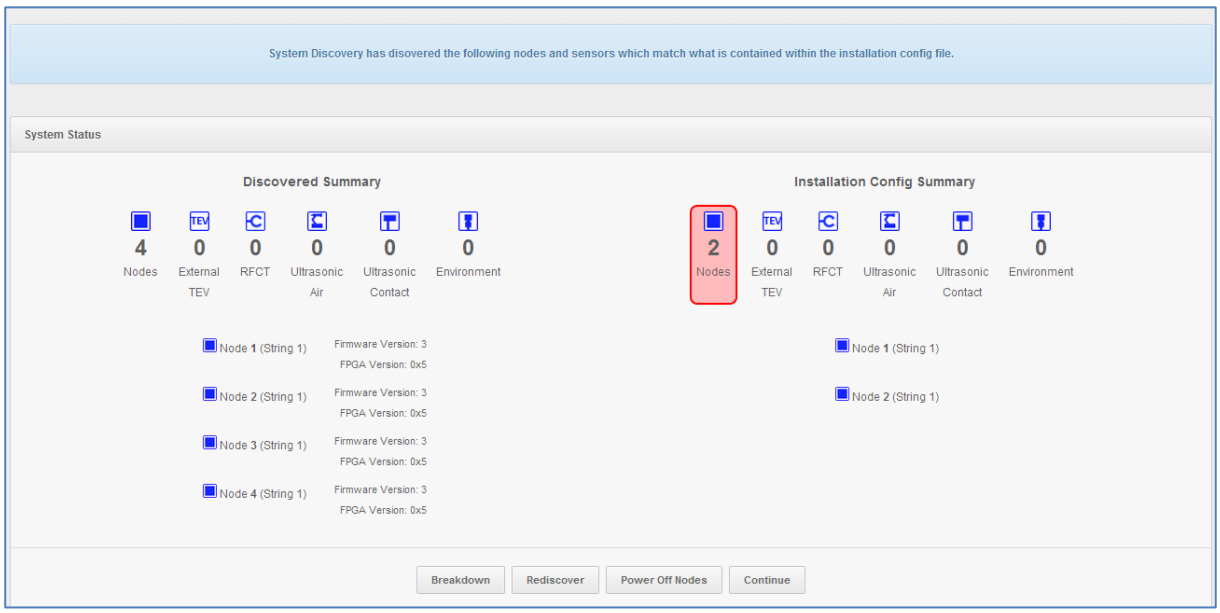



Figure 34: System Discovery results when using a configuration file

After you are happy with the discovered Nodes and Sensors, another view of the installation layout is given, see Figure 355. If the discovered Sensors don't match the contents of the configuration file or previous installation, or if this is brand-new system discovery, then the sensors need to be placed on to the layout diagram.

First of all drag the hub from the palette on the left and place it on the substation layout. When hovering over an area that can be placed on, the area will turn green.

Once the hub has been placed, the first Node is then available in the palette, again drag this onto the layout. Once the first Node has been placed, the palette then changes to now show the available sensors for that Node.

Once all additional Sensors have been placed for the current node, click on the Next button to move to the next Node. At any time, the Prev and Next buttons can be used to navigate the current string of Nodes.

Right-clicking any Node or Sensor displays a context menu from where the following actions can be performed.

| | |
|---|---|
| Cable Length | Set the length of the cable leading into the selected Node or Sensor. Either select a predefined length or enter a custom one. Lengths to external TEV probes and aerials are important for the PD calculations and must be accurate. All other lengths are only needed to indicate the length of cable required for commissioning the system. |
| String Assignment | (Nodes Only) Nodes can be assigned to one of four strings (depending on hardware configuration). |
| Assign/Un-assign | Assign or un-assign the node or sensor from its attached Node or string. When another Node is selected, available unassigned sensors will flash to indicate that they can be assigned. |
| Remove | Removes the current item from the layout. |
| Remove All | Removes all the items from the layout. |

Cable lengths that have yet to be entered will remain highlighted in red on the diagram. All cable lengths must be entered before proceeding (the Complete button will be disabled until cable lengths are entered). Once the layout is finished, click on the Complete button to complete the setup.

Figure 35: Confirming the installation layout

As soon as everything is complete, click on the Complete button to finalise the system discovery process (note: after you click complete the layout cannot be changed without repeating the process). Another delay will occur here as the Nodes are communicated with.

Finally, the option to re-start the services is given. Select Yes here to re-start all the services. See "Device Management and Settings" for more details regarding the services.

Now that system discovery has completed, the status message will turn to Monitoring Status Active when everything is setup (see 10.2 The Local UltraTEV Monitor™ Web-Interface). If UltraTEV Cloud™ is being used; the communications with the cloud server has to be established. Providing that a communications method has already been configured (3G, Wi-Fi or wired Ethernet), this process should happen automatically. The status message will turn from Pending Cloud Registration to Monitoring Status Active when everything is setup.

## 10.4 Device Management and Settings

Sometimes it may be necessary to shut-down the UltraTEV Monitor™ or power off the Nodes. These can be achieved from the Power and System Status button in the admin navigation bar. Figure 366 shows the power management screen; from here the UltraTEV Monitor™ can either be shut-down or restarted. Figure 377 shows the system status screen. Here the individual services can be stopped and started. For healthy operation, these should always be running and are set to automatically start whenever the device is first powered on. In order to power down the Nodes, the Monitor service will need to be stopped.

If any Nodes are changed, the System Discovery process will need to be re-run. This will mean creating a new installation through the web-portal.

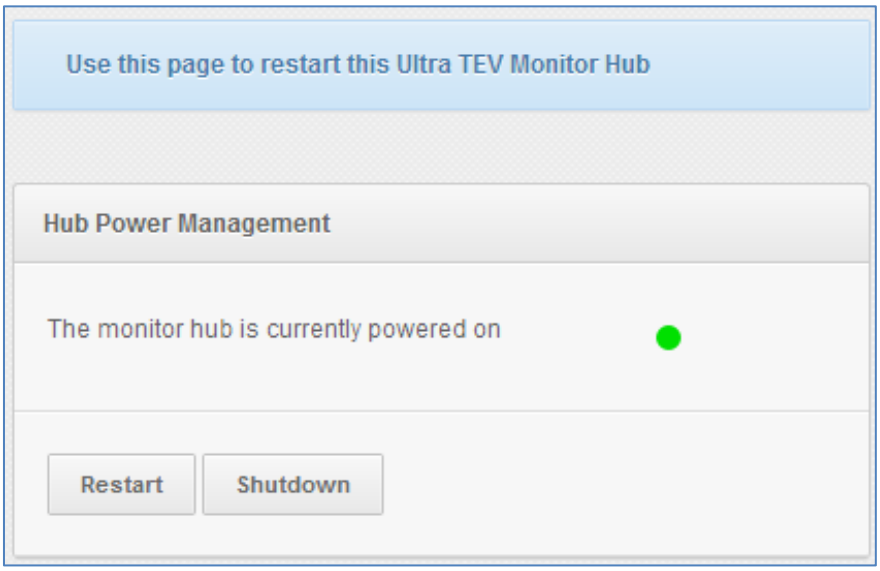



Figure 36: Power Management

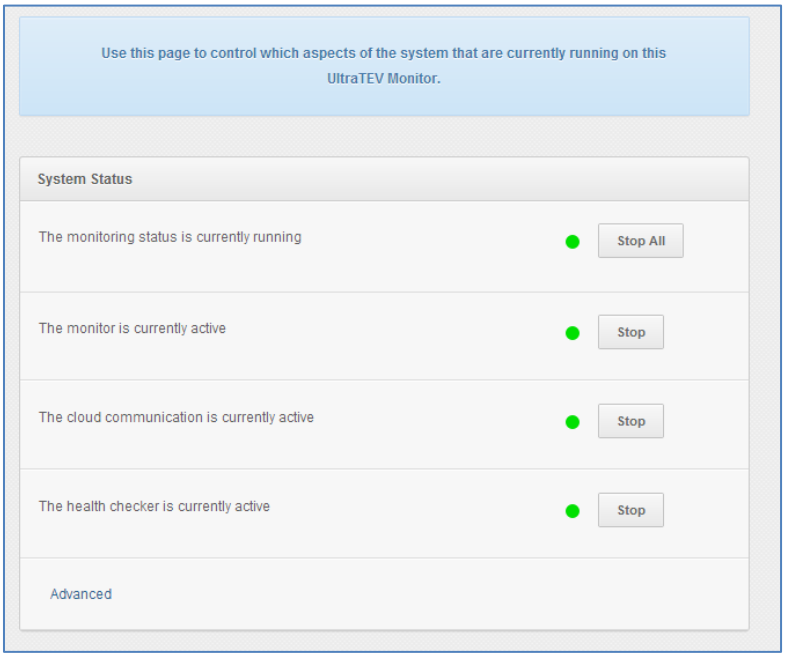



Figure 37: System Status

# 11 Creating and Managing Alarms

The creation of alarms can be undertaken on either the device or the web-portal in exactly the same manner. The rest of this section assumes that this process is being performed on the device web page.

Select the Alarm Configuration button. The screen in Figure 38 will then appear. This screen shows the list of connected nodes on the system.

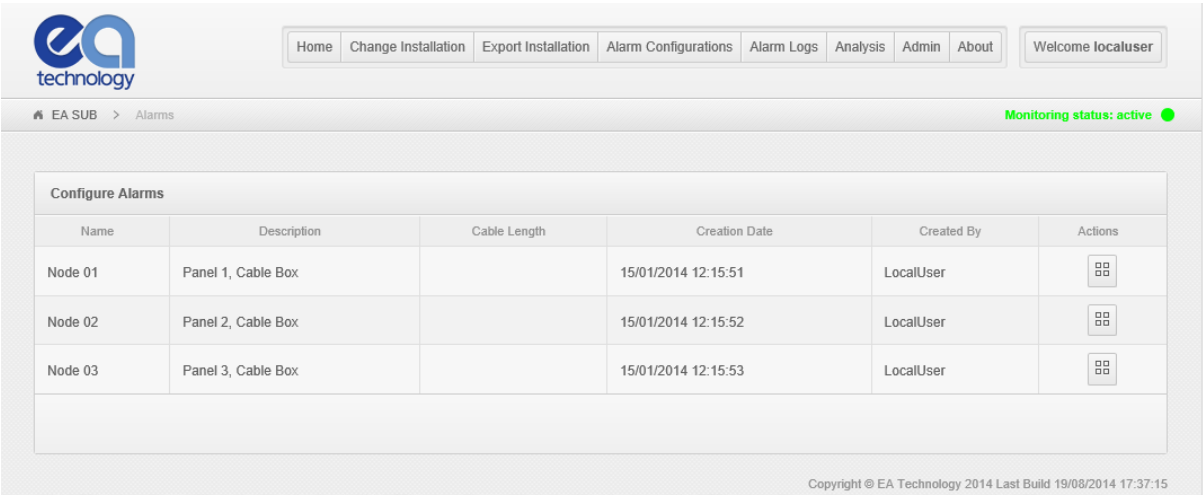



Figure 38: Connected nodes view

There are a couple of actions that can be performed on each node, detailed below:

View Channels – View the channels that are connected to this node.

View Alarm Summary Report – View a summary of all alarms for this particular node (UltraTEV Cloud Only).

By clicking on the View Channels icon, a list of the channels on that node is then displayed, as shown in Figure 399.

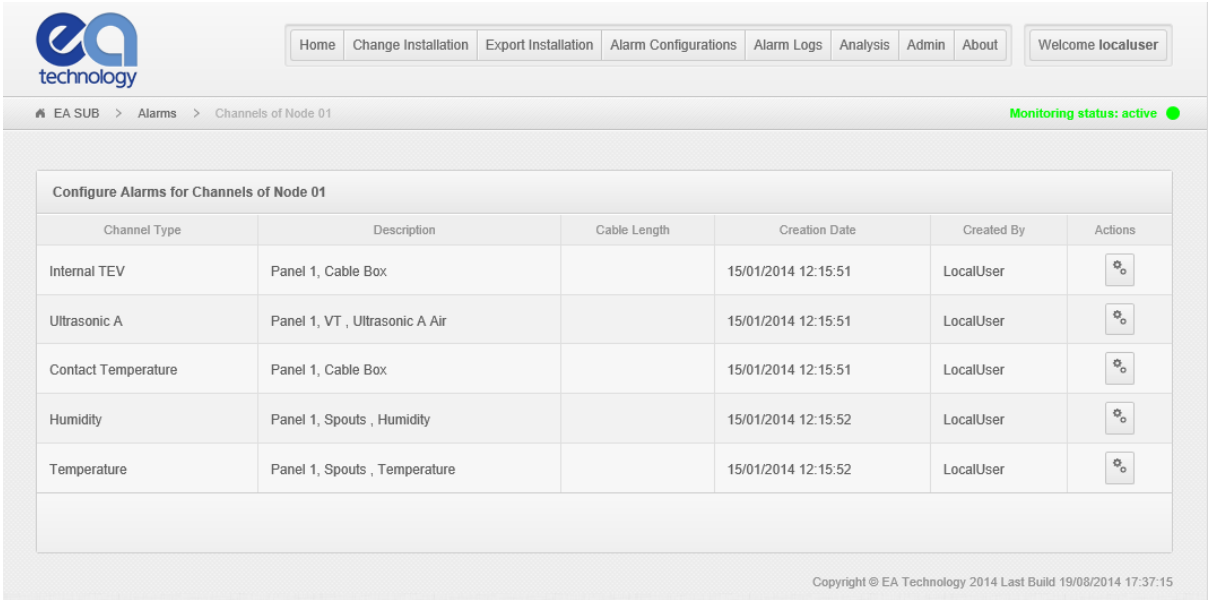



Figure 39: Viewing the channels for a node

There are again a couple of available options, detailed below:

Edit Alarm Settings – Create, edit, delete or copy a specific alarm setting.

View Alarm Summary Report – View a summary of all alarms for this particular channel (UltraTEV Cloud Only).

By clicking on Edit Alarm Settings, a screen similar to Figure 4040 is shown. This displays the list of currently configured alarms for this particular channel (or Sensor if it is easier to think of them like that).

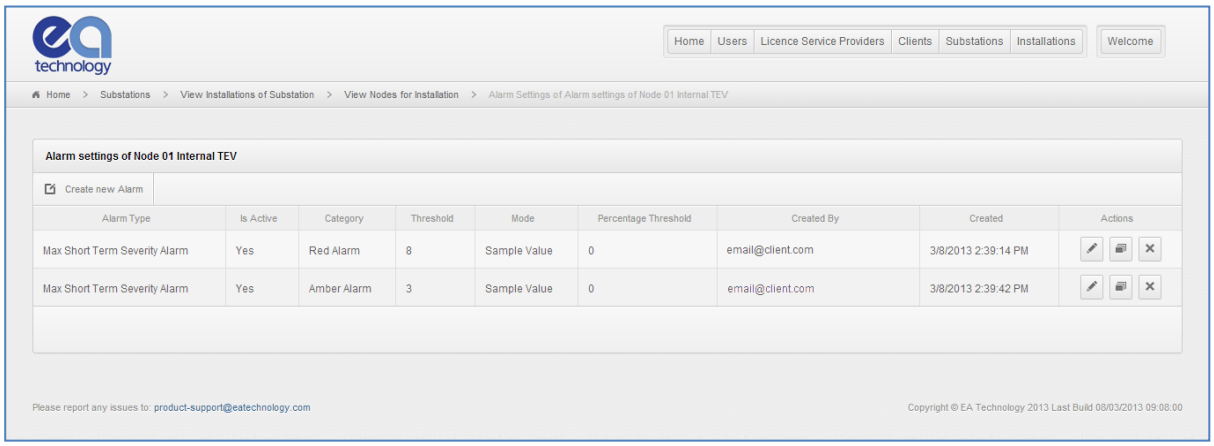


Figure 40: Configured Alarms

There are a few actions that can be performed on each alarm, detailed below:

Edit Alarm – Edit the alarm settings.

Copy Alarm – Copy the selected alarm to different channels.

Delete Alarm – Deletes the selected alarm.

To create a new alarm, click on Create New Alarm. The screen in Figure 4141 will then be shown. All the fields are required to be entered for a new alarm; the following table details their meaning:

| | |
|---|---|
| Is Active | Determines if the alarm is active or not. Setting this to no will mean that the alarm will not activate if the alarm criteria is met. |
| Category | Choose between red or amber. This denotes the severity of the alarm. |
| Type | Select the measurement point that you want to set an alarm against. |
| Threshold | The value by which the measurement point must be over for the alarm to activate. |
| Span Mode | There are different modes by which the alarm criteria can be measured. For this option, select Sample Value. |

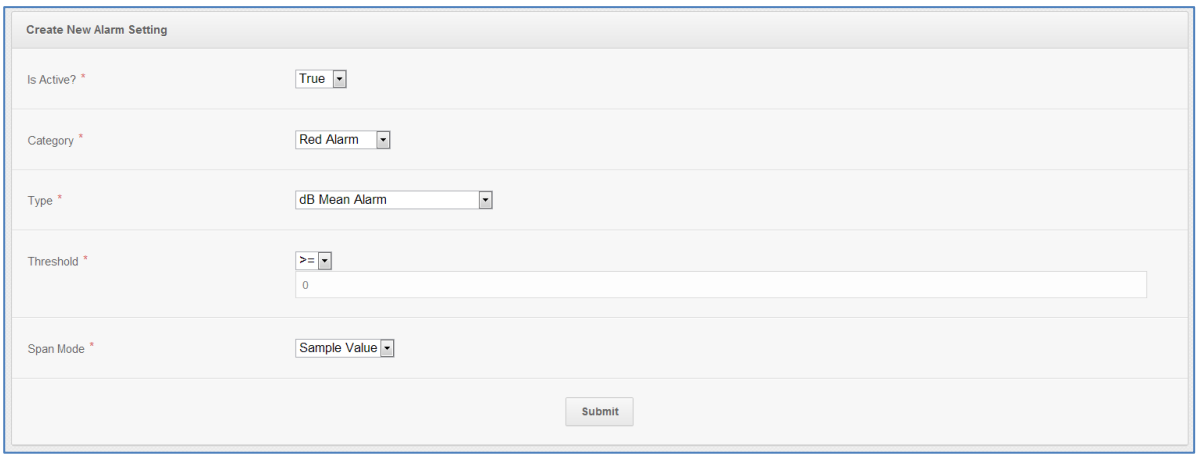



Figure 41: Creating a new alarm

Figure 422 shows the screen for copying alarms. This enables you to copy an alarm created for one channel to other similar channels. Pick the channels in the left window that you wish to copy the selected alarm to. Move these channels to the right-hand window and click on Copy to copy to these channels.

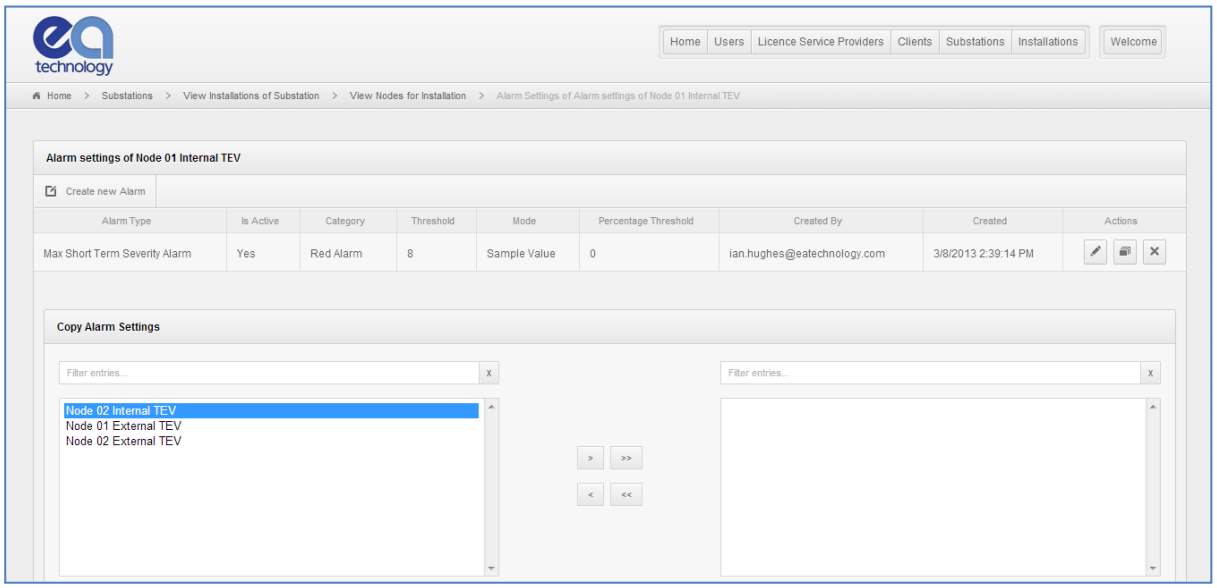



Figure 42: Copying alarms

All external sensors (External TEV, Ultrasonic, etc...) by default have health and disconnect alarms set. These cannot be modified in anyway and new ones cannot be added. These are internal alarms that are used to determine the status of the Sensors.

## 11.1 Alarm Types

The fields in the dropdown list use short names that match to different data recorded or calculated for the different types of channels in the system as listed below:

| | |
|---|---|
| Max Amplitude | The maximum amplitude for TEV channels. |
| Mean Amplitude | The mean amplitude for TEV channels. |
| Max Level | The maximum amplitude for CPD channels. |
| Mean Level | The mean amplitude for CPD channels. |
| Max Pulses Per Cycle | The maximum pulses per cycle for TEV and CPD channels. |
| Mean Pulses Per Cycle | The mean pulses per cycle for TEV and CPD channels. |
| Max Short Term Severity | The maximum short term severity for TEV and CPD channels. |
| Overall Severity | The overall severity for TEV channels. |
| First Count | The first count of TEV channels. |

| | |
|---|---|
| Trigger Count | The trigger count of TEV and CPD channels. |
| Mean | The mean amplitude for Ultrasonic channels. |
| Max | The max amplitude for Ultrasonic channels. |
| Reading | The reading for Contact Temperature, Temperature and Humidity channels. |
| Mean ALC | The mean ALC level (used for advanced diagnostics only). |
| Max ALC | The maximum ALC level (used for advanced diagnostics only). |

# 12 Viewing Alarms

The layout diagram will show any Nodes and Sensors that are in an alarm condition. Figure 433 shows an example of how this might look. The table below describes the meaning of the different icon modes.

| Icon Status | Description |
|---|---|
| Red Flashing | Alarm active and not acknowledged |
| Amber Flashing | Alarm active and not acknowledged |
| Red Static | Alarm active and acknowledged |
| Amber Static | Alarm active and acknowledged |
| Grey Flashing | Alarm cleared but unacknowledged |
| No Outline | No Alarm active |

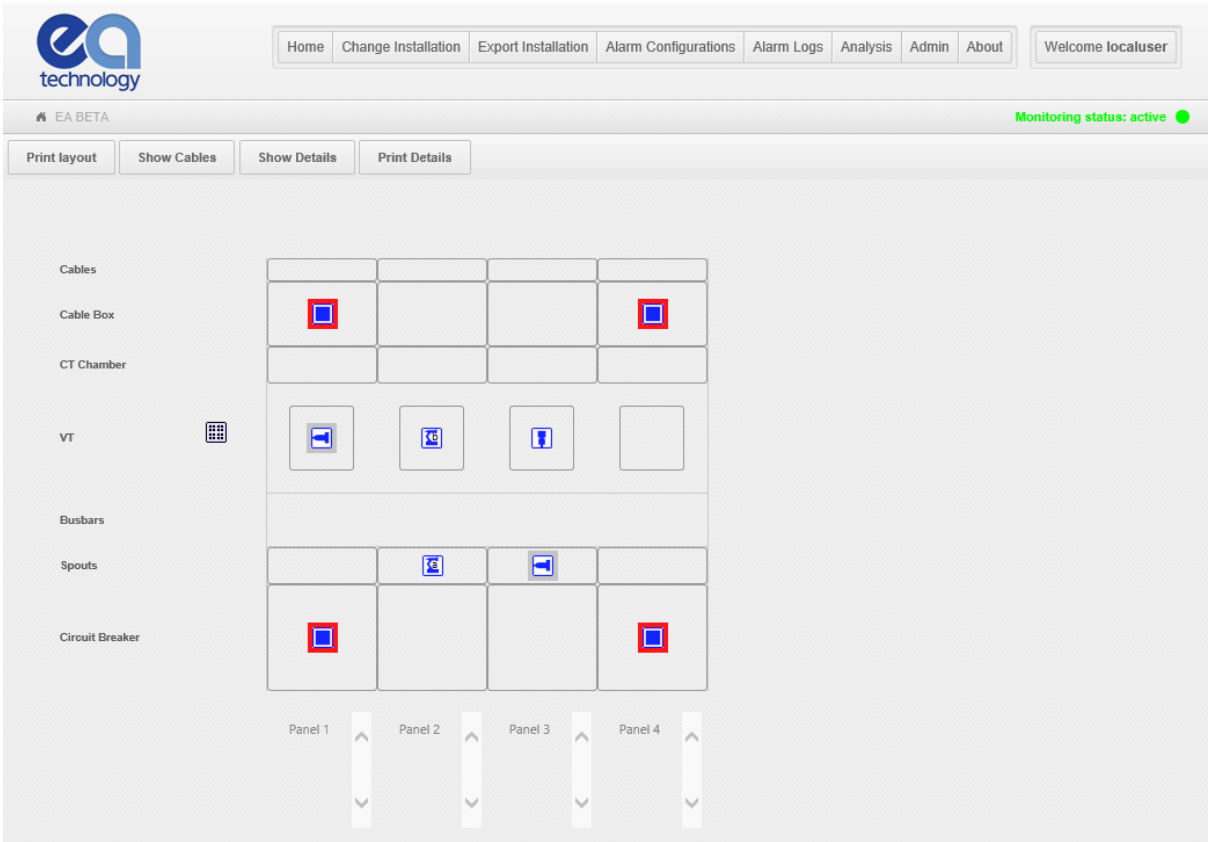



Figure 43: Layout page (home page)

The alarm summary table can either be access via clicking on a sensor in the layout diagram or accessed via the alarm summary icon when using UltraTEV Cloud. This table can be seen in Figure 444.

Each row in the table represents an alarm that has been raised; any alarms that are still active (i.e. the value has not since returned below the threshold) will be at the top. The details of the alarm

and the node concerned are all clearly displayed. The last three columns display the history of the alarm; the first time the alarm was raised, the last time the alarm condition was met and the time in which the alarm cleared (went below the threshold). Each of these times are also shown with the corresponding value that caused the alarm.

Alarms of Installation 98

| Node Id | Monitoring Point | Type | Threshold | Category | First Alarm | Last Alarm | Cleared |
|---|---|---|---|---|---|---|---|
| 2 | Node 01 | Node Health Alarm | 0 | Amber Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 3 | Node 02 | Node Health Alarm | 0 | Red Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 4 | Node 03 | Node Health Alarm | 0 | Red Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 5 | Node 04 | Node Health Alarm | 0 | Red Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 6 | Node 05 | Node Health Alarm | 0 | Red Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 7 | Node 06 | Node Health Alarm | 0 | Red Alarm | 13/02/2013 13:57<br>Value: 128 | 14/03/2013 13:46<br>Value: 128 | 14/03/2013 15:04 |
| 2 | Node 01 | Node Health Alarm | 0 | Amber Alarm | 30/01/2013 12:10<br>Value: 128 | 01/02/2013 13:44<br>Value: 128 | 11/02/2013 14:23 |
| 3 | Node 02 | Node Health Alarm | 0 | Red Alarm | 30/01/2013 12:10<br>Value: 128 | 01/02/2013 13:44<br>Value: 128 | 11/02/2013 14:23 |
| 4 | Node 03 | Node Health Alarm | 0 | Red Alarm | 30/01/2013 12:10<br>Value: 128 | 01/02/2013 13:44<br>Value: 128 | 11/02/2013 14:23 |
| 5 | Node 04 | Node Health Alarm | 0 | Red Alarm | 30/01/2013 12:10<br>Value: 128 | 01/02/2013 13:44<br>Value: 128 | 11/02/2013 14:23 |

Showing 1 to 10 of 0 entries

First 1 2 Last

Figure 44: Alarms Summary Information

Alarm Logs

Print

Alarms Summary

| Monitoring Point | Alarm Type | Alarm Threshold | Alarm Category | First Alarm Sample Time | First Alarm Value | Last Alarm Sample Time | Last Alarm Value | Clear Sample Time | |
|---|---|---|---|---|---|---|---|---|---|
| Panel 1, Cable Box | Overall Severity Alarm | 50 | Red Alarm | 15/04/2015 10:02 | 6 | 15/04/2015 10:08 | 6 | 15/04/2015 10:10 | ☐ |
| Panel 1, Cable Box | Overall Severity Alarm | 50 | Red Alarm | 15/04/2015 09:36 | 5 | 15/04/2015 09:58 | 6 | 15/04/2015 10:00 | ☐ |
| Panel 1, Cable Box | Overall Severity Alarm | 50 | Red Alarm | 15/04/2015 09:10 | 5 | 15/04/2015 09:22 | 5 | 15/04/2015 09:24 | ☐ |
| Panel 1, Cable Box | Overall Severity Alarm | 50 | Red Alarm | 14/04/2015 16:58 | 6 | 14/04/2015 17:20 | 6 | 14/04/2015 17:22 | ☑ |
| Panel 1, Cable Box | Overall Severity Alarm | 50 | Red Alarm | 14/04/2015 16:48 | 6 | 14/04/2015 16:54 | 6 | 14/04/2015 16:56 | ☑ |

1 - 5 of 5 items

Figure 45a: Alarms Summary Information Standard

Alarm data can be verified using the alarm log table. The data can be ordered and filter by every column. When an alarm is acknowledged the colour will change to green if it is cleared. Notes can be added to each alarm.

# 13 Alarm Notifications

Notifications can be configured by clicking on Notification Configuration from the menu, or on the installation list when using UltraTEV Cloud™. Configuring alarm notifications can be broken down into two parts; configuring the notification and configuring the subscriptions to the notification. Figure 46 shows the first part of the process. The following table describes each of the fields on this screen.

| | |
|---|---|
| Heartbeat frequency | The interval in days that a health message will be sent out regardless of alarm conditions. |
| Maximum SMS Length | The maximum length in characters of the SMS message. |
| Limit Number of Notifications | The number of notifications of a communication method per day per alarm setting. -1 indicates that no limit is enforced and 0 effectively disables the notification system. |
| Notification Valid Period | This is the number of days before an unsent notification expires. Once expired, no more attempts will be made to send it. |
| Add | This is a list of keywords that can be included in the customised SMS text and the customised e-mail text; these keywords will be replaced when a notification is issued by the actual values in the system. |
| Custom SMS Message | This is the customised text that will be included in SMS notifications. Each notification is designed to contain basic information to ensure the identification of the source of an alarm though some of the basic information may omitted when a notification is issued if the information is included in the customised text. |
| Custom Email Message | This is used the same way as the customised SMS text except that this applies to e-mail notifications. |

To understand “Notification Limit” and “Notification Valid Period” better, note that a notification of a particular communication method is raised when an alarm setting is first triggered or when it is cleared after being on. However, the notification for clearing does not count towards the number of notifications when “Notification Limit” is considered.

This notification is then issued to users who subscribe to it and becomes a number of issued notifications.

Note that the settings here apply to the whole system, all Nodes and channels.

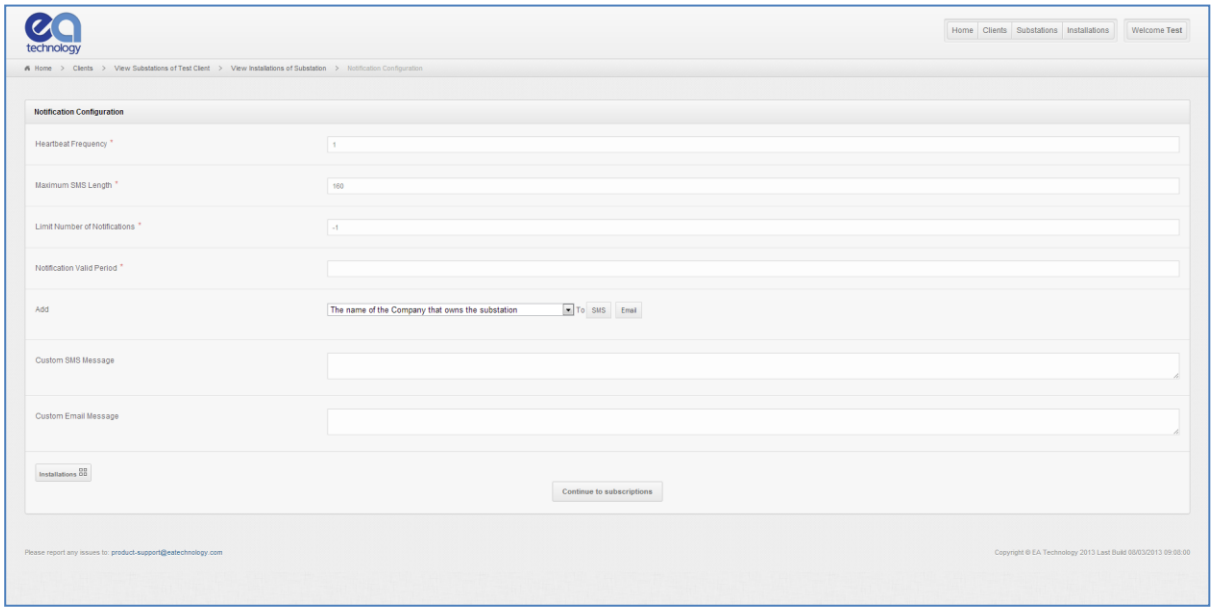



Figure 46: Creating and editing notifications

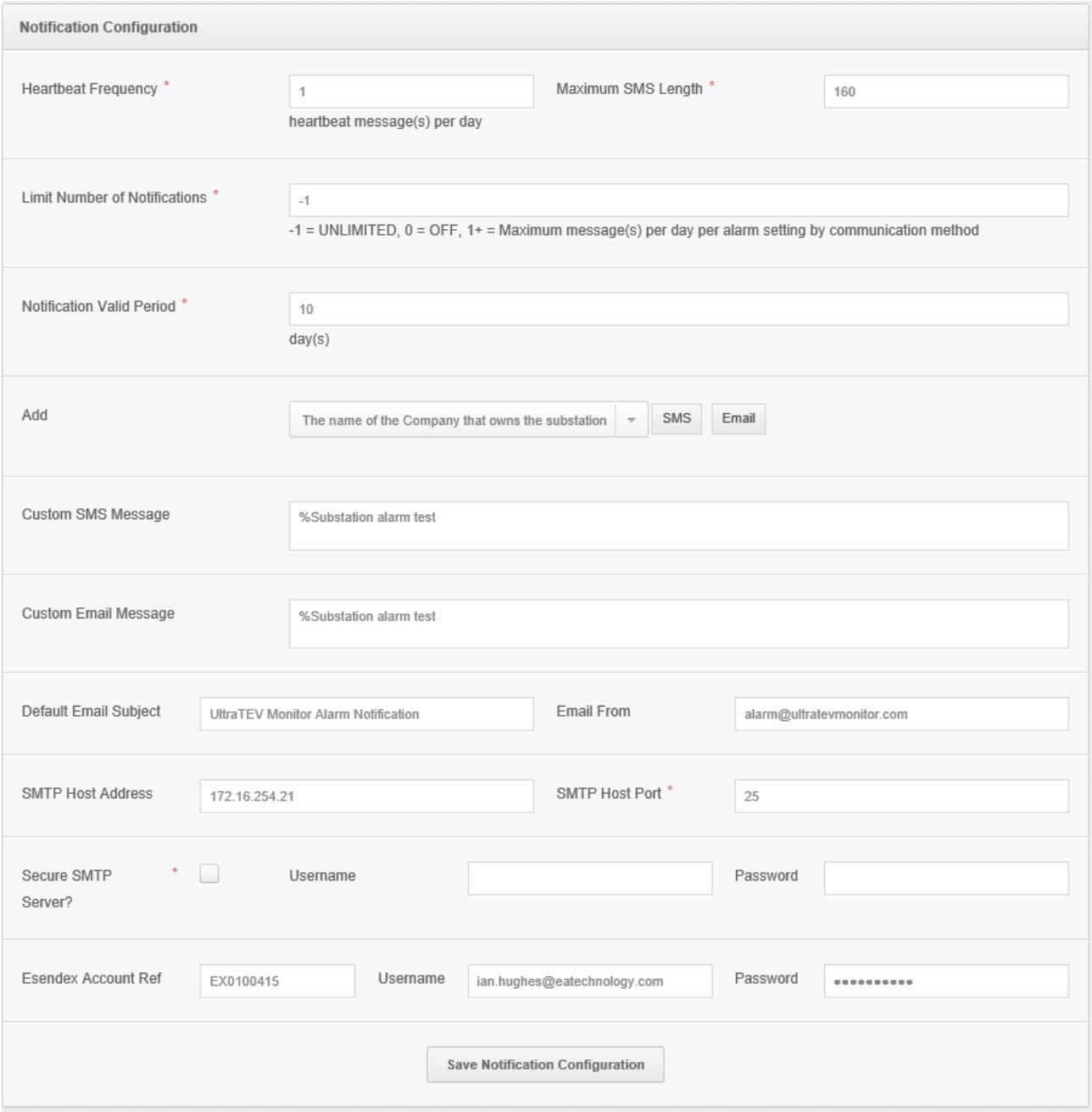



Figure 47a: Creating and editing notifications Standard

Once all the notification settings have been entered, click on Continue to Subscriptions to go to the next step. Figure 48 shows what this screen might look like. This is a list of all the available users who can receive notifications for this installation.

Figure 48: List of available users

Select the user you wish to configure subscriptions for and click on the action button. Figure 49 shows how this next stage might look. From this screen a list of all configured alarms is shown. Simply select which alarms you would like to receive notifications for and the method (E.g. SMS or email or both).

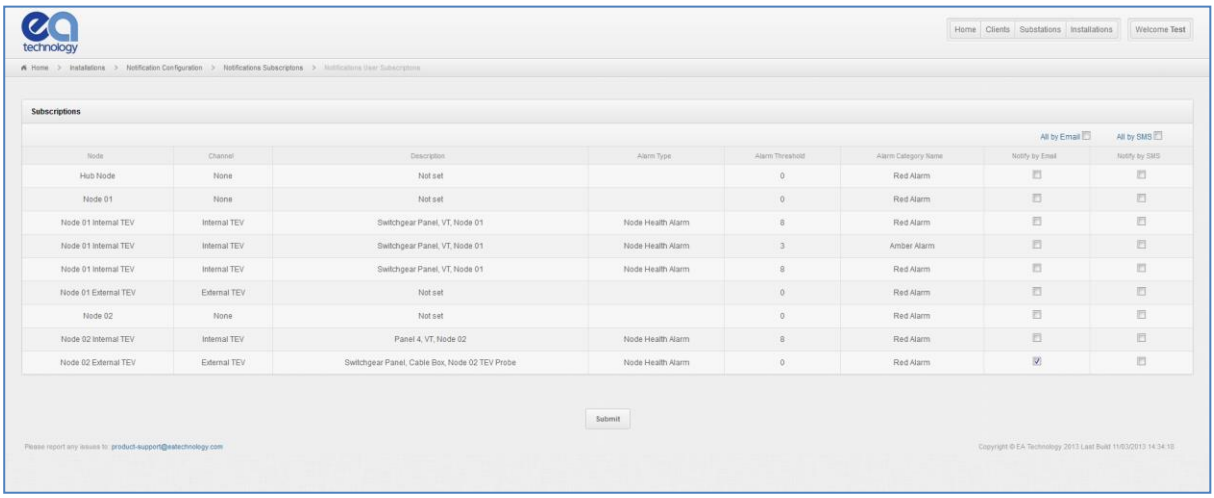



Figure 49: Modifying notification subscriptions

## 13.1 SMTP Settings

In order that users may receive alarm notifications by e-mail, the UltraTEV Monitor must connect to a valid SMTP server. The required settings values can usually be obtained from your IT team, and a brief description of each is below.

- **SMTP Host Address** – This is the address (IP or DNS) at which the SMTP server can be located. This address must be accessible from the UltraTEV Monitor unit.
- **SMTP Host Port** – The TCP port through which the UltraTEV Monitor can connect to the SMTP server. This is usually 25 or 2525.
- **Secure SMTP Server?** – Check this box if a username and password is required to connect to and forward e-mails through to SMTP server.
- **Username** – The username to use if the SMTP server requires one. (See previous setting)
- **Password** – The password to use if the SMTP server requires one. (See previous setting)

Note: that if you include a **Username** and **Password** value, but do not check the "**Secure SMTP Server?**" checkbox, the **Username** and **Password** will not be used when connecting to the SMTP server. If the checkbox is checked but the **Username** and **Password** fields are not supplied, the software will not be able to connect to and forward e-mails through the SMTP server.

## 13.2 Esendex Settings

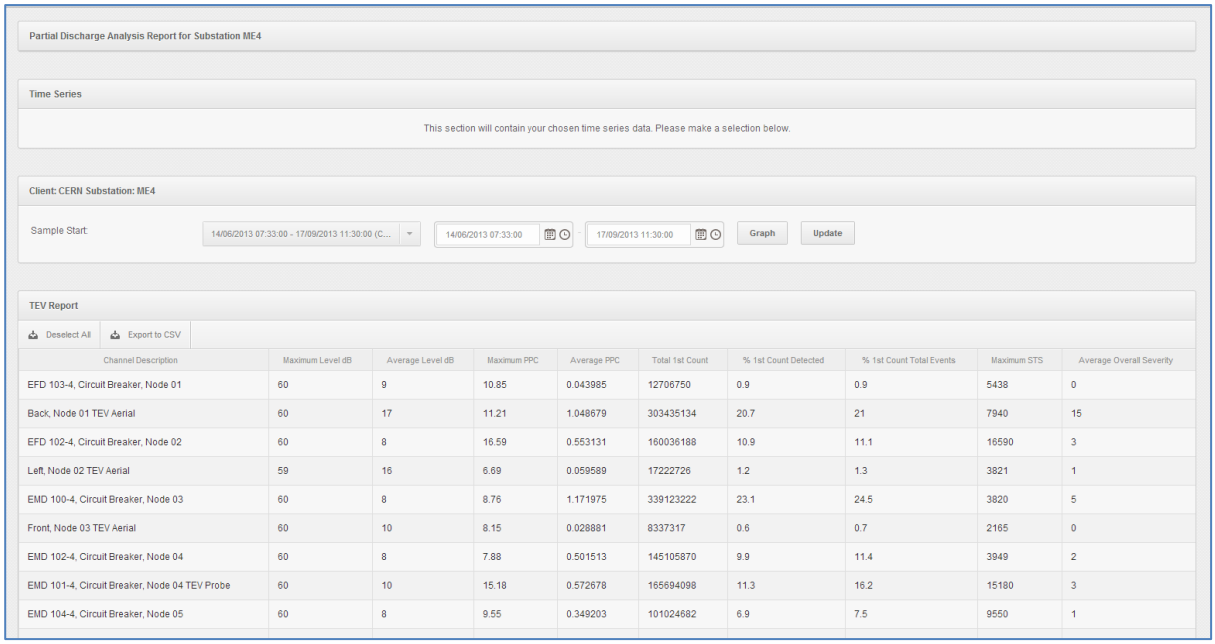
The UltraTEV Monitor software has been developed to forward SMS notifications through a service named Esendex (https://www.esendex.com). In order to receive SMS notifications from the UltraTEV Monitor, you must create an Esendex account from the website and are responsible for ensuring there are enough message credits. The website allows you to monitor SMS Notification volumes for your specific UltraTEV Monitors (or possibly you already use the service and wish to use an existing account). Note that the Esendex account must have SMS credits in order to forward notifications. If no credits are currently available, the notifications will be queued until such time as credits are available. The following settings must be configured on your UltraTEV Monitor in order to change the Esendex account to use.

- **Esendex Account Ref** – This is the unique account number of your Esendex account. This will be given to you once you create an account with Esendex.
- **Username** – This must be a username configured for access with Esendex.
- **Password** – The password used to access the Esendex account.

It is important to note that for your UltraTEV Monitor to send notifications via SMS and e-mail, an active internet connection must be available.

# 14 Analysing Data

A system is provided to enable the user to view the data and create custom graphs to show the data specific to their needs. To access the analysis page for an installation, click on the Analyse button or through the installation navigation options when using UltraTEV Cloud. The data analysis screen, shown in Figure 50, is broken down into a few sections. At the very top is the area where any graphs will be shown. Beneath this is a "control box" where the timeframe for the data can be set. Finally, at the base of the screen are sections showing a summary of the data for each measurement type; TEV, Ultrasonic, Cable PD and Environmental. See "Measurement Types" for an explanation of each of the measurements types.




| Channel Description | Maximum Level dB | Average Level dB | Maximum PPC | Average PPC | Total 1st Count | % 1st Count Detected | % 1st Count Total Events | Maximum STS | Average Overall Severity |
|---|---|---|---|---|---|---|---|---|---|
| EFD 103-4, Circuit Breaker, Node 01 | 60 | 9 | 10.85 | 0.043985 | 12706750 | 0.9 | 0.9 | 5438 | 0 |
| Back, Node 01 TEV Aerial | 60 | 17 | 11.21 | 1.048679 | 303435134 | 20.7 | 21 | 7940 | 15 |
| EFD 102-4, Circuit Breaker, Node 02 | 60 | 8 | 16.59 | 0.553131 | 160036188 | 10.9 | 11.1 | 16590 | 3 |
| Left, Node 02 TEV Aerial | 59 | 16 | 6.69 | 0.059589 | 17222726 | 1.2 | 1.3 | 3821 | 1 |
| EMD 100-4, Circuit Breaker, Node 03 | 60 | 8 | 8.76 | 1.171975 | 339123222 | 23.1 | 24.5 | 3820 | 5 |
| Front, Node 03 TEV Aerial | 60 | 10 | 8.15 | 0.028881 | 8337317 | 0.6 | 0.7 | 2165 | 0 |
| EMD 102-4, Circuit Breaker, Node 04 | 60 | 8 | 7.88 | 0.501513 | 145105870 | 9.9 | 11.4 | 3949 | 2 |
| EMD 101-4, Circuit Breaker, Node 04 TEV Probe | 60 | 10 | 15.18 | 0.572678 | 165694098 | 11.3 | 16.2 | 15180 | 3 |
| EMD 104-4, Circuit Breaker, Node 05 | 60 | 8 | 9.55 | 0.349203 | 101024682 | 6.9 | 7.5 | 9550 | 1 |

Figure 50: Summary tables

The control box can be used to select the timeframe for which the data will be displayed. Either select from the list the sample period or enter a custom date range as shown in Figure 51. The sample periods are whole periods where the UltraTEV Monitor was running. Each time the UltraTEV monitor is stopped and restarted, a new sample period is created. The last item in the list will allow the selection of all data. Clicking on the Update button will update the summary tables and any displayed graphs with the new timeframe. The Graph button is used to display any selected data (see below) in a graph.

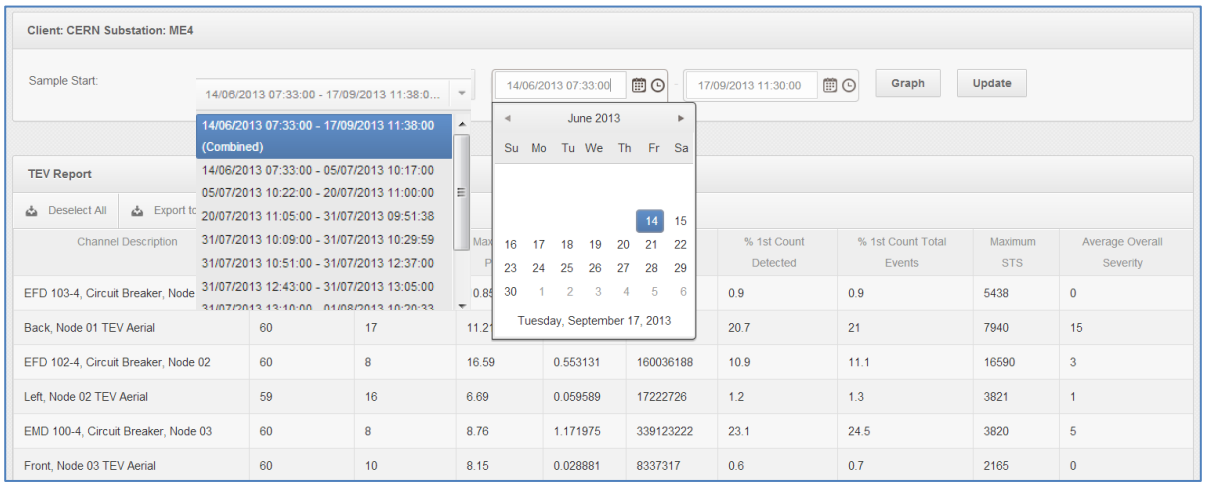



Figure 51: Selecting timeframe

Data can be selected from any measurement point in any of the summary tables, see Figure 52. Click and drag the mouse over the fields to select multiple fields within the same summary table or click on individual cells to select them. Multiple cells can be selected by holding down the Ctrl button on your keyboard as additional cells are selected. To deselect all the cells from a summary table, click on the Deselect All button for that table.

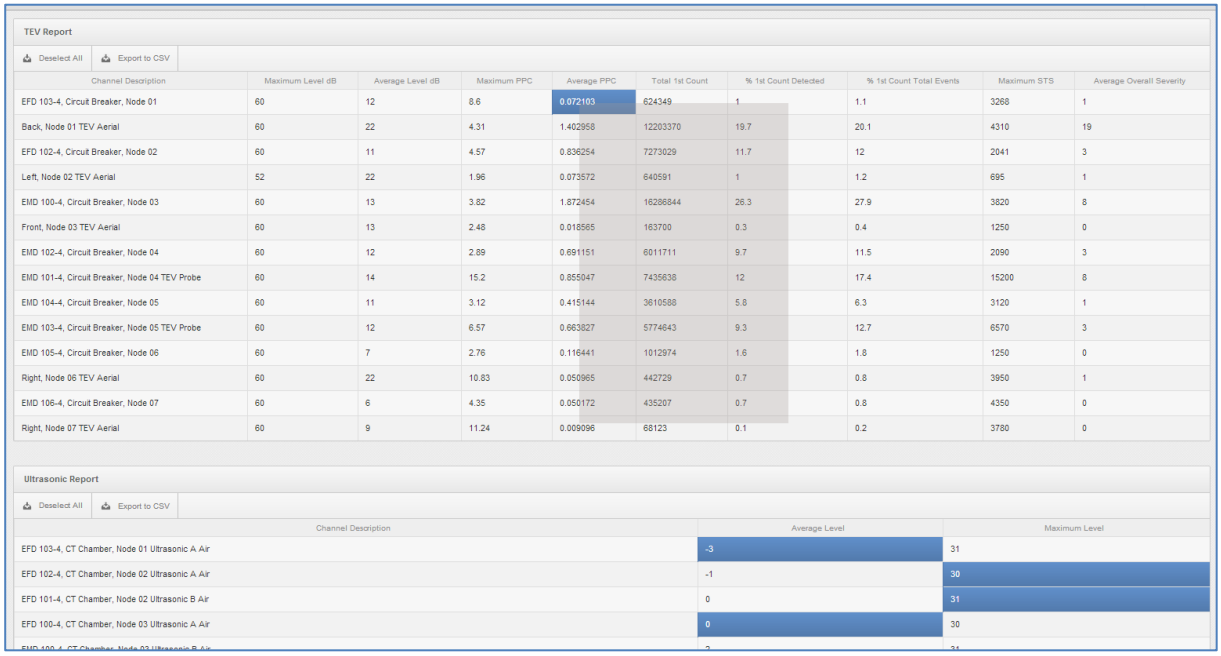



Figure 52: Selecting values to graph

To view a graph of the selected data, click on Graph within the control box. Depending on the selected data types, one or more graphs will be displayed for the selected timeframe. Figure 53 shows an example of how the graph might look. Depending on the selected timeframe, the granularity of the data might be different. For example, selecting a years-worth of data will not show every single sample value within that year but instead an average (or maximum depending on if the field is an average or maximum) of each days/weeks/months data.

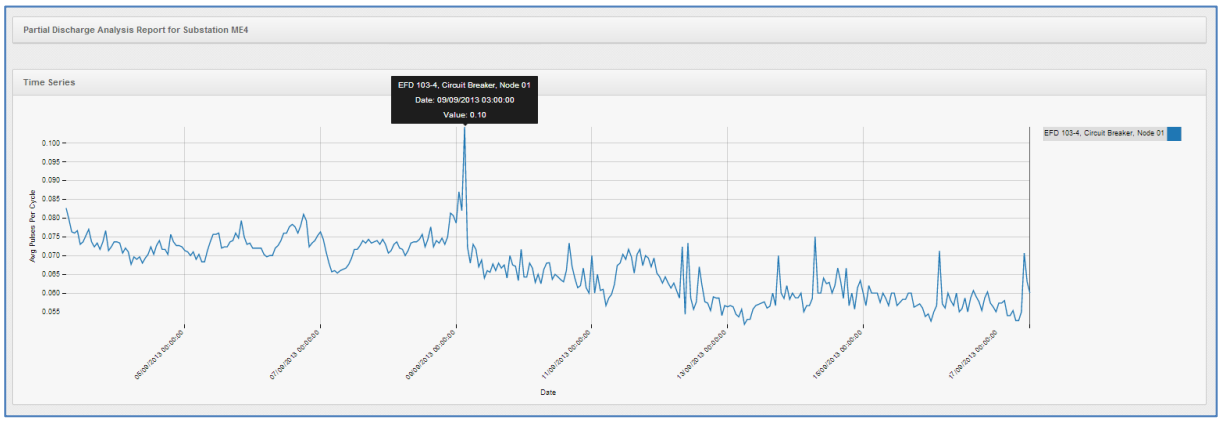



Figure 53: Viewing a graph of selected data

## 14.1 Measurement Types

Each of the UltraTEV Monitor™ channels collects a variety of different measurements and these are recorded in the summary table. The following table explains what each of these different measurement types is.

| | |
|---|---|
| Maximum Level | This is the maximum of the Maximum Amplitude (dB for TEV, pC for Cable PD) of samples. |
| Average Level | This is the average of the Mean Amplitude (dB for TEV, pC for Cable PD) of samples. |
| Maximum PPC | This is the maximum of the Maximum Pulses Per Cycle of samples. |
| Average PPC | This is the average of the Mean Pulses Per Cycle of samples. |
| Total 1st Count | This is the total of the First Counts of the samples. |
| % Total Events | This is the Total First Count for the channel divided by the Total number of pulses detected by the system. Note that the total number of pulses detected by the system is the sum of TEV or Cable PD event count of the samples. |
| % 1st Count | This is the percentage of the total number of pulses that this channel detected first. |
| Maximum STS | This is the maximum of the Maximum Short Term Severity of samples. |
| Average Overall Severity | This is the average of the Overall Severity of the samples. |

## 14.2 Downloading Data

The UltraTEV Monitor™ Analysis Data Export feature, allows the user to transfer the analysis data to a CSV file and view it later in a program like Microsoft Excel to perform further data analysis.

The data generated from the export feature is linked to one of the four summary report tables displayed in the analysis webpage. It is important to mention that the data retrieved is not relative to the aggregated data of the samples as shown in the tables, but rather to all the samples stored in the system and which fall into a specified time interval.

The following table specifies what type of data created, depending on the type of report.

| Report Type | Data Contained |
|---|---|
| TEV | • Sample Date<br>• Channel Description<br>• Maximum ALC<br>• Average ALC<br>• Maximum Level dB<br>• Average Level dB<br>• Maximum PPC<br>• Average PPC<br>• Total 1st Count<br>• Maximum STS<br>• Average Overall Severity |
| Ultrasonic | • Sample Date<br>• Channel Description<br>• Ultrasonic Average Level<br>• Ultrasonic Maximum Level<br>• Ultrasonic Minimum Level |
| Environment | • Sample Date<br>• Channel Description<br>• Environment Average<br>• Environment Maximum<br>• Environment Minimum |
| Cable PD | • Sample Date<br>• Channel Description<br>• Maximum pC<br>• Minimum pC |

Client: Scottish Power Substation: Runcorn

Sample Start: 27/11/2012 16:09:01 - 15/07/2013 08:38:00 (Combi... 27/11/2012 16:09:01 28/11/2012 16:09:01 Graph Update

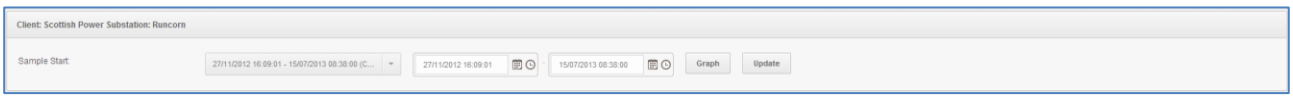
TEV Report

Deselect All Export to CSV

| Channel Description | Maximum Level dB | Average Level dB | Maximum PPC | Average PPC | Total 1st Count | % 1st Count Detected | % 1st Count Total Events | Maximum STS | Average Overall Severity |
|---|---|---|---|---|---|---|---|---|---|
| Beeston Court Feeder, Circuit Breaker, Node 01 | 47 | 4 | 4.4 | 0.019186 | 12870407 | 1.8 | 3.5 | 985 | 0 |
| Left, Node 01 TEV Aerial | 60 | 12 | 9.72 | 0.203425 | 140521499 | 19.8 | 19.9 | 4013 | 4 |
| Seymore Court Feeder, Circuit Breaker, Node 02 | 48 | 3 | 3.69 | 0.171949 | 118816561 | 16.8 | 18.2 | 826 | 0 |
| Left, Node 02 TEV Aerial | 60 | 4 | 4.85 | 0.010105 | 6979763 | 1 | 3.3 | 4850 | 0 |
| Bus Section, Circuit Breaker, Node 03 | 47 | 1 | 6.22 | 0.100914 | 69726242 | 9.8 | 12.7 | 986 | 0 |
| AP Precision Norton Valves, Circuit Breaker, Node 04 | 47 | 2 | 3.73 | 0.146828 | 101461180 | 14.3 | 15.8 | 744 | 0 |
| 11/33kV TX, Circuit Breaker, Node 05 | 47 | 2 | 7.2 | 0.081586 | 56354364 | 8 | 10.4 | 786 | 0 |
| Right, Node 05 TEV Aerial | 60 | 11 | 16.52 | 0.238288 | 164682076 | 23.3 | 28 | 9090 | 1 |
| Runcorn Custody Feeder, Circuit Breaker, Node 06 | 48 | 1 | 3.17 | 0.008859 | 5982819 | 0.8 | 1.8 | 317 | 0 |
| Right, Node 06 TEV Aerial | 60 | 6 | 4.95 | 0.044555 | 30780209 | 4.3 | 5.7 | 2370 | 0 |

In order to export a report to a CSV file, the user needs to perform the following steps, in the data analysis webpage:

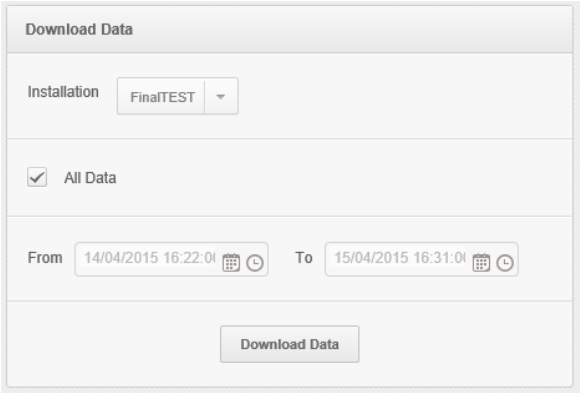
Step one: In the samples date range menu select a date range, or create a custom one, this will set the sample interval in which the exported data will fall in.




Step two: Click the “Export to CSV” button in one of the summary report table, for which you would like to gather information. Wait a moment for the download to start.

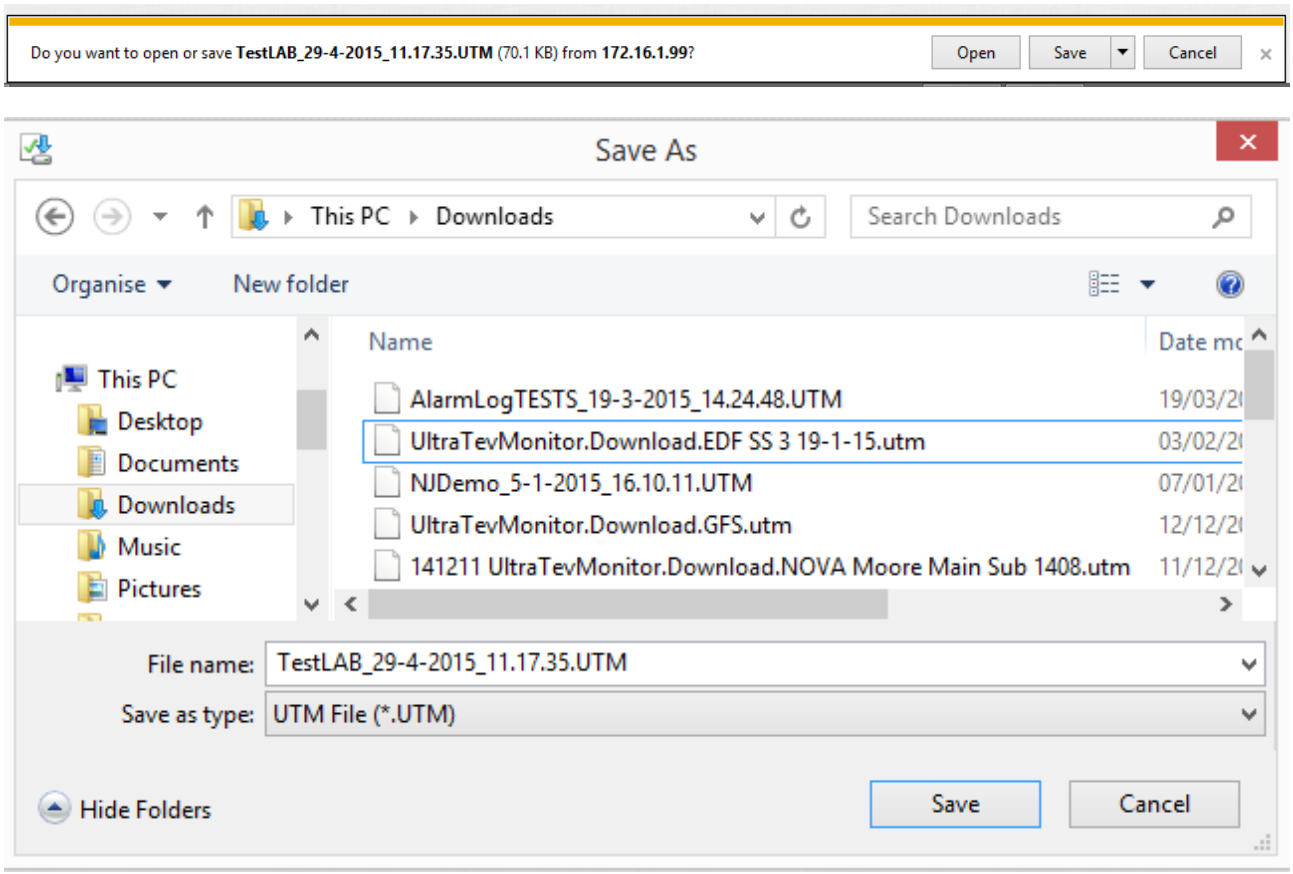
Step three: Once the download has been completed, open the downloaded file with Microsoft Excel, or any other program that supports files of the CSV format.

The Standard software has the capability to download all or part of the data. The data can then be uploaded into PDDAS Desktop edition version 2. The destination device can be chosen from the dialog box prior to the download commencing.




Large dataset (>2 Months in duration) should be downloaded in monthly sections to remove the risk of web browser timeout.

When the data it is ready you can choose where you want to save the data.



## 14.3 Downloading to USB Memory

The data can be downloaded to a USB memory device without the need to have access to the web interface, this can be achieved by following the steps detailed below:-

1. Put a USB memory device into the USB port. The 'Data Download Button' will illuminate green.

2. Press the 'Data download Button', the Button will flash whilst the data is downloading.

3. When downloading is complete the Button will stop flashing and go to steady green.

4. Press and hold the 'Data download Button' when the button illumination goes off remove the USB memory device.

# 15 User Management

The web interface requires users to log in before they can navigate the site. Each user is authorised against certain roles. Click on Admin and then User Management.

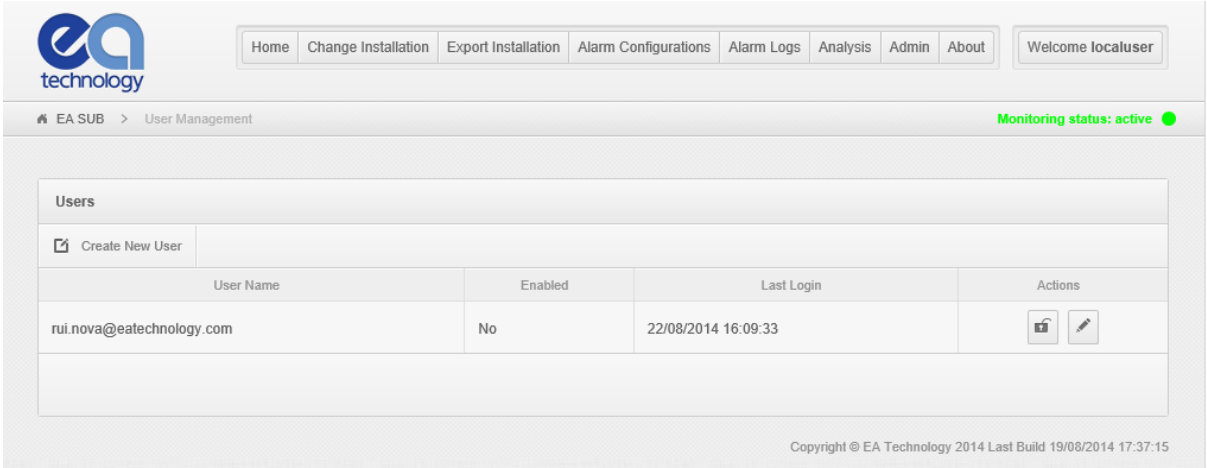



Figure 54: User list

Click Create new user and then create the user. The email address will be the user name. Choose the password and confirm, then select the role for this user and click submit.

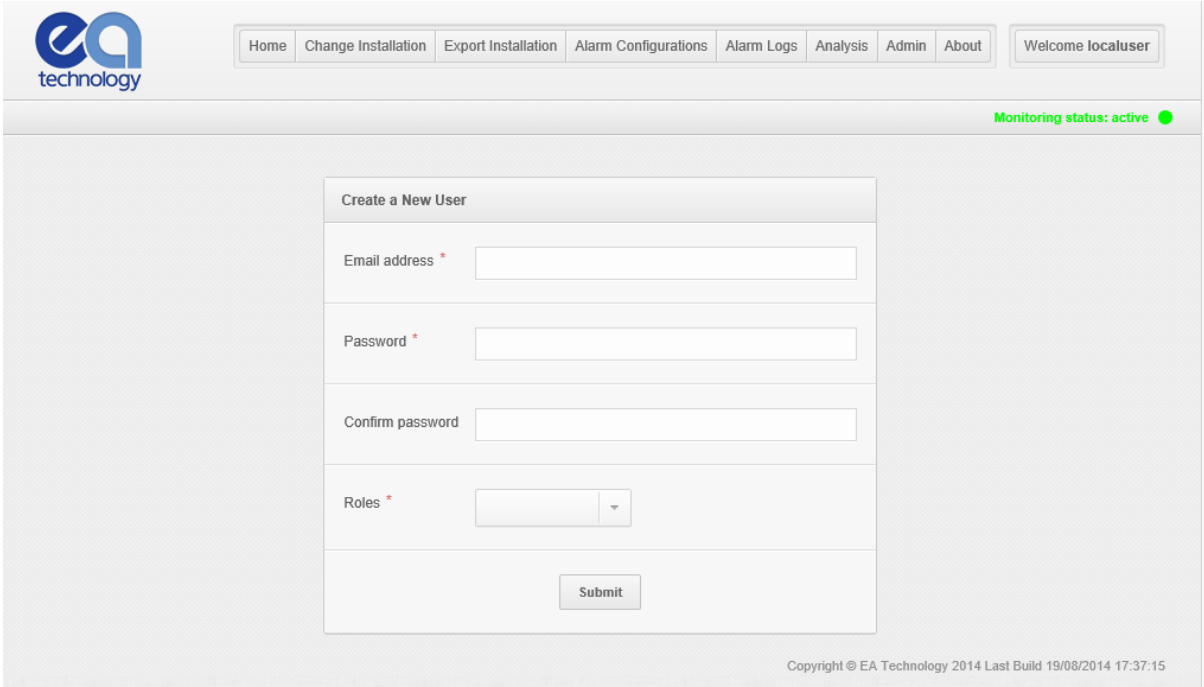



Figure 55: Create new user

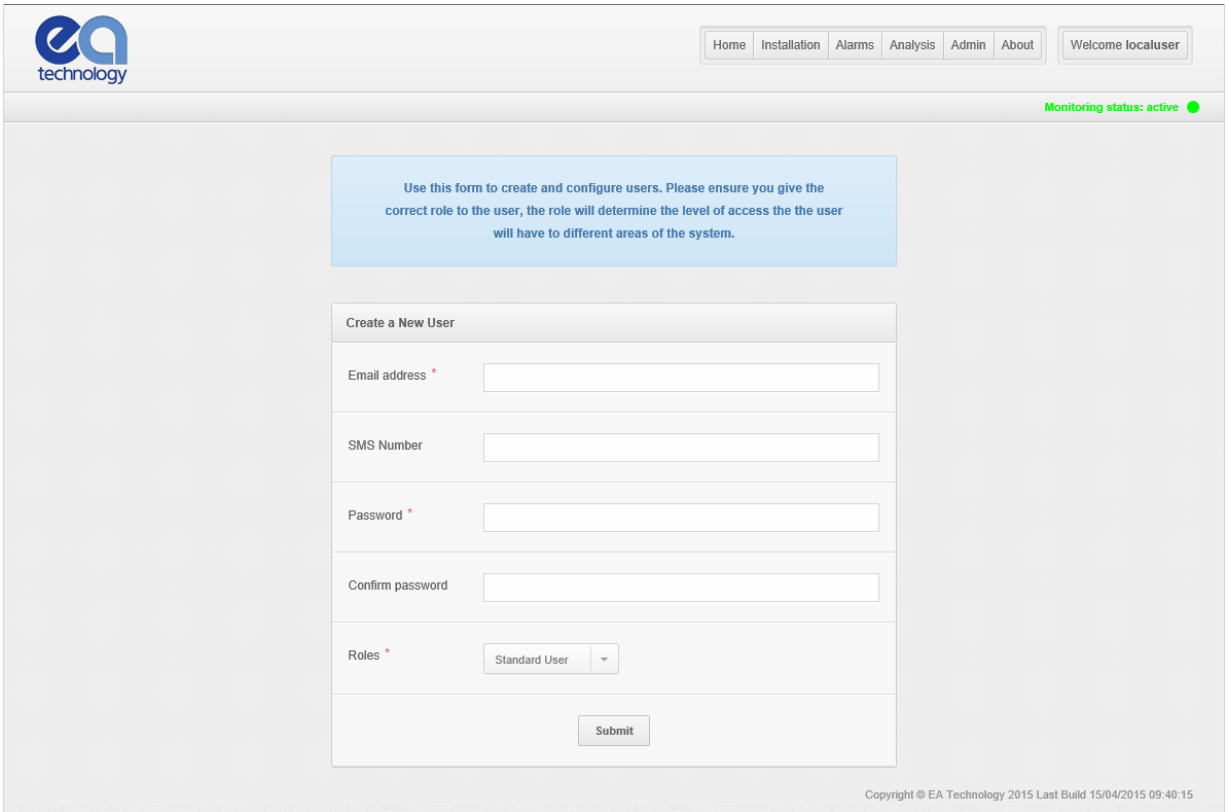



Figure 56a: Create new user Standard

Once the user created, the page will redirect to the list of users. Figure 54 shows the user list. In this list, you can edit and change the password if required. Once a new user is created, the user can then log in to the web. Figure 57 shows the login screen.

Figure 57: Login screen

A user cannot register themselves with the UltraTEV Cloud™ web portal, they have to be invited either by an EA Technology representative or someone within their own organisation who already has access. For a new Licence Service Provider, EA Technology will create the Licence Service Provider an email address of the initial contact. A registration email will then be sent to this address with a link for them to complete the registration.

# 16 UltraTEV Cloud™

The idea behind the UltraTEV Cloud™ system is simple; with the exception of the initial commissioning, the device can be managed entirely from the comfort of your home or office. Not only this but all of your devices can be managed from one place without the need to know any individual connection details.

We have taken our award-winning UltraTEV Monitor™ system and effectively split it in two. The usual PD, Ultrasonic and cable PD data is still collected on the device. This data is streamed to the UltraTEV Cloud™ web portal, where it can be analysed from anywhere with an internet connection.

The web portal is central to the system. From here every device can be managed from one simple user interface. The main tasks are:

- Create new installations
- Analyse data
- View alarms
- Configure alarm settings
- Configure alarm notifications

In addition to these features, there are also all the usual management tasks such as changing passwords and contact details.

## 16.1 Introduction

In order to use the system, you will need a laptop. Although the majority of tasks can be completed using the web portal, initial commissioning needs to be done via a local connection to the device. See "Connecting to the UltraTEV Monitor" for how to connect to the local web interface. Other than that, any other interaction is done via the web-portal. During the setup process, an Installation Configuration File is used. This is downloaded from the web-portal and then must be uploaded to the device web-interface during the initial commissioning stage. This configuration file serves two purposes:

1. It contains information about which Nodes and Sensors that are expected to be connected and their locations on the switchgear.
2. It contains specially encrypted instructions telling the UltraTEV Monitor™ device where to send its data and how to make the connection.

In the UltraTEV Cloud™, the Ultra TEV Monitor™ device will not function without the Installation Configuration file, and any attempt to commence monitoring will not work.

## 16.2 Getting Started

Connect to the UltraTEV Cloud web-portal using the following URL;

http://no-outage.eatechnology.com

Upon visiting the site, you will need to log in with the email address that was registered for you. If you do not yet have an account, please speak to your account manager or EA Technology representative to obtain access. If you have forgotten your password, click on the "forgot your password?" link to have your password reset and a new password emailed to you.

After a successful login, the user will be directed to the main page. This will vary depending on the users' access level but will always contain two main parts. At the top of the screen, as will always be the case, is the main site navigation. See "Navigation" for details of how to use the site navigation bar. Beneath this will be a list of everything at the top level that the current user can see. In the case of a service provider, this will be a list of all the clients that they are responsible for. If no clients have been setup yet, this list will be empty. Figure 58 shows how this might look.

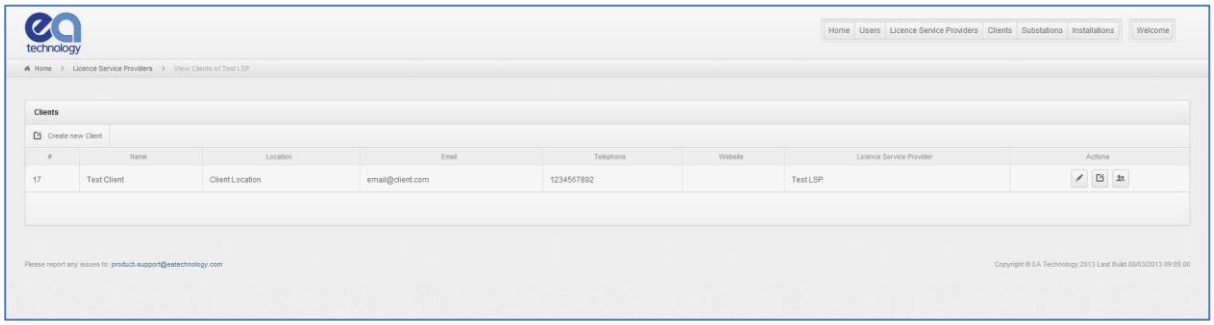



Figure 58: List of Clients

## 16.3 Navigation

At the top of every screen is the site navigation bar and breadcrumb trail. These are always visible and will perform the same actions regardless of where the user is on the site. The exact contents will vary depending on each users access rights however. Figure 59 shows an example of how this might look.

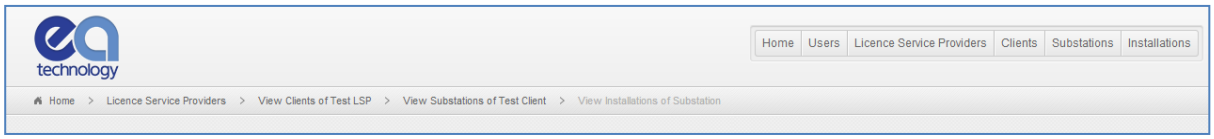



Figure 59: Navigation Bar and Breadcrumb Trail

The buttons at the top of the screen can be used to view a list of each of the items that the logged in user has access to. Clicking the Installations button for example will view a complete list of all the installations that the logged in user has access to.

Beneath the buttons is the breadcrumb trail, this will show the user where they are in the hierarchy. For example, if they have navigated down from a service provider, then a client then a substation, the bread crumb will represent this. In this case on the installations for that substation would be seen in the list. Clicking any of the items in the breadcrumb will take the user back to that level.

Clicking the username in the top left will reveal a context menu allowing the user to either logout of the system or edit their profile.

## 16.4 Creating and Managing Assets

### 16.4.1 Clients

To create a new client, from the clients screen, click on the Create New Client button. The screen shown in Figure 61 will then be displayed. Fill in the details for the client company, items marked with a red asterisk are required fields and must be entered to complete the setup. The initial user's email field will be the email address of the client user that will have access to the system. This user will be emailed with instructions of how to access the site and setup their password.

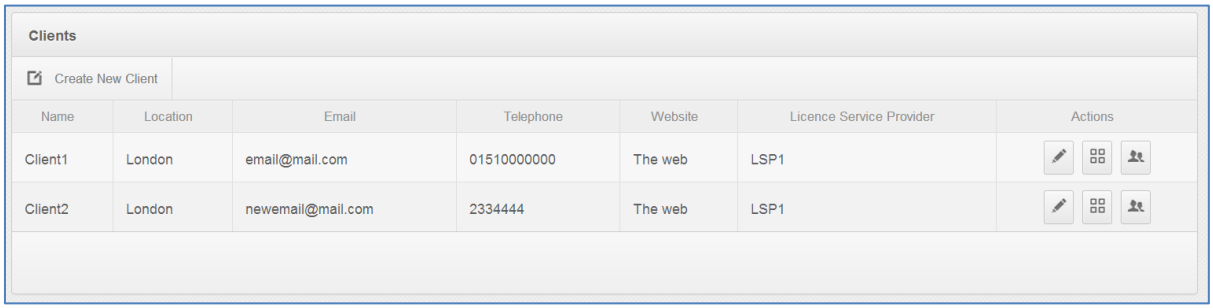



Figure 60: List of Clients

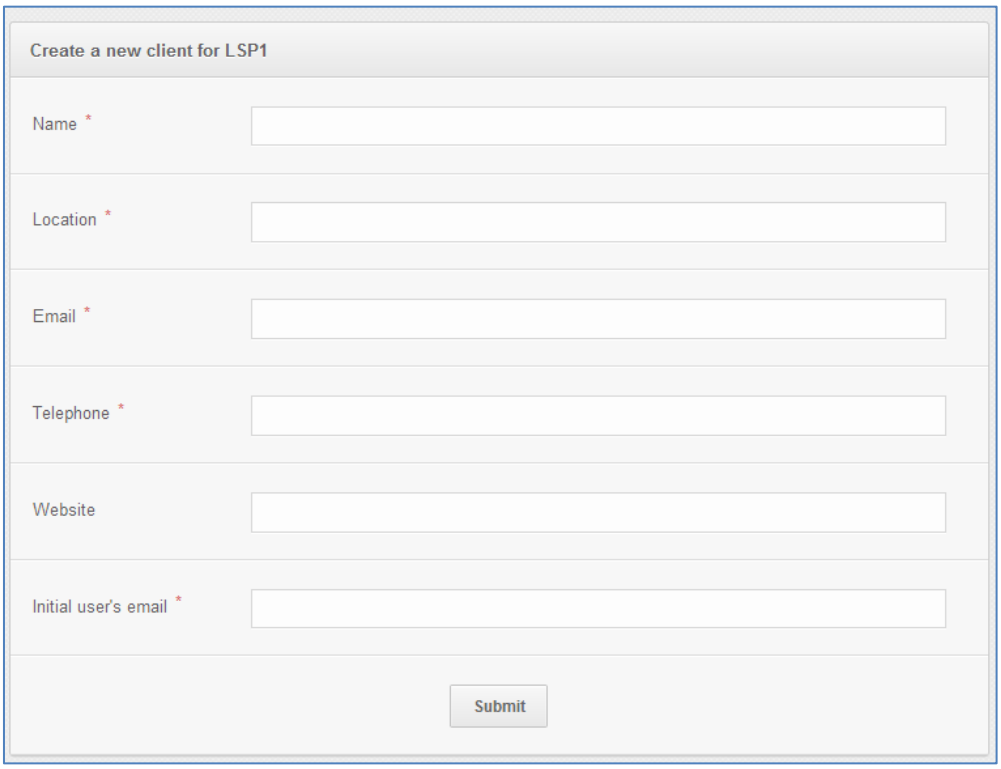



Figure 61: Creating a new Client

Each client within the clients list has a number of options available, denoted by the icons in the Actions column.

Edit Client – Edit the details of the client.

View Substations – View a list of the substations for this client.

Create New Substation – If there are no current substations for the client, create a new one.

View Users – View a list of users who belong to this client.

### 16.4.2 Substations

Notice, to create a substation it is required to navigate to the substation list screen through a corresponding Client and not from the top navigation menu. To create a new substation, from the substation screen, click on the Create New Substation button.

The screen shown in Figure 62 will then be displayed. Fill in the details for the substation, the only required field is a name, denoted by the red asterisk. The source frequency will be in Hz and will be either 50 or 60 depending on your region. The voltage fields are in kV.

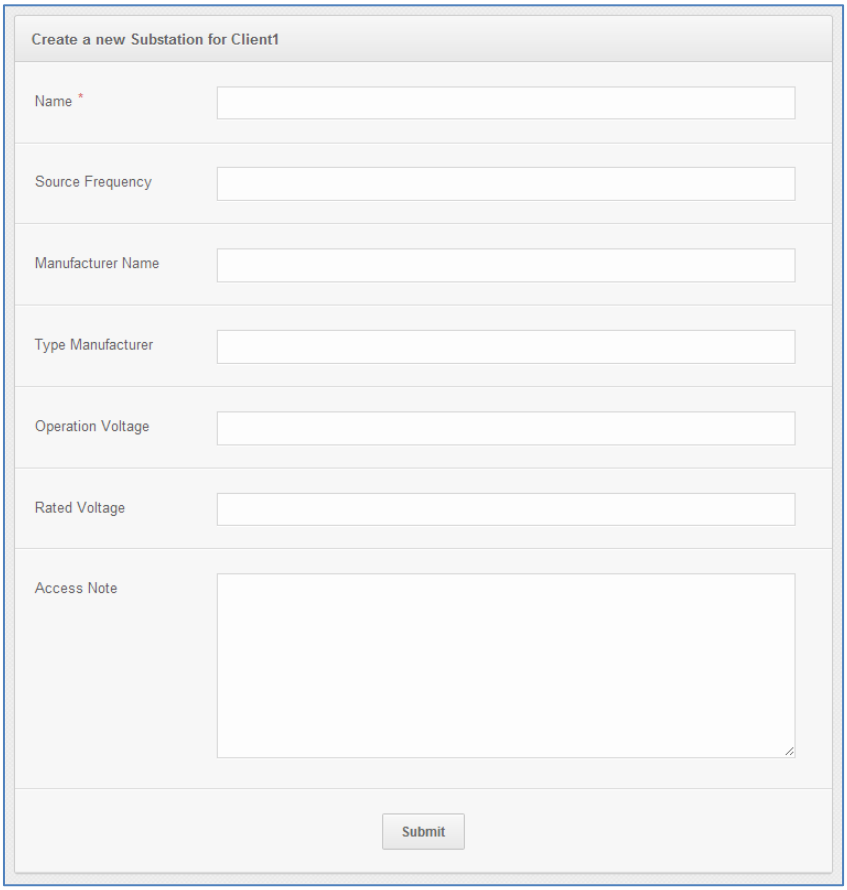



Figure 62: Creating a new Substation

After inputting the substation details, you are taken to the substation layout screen. Each substation has a layout that is used when creating an installation. This layout is defined when a new substation is created. Once a substation has an active installation on it, the layout cannot be edited. Figure 63 shows the substation layout screen.

The substation layout is a plan view of a typical piece of Medium Voltage (MV) switchgear. The bottom of the diagram is the front; the top of the diagram is the back and the middle of the diagram represents the top of the switchgear.

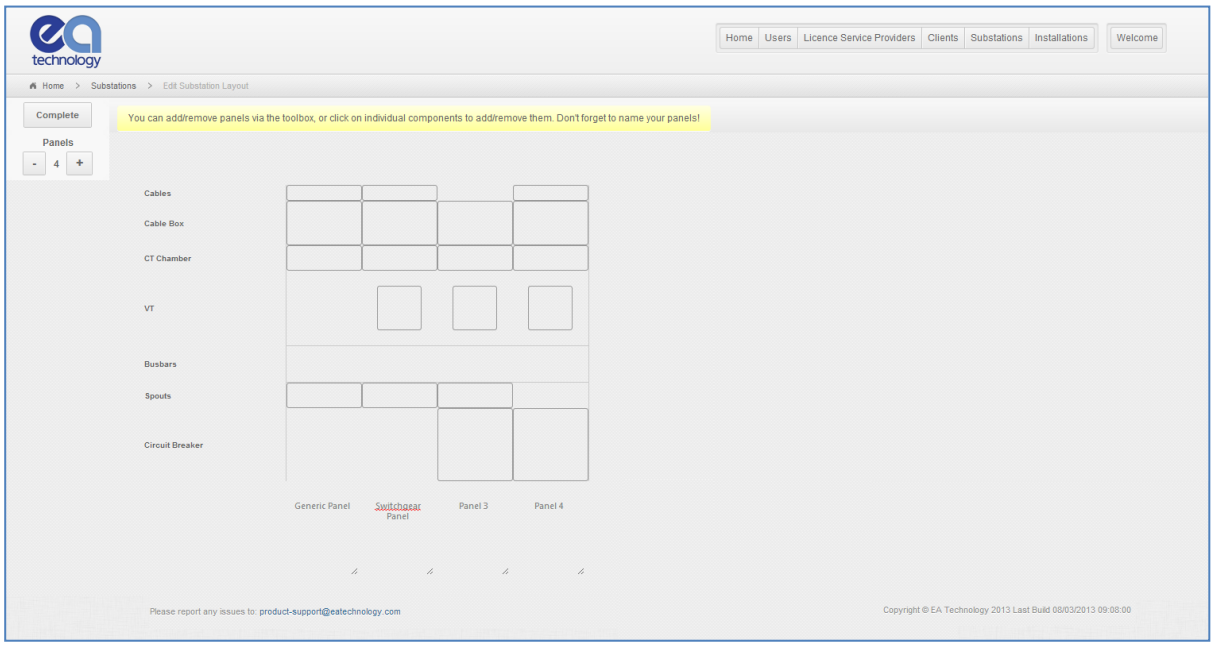



Figure 63: Defining a substation layout

A substation layout diagram can be edited in three different ways:

| | |
|---|---|
| Number of Panels | By using the control box in the top left of the screen, the number of present panels can be set. |
| Panel Names | At the base of each panel, there is a free text field. This can be clicked in and then given a name of your choice. Any nodes and sensors placed on this panel will include the panel name in their description. This makes it obvious when analysing the data, which panel is being considered. |
| Components | Each panel can be configured to only have a certain set of components. (VT, CT, Busbar, etc…) Click on a component to remove it and click again to re-instate it. Nodes and sensors cannot be placed on removed components. |

Once the layout has been created, click on the Complete button. This will take you to the list of substations screen. Figure 64 shows how this list might look.

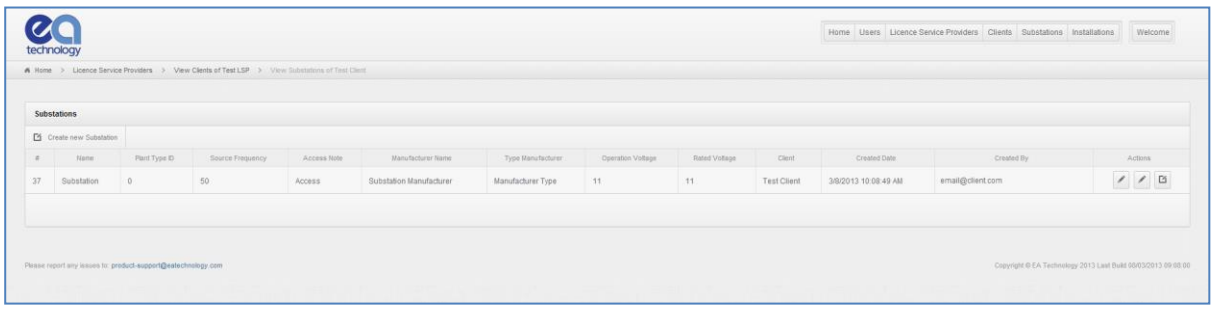



Figure 64: List of substations

Each substation within the substations list has a number of options available, denoted by the icons in the Actions column.

Edit Substation – Edit the details of the substation.

Edit Substation Layout – Edit the details substation layout.

Create New Installation – If there are no current installations on the substation, create a new one.

View Installations – View all the installations for this substation.

### 16.4.3 Installations

Note: to create an installation it is required to navigate to the installation list screen through a corresponding Substation and not from the top navigation menu. When creating a new installation, the substation layout is used and the required nodes and sensors are placed on the layout. This part of the process is establishing what nodes and sensors are being used for the installation and where they are situated on the switchgear. From this a list of equipment that will be needed can be created. It also saves performing this task in the substation itself although the rest of the system-discovery process will still need to be performed.

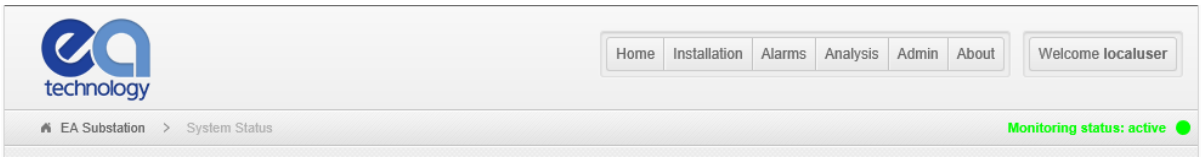
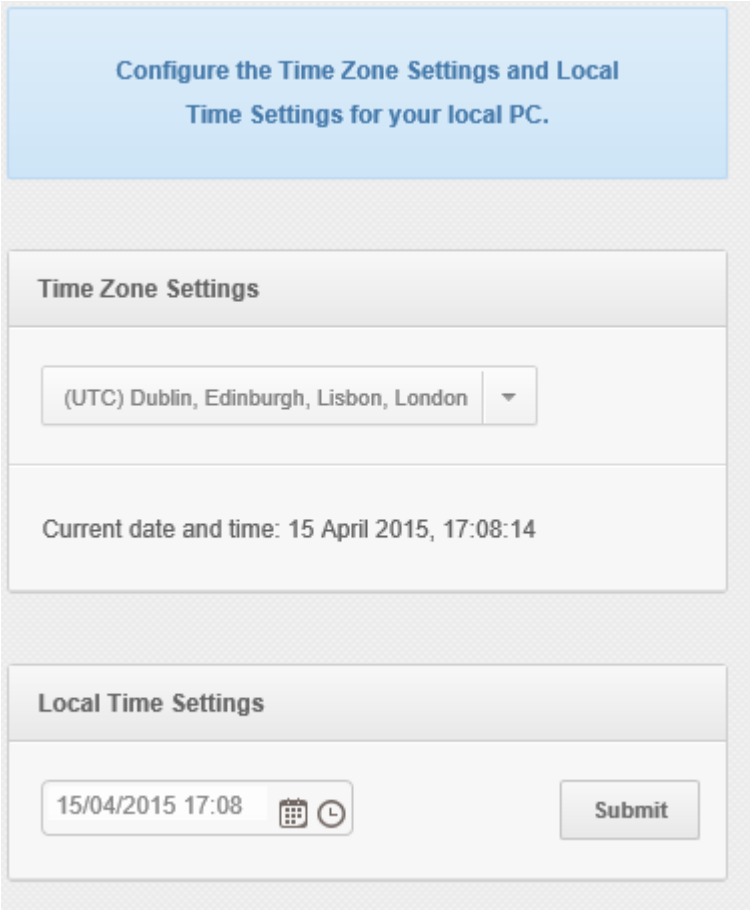



Figure 30a: UltraTEV Monitor Web-Interface Stand-Alone

You can change the machine to your time zone or correct the local time. If you change the local time, you need to do another installation after.


Configure the Time Zone Settings and Local Time Settings for your local PC.
Time Zone Settings
(UTC) Dublin, Edinburgh, Lisbon, London
Current date and time: 15 April 2015, 17:08:14
Local Time Settings
15/04/2015 17:08
Submit

System Discovery for further details on this topic.

Create a new installation by clicking the Create New Installation button from either the list of installations or from the substation which you wish to use.

The screen shown in Figure 65 will then be displayed. First of all drag the hub from the palette on the left and place it on the substation layout. When hovering over an area that can be placed on, the area will turn green.

Once the hub has been placed, the first Node is then available in the palette, again drag this onto the layout. Once the first node has been placed, the palette then changes to now show the available Sensors for that node. Figure 66 shows the palette as it will look now.

The process of creating an installation by dragging and dropping Sensors onto the layout diagram is identical to that used in the System Discovery process on the device. Discovery for further details.

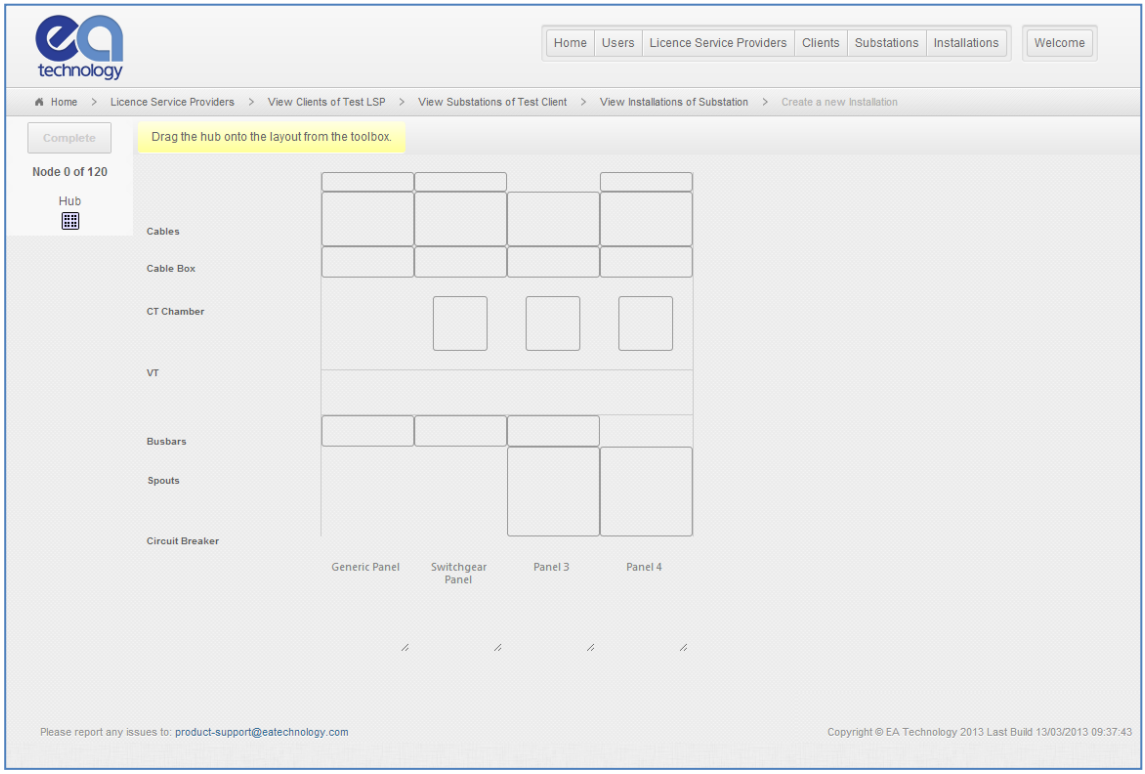



Figure 65: Creating a new installation

Figure 66: Installation Palette

The system will now proceed to create the back-end details that are needed to support the installation; this may take a few seconds. Once finished, you will be returned to the list of installations. Figure 67 shows how this list might look.

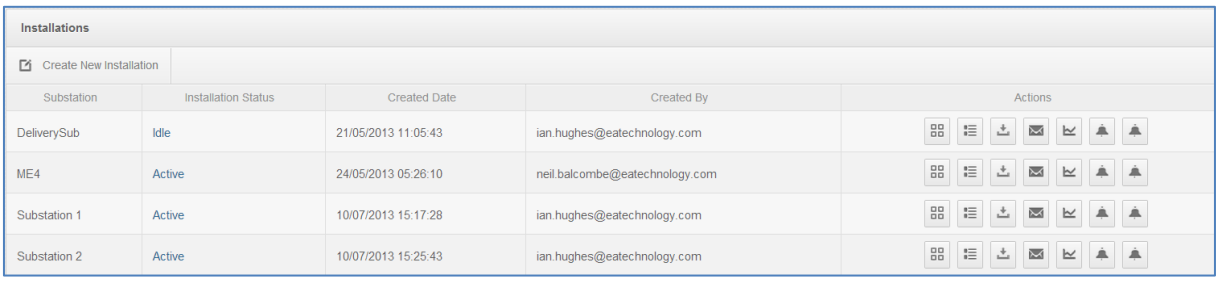



Figure 67: List of installations

Notice the installation status will be listed as Pending. This status can be clicked to be shown more information and given options for changing the status.

Each installation within the installations list has a number of options available, denoted by the icons in the Actions column.

View Layout – View the installation layout.

View Equipment List – Displays a list of the equipment used in this installation. This list can be printed.

Download Installation Configuration File – Downloads the file needed to complete the installation setup on the UltraTEV Monitor™ device.

Notification Configuration – Configure notification settings for this installation.

Analyse Data – View the data from this installation and perform any analysis tasks.

View Nodes – View the nodes that are connected in this installation. From here alarms can be configured.

View Alarms – View the active and historic alarms for this installation.

Before visiting the substation to continue installation, you must first download the Installation Configuration File.

## 16.5 Installation Status

By clicking on the current installation status from the list of installations, the status of the installation can be seen. Figure 68 shows an example of this screen. From here we can see when the last heartbeat was received from the UltraTEV Monitor™. Heartbeats are sent every 30 seconds to indicate that the device is running. The last sample time is the time of the last sample from the UltraTEV Monitor™. This is the time of the sample on the device, not the time it was received at the server.

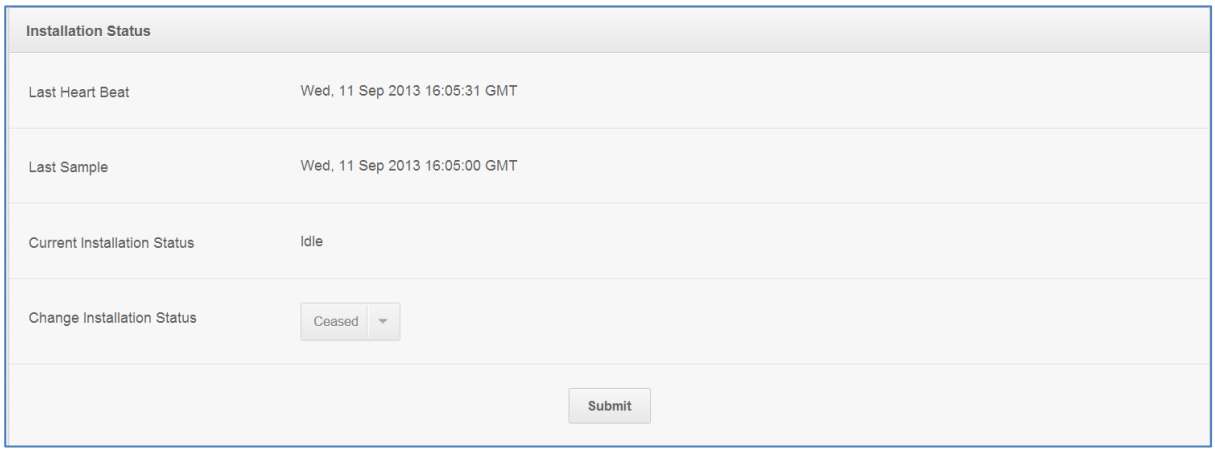



Figure 68: Installation status screen

Depending on the current installation status, another status may be set. The following table explains the different installation statuses.

| | |
|---|---|
| Pending | The Pending status is for when an installation has been created but no data has been received yet. Once device registration has occurred (or the first message has been received) then the status will automatically change to Active. The Pending status also signals that changes to the installation can still be made. |
| Active | When an installation is Active, it means the system is switched on by the user and receiving data. |
| Idle | An idle installation has been started by the user but hasn't received any messages from the device in a period of 60 minutes. |
| Ceased | If an installation has been taken out of service and will no longer be sending any data it can be marked as Ceased. When this status is applied, the middleware will be instructed to no longer hold onto incoming messages for this installation. |
| Archived | If access to the data of a Ceased system is no longer required, the database for that system can be moved to another storage area. In this case, the status can be set as Archived. |

# 17 Specification

## 17.1 UltraTEV Monitor Node

### 17.1.1 TEV

| | |
|---|---|
| **Measurement Range:** | 0 to 60dBmV |
| **Pass band:** | 3 to 80 MHz |
| **Resolution:** | 1dB |
| **Accuracy:** | ±1dB |
| **Precedence Resolution:** | 1ns |

### 17.1.2 Ultrasonic

| | |
|---|---|
| **Measurement Range:** | -7dBµV to 68dBµV |
| **Resolution:** | 1dB |
| **Accuracy:** | ±1dB |
| **Transducer Sensitivity:** | -65dB (0dB = 1 volt/µbar RMS SPL) |
| **Transducer Centre Frequency:** | 40 kHz |
| **Transducer Diameter:** | 16mm |

### 17.1.3 Cable PD

| | |
|---|---|
| **Measurement Range:** | 0 to 102,400pC |
| **Pass band:** | 200 kHz to 20MHz |
| **Resolution:** | 50pC |

### 17.1.4 Indicators

| | |
|---|---|
| **Power LED:** | Bi-colour Red/Green LED |
| **Status LED:** | Bi-colour Red/Green LED |
| **TEV State:** | Bi-colour Red/Green LED |
| **Ultrasonic State:** | Bi-colour Red/Green LED |
| **Cable PD State:** | Bi-colour Red/Green LED |

### 17.1.5 Connectors

| | |
|---|---|
| **Power and Comms Signals:** | 2x RJ45 |
| **External TEV Sensor:** | 1x BNC socket |
| **Ultrasonic Sensor:** | 2x 5-pin Lemo socket |
| **Cable PD Sensor:** | 1x 3-pin Lemo socket |
| **Humidity Sensor:** | 1x mini USB |
| **Aux Power Connector:** | 1x 2-pin Lemo socket |

### 17.1.6 Power Supply

| | |
|---|---|
| **Low Voltage DC:** | 48V, 80 mA |

### 17.1.7 Dimensions

| | |
|---|---|
| **Size:** | 155 x 135 x 55 mm (6.1 x 5.3 x 2.2 inches) |
| **Weight:** | 0.45 Kg (0.9 lbs) |

### 17.1.8 Environmental

| | |
|---|---|
| **Operating Temperature:** | 0 to 50 degrees C |
| **Humidity:** | 0 – 90% RH non-condensing |
| **IP Rating:** | 53 |

### 17.1.9 EMC

| | |
|---|---|
| **Safety class:** | SELV |
| **EMC Immunity:** | Industrial Levels |
| **EMC Emissions:** | Industrial Levels |

## 17.2 Portable Hub Unit

### 17.2.1 Power Supply

| | |
|---|---|
| **Voltage In:** | 110-230V AC (nominal) |
| **Voltage Out:** | 48V DC |
| **Frequency:** | 50-60 Hz (nominal) |
| **Maximum Power:** | 250W |
| **Fusing (On Hub Unit):** | 1x Anti-surge (T) 5A Fuse |

**NOTE:** All fuses are 5 x 20 mm cartridge type

### 17.2.2 Hub Unit Indicators

| | | |
|---|---|---|
| **System Power:** | 1x | Green LED |
| **UltraBus Power:** | 1x | Green LED |
| **Monitor Health:** | 1x | Green LED |
| **Alarm, SCADA Outputs 1-3:** | 4x | Red LED |

### 17.2.3 Hub Unit Connectors

| | | |
|---|---|---|
| **UltraBUS:** | 2x | RJ45 |
| **Ethernet:** | 4x | RJ45 Connector 10/100/1000Mb |
| **USB:** | 2x | USB Type-A Socket |
| **Auxiliary Power/Comms:** | 2x | 6 Pin Lemo 1B |
| **Power In:** | 1x | Neutrik XLR |
| **Wi-Fi:** | 1x | RP-SMA |
| **VGA:** | 1x | Standard Female three row DE-15 |
| **RS232:** | 1x | Male DB9 |
| **Chassis Earth:** | 1x | M4 Stud |

### 17.2.4 Dimensions

| | |
|---|---|
| **Size W x L x D** | 306mm x 248mm x 88mm (12 x 9.8 x 3.5 inches) |
| **Hub Unit Weight:** | 3.6kg (7.9 lbs) |
| **Power Supply Weight:** | 4.2kg (9.2 lbs) |

### 17.2.5 Environmental

| | |
|---|---|
| **Operating Temperature:** | 0 - 50˚C |
| **Humidity:** | 0 – 90% RH Non-condensing |
| **IP Rating:** | 30 |

### 17.2.6 EMC

| | |
|---|---|
| **Safety Class:** | I |
| **EMC Immunity:** | Industrial Levels |
| **EMC Emissions:** | Industrial Levels |

## 17.3 Wall Mount Hub and Power Supply

### 17.3.1 Hub Unit Controls

The Wall Mount Hub is supplied with NO user interface controls. However the instrument maybe controlled locally using either, a wired or wireless connection via a Laptop or Tablet PC. Alternatively, access to the Hub may be gained through a remote desktop connection.

**Reset button:** Micro-switch accessed by hole in the enclosure

### 17.3.2 Power Supply Controls

The Power Supply has NO user interface controls. To switch the power on and off use a mains outlet with a switch.

### 17.3.3 Power Supply Input

**Voltage:** 110-230V AC (nominal)
**Frequency:** 50-60 Hz (nominal)
**Maximum Power:** 350W
**Fusing**: 2x Anti-surge (T) 5A Double Pole Fusing
Minimum 1000A Breaking Capacity
1x Fast (F) 100mA

### 17.3.4 Power Supply Output

**Hub Unit Power:** 12V DC, Maximum 5A
**Node Power:** 48V DC, Maximum 5.2A
**Phase Reference:** 9V AC, Maximum 100mA, Short-circuit Protected
**Fusing:** 1x Anti-surge (T) 7A Fuse
1x Anti-surge (T) 8A Fuse
**NOTE:** All fuses are 5 x 20 mm cartridge type

### 17.3.5 Optional 48V Power Supply Input

**Voltage In:** 48V DC
**Phase Reference Frequency:** 50-60 Hz (nominal)
**Maximum Power:** 350W
**Fusing:** 1x Anti-surge (T) 5A Fuse

### 17.3.6 Optional 48V Power Supply Output

**Hub Unit Power:** 12V DC, Maximum 5A
**Node Power:** 48V DC, Maximum 5.2A
**Phase Reference:** 9V AC, Maximum 100mA
**Fusing:** 1x Anti-surge (T) 7A Fuse
1x Anti-surge (T) 8A Fuse
**NOTE:** All fuses are 5 x 20 mm cartridge type

### 17.3.7 Hub Unit Indicators

**System Power:** 1x Green LED
**UltraBus Power:** 1x Green LED
**Monitor Health:** 1x Green LED
**Alarm, SCADA Outputs 1-3:** 4x Red LED

### 17.3.8 Power Supply Indicators

| | | |
|---|---|---|
| **Power On:** | 1x | Green LED |

### 17.3.9 Hub Connectors

| | | |
|---|---|---|
| **UltraBUS:** | 4x | RJ45 |
| **Ethernet:** | 4x | RJ45 Connector 10/100/1000Mb |
| **USB:** | 2x | USB Type-A Socket |
| **Auxiliary Power/Comms:** | 2x | 6 Pin Lemo 1B |
| **Power In:** | 1x | Neutrik 8 Pin speakON |
| **Mobile Comms:** | 2x | SMA |
| **Wi-Fi:** | 2x | RP-SMA |
| **VGA:** | 1x | Standard Female three row DE-15 |
| **RS485:** | 1x | Male DB9 |
| **RS232:** | 1x | Male DB9 |
| **SCADA/Alarm Volt Free Output:** | 2x | Header Weidmuller SL 3.5 - 6 pin |
| **SCADA/Isolated Inputs:** | 1x | Header Weidmuller SL 3.5 - 4 pin |
| **Chassis Earth:** | 1x | M4 Stud |

### 17.3.10 Power Supply Connectors

| | | |
|---|---|---|
| **Power Out:** | 1x | Neutrik 8 Pin speakON |
| **Power In:** | 1x | Neutrik powerCON TRUE1 |

### 17.3.11 Hub Volts Free Contacts

| | | |
|---|---|---|
| **Type:** | 4x | Fully isolated SPDT |
| **Switching Voltage:** | AC/DC 5V – 48V | |
| **Switching Current:** | AC/DC 10mA – 5A | |
| **Connector:** | 2x | Weidmuller BL 3.5/4, Socket Block, Screw Terminals |

### 17.3.12 Hub Isolated Inputs

| | | |
|---|---|---|
| **Type:** | 2x | Opto-Isolated |
| **Switching Voltage:** | 12V – 90V DC | |
| **Connector:** | 1x | Weidmuller BL 3.5/4, Socket Block, Screw Terminals |

### 17.3.13 Dimensions

| | |
|---|---|
| **Size W x L x D** | 382mm x 260mm x 100mm (15 x 10.2 x 3.9 inches) |
| **Hub Unit Weight:** | 3.6kg (7.9 lbs) |
| **Power Supply Weight:** | 4.2kg (9.2 lbs) |

### 17.3.14 Environmental

| | |
|---|---|
| **Operating Temperature:** | 0 – 40˚C with 3G Modem<br>0 - 50˚C without 3G Modem |
| **Humidity:** | 0 – 90% RH Non-condensing |
| **IP Rating:** | 30 |

### 17.3.15 EMC

| | |
|---|---|
| **Safety Class:** | I |
| **EMC Immunity:** | Industrial Levels |
| **EMC Emissions:** | Industrial Levels |

### 17.3.16 Fittings

**Hub Unit and Power Supply each:** 4 x 10mm/5mm keyhole slot
**Interconnecting Cable:** 1.1m allowing installation above or next to each other

# 18 Maintenance

It is important that the unit is kept clean and dry. It is not weatherproof. Avoid storage in damp and humid conditions and do not subject it to temperature extremes, excessive vibration or shocks. Do not stand on the case.

No attempt should be made to gain access to the internal circuitry of the instrument, or its accessories. Advice should be sought from EA Technology, or the supplier, if any doubt exists over the equipment's performance or operation.

The unit should be cleaned with a damp cloth. If more heavily soiled, a foam cleanser may be used, provided care is taken not to allow fluid to enter the instrument. Abrasive cleaners must not be used.

## 18.1 Portable Hub

The only user-serviceable part of the Hub is the fuse on the Hub Unit. Use a slotted screwdriver to remove the fuse if it has blown and insert a new one.

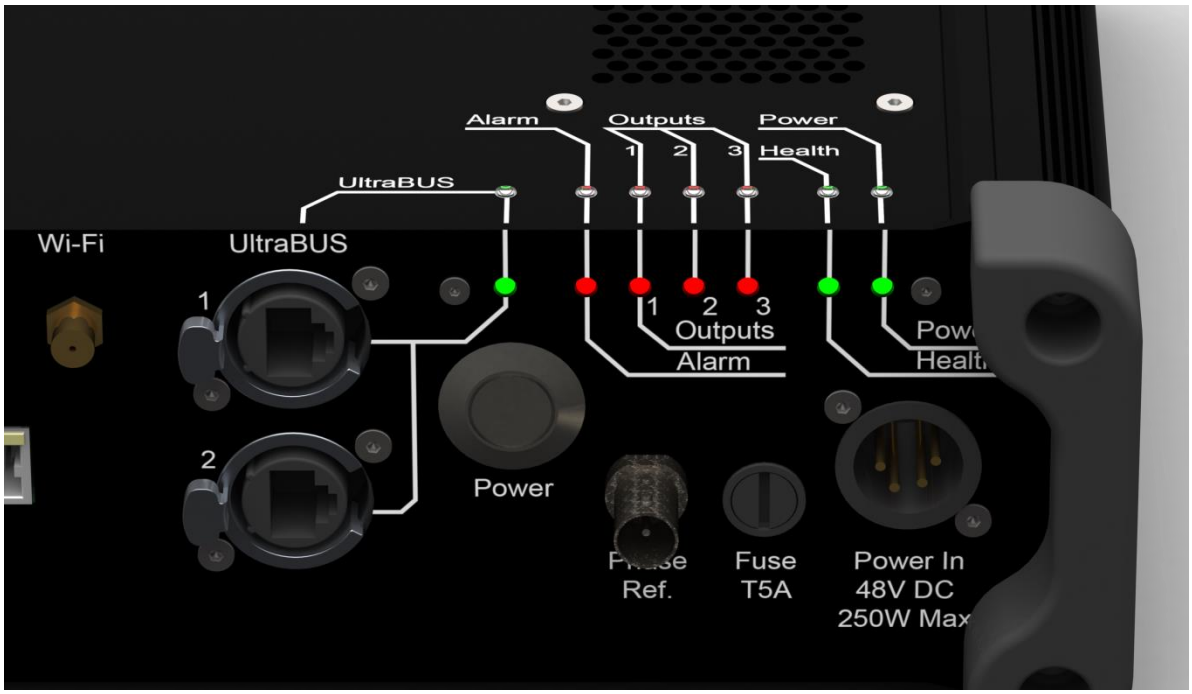



Figure 67: Hub Unit showing fuse location

**NOTE:** All fuses are ceramic 5 x 20 mm Cartridge Type; the rating for each is marked on the Power Supply case. The T5A Input Fuses must have a minimum breaking capacity of 1000A.

**NOTE:** Fuses should only be inspected or replaced after ALL POWER has been removed from the system. Unplug power supply from Power In socket to be certain.

## 18.2 Wall Mount Hub

### 18.2.1 Power Supply

The Power Supply is equipped with 5 fuses on the bottom panel (see Figure 6). The mains input is double pole fused, protecting both the live and neutral lines. There is also a small fuse to protect the phase reference transformer and the indicator LED. The power out to the Hub Unit has two fuses, one on the 48V line out to the UltraTEV Nodes, one on the 12V to power the Hub Unit.

Power Supply fuses can be found on the bottom face of the Power Supply as shown in Figure 69:

Figure 69: Power Supply bottom face plate

**NOTE:** All fuses are ceramic 5 x 20 mm Cartridge Type; the rating for each is marked on the Power Supply case. The T5A Input Fuses must have a minimum breaking capacity of 1000A.

**NOTE:** Fuses should only be inspected or replaced after ALL POWER has been removed from the system. Unplug the black and yellow Power In connector to be certain.

### 18.2.2 Optional 48V Power Supply

The optional 48V Power Supply is equipped with 3 fuses on the bottom panel. There is one input fuse for the 48V input. The power out to the Hub Unit has two fuses, one on the 48V line out to the UltraTEV Nodes, one on the 12V to power the Hub Unit.

Power Supply fuses can be found on the bottom face of the Power Supply as indicated in 70:

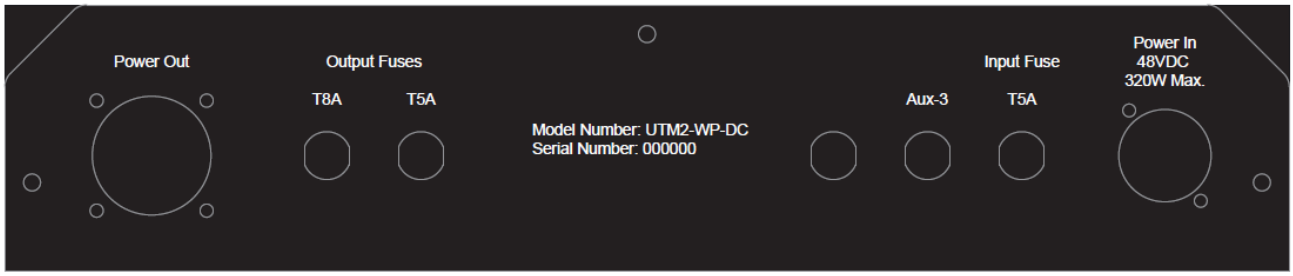



Figure 70: Optional 48V Power Supply bottom face plate

**NOTE:** All fuses are ceramic 5 x 20 mm Cartridge Type; the rating for each is marked on the Power Supply case. The T5A Input Fuses must have a minimum breaking capacity of 1000A.

**NOTE:** Fuses should only be inspected or replaced after ALL POWER has been removed from the system. Unplug the black and yellow Power In connector to be certain.

# 19 Warranty Policy

**What Does the Warranty Policy Cover?**

EA Technology products and accessories are warranted against defects in material and workmanship for twelve months from the date of despatch from our premises.

During the warranty period, EA Technology will, at its option, either repair or replace products, parts or accessories which prove defective.

**What is Not Covered by the Warranty Policy?**

The following are not covered: damage caused by accident, misuse, abuse, product modification or neglect; damage resulting from failure to follow instructions contained in your operating manual; damage resulting from the performance of repairs by someone not authorised by EA Technology.

**Warranty Policy for Repairs**

Repaired products are warranted against defects in workmanship and materials for a period of six months, or the remainder of the original warranty period, whichever is greater.

product-support@eatechnology.com

+44 (0)151 347 2293

# 20 Calibration

Nodes require calibration at the following calibration intervals:

24 months, permanent installation

12 months, temporary installation

The Hub Unit should be returned with the Nodes for calibration.

Your application may require a different calibration interval dependant on the frequency of use.

# 21 Repair

For information on our repair procedure please contact EA Technology Product Support.

product-support@eatechnology.com

# 22 Waste Electrical and Electronic Equipment Directive (WEEE)

EA Technology is a member of an approved compliance scheme as defined by the WEEE directive. When an EA Technology product reaches the end of its operational life, it must be recycled by a licensed waste management operator, or returned to EA Technology for recycling.

# 23 Continuous Improvement

EA Technology has a policy of continual product development and enhancement. Consequently, there may be minor variations in specifications or operation that are not covered in this operating manual.

Every effort has been made to ensure that the information provided in this operating manual is accurate at the time of going to print.

If any errors or omissions are noticed, please notify:

product-support@eatechnology.com

# 24 Declaration of Conformity

| | |
|---|---|
| Manufacturers Name: | EA Technology Ltd |
| Manufacturers Address: | Capenhurst Technology Park<br>Capenhurst<br>Chester<br>CH1 6ES<br>UK |
| Issue Date: | 13th August 2014 |
| Type of Equipment: | UltraTEV Monitor™ |
| Model Number: | UTM2-PH, UTM2-WH |

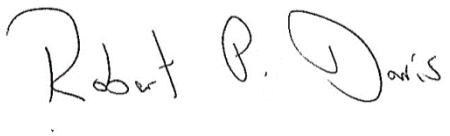
I hereby declare that the equipment specified above conforms to the provisions of the **EC DIRECTIVE 89/336/EEC** on Electromagnetic Compatibility (EMC). Having met the requirements of the following standards:

**EN 61000-6-2: 2001**
**IMMUNITY STANDARD (INDUSTRIAL ENVIRONMENT)**

**EN 61000-6-4:2001**
**EMISSION STANDARD (INDUSTRIAL ENVIRONMENT)**

**EN 60335-1 Household appliances and similar – Class I**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Robert Davis
**Chief Executive Officer**
**EA Technology Ltd**

# 25 Contact Us

## Head Office

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Capenhurst Technology Park
Chester, UK, CH1 6ES
Tel: +44 (0)151 339 4181

For details of our international offices and distributors, please visit our website:

www.eatechnology.com/contact us

## Sales

Email: sales@eatechnology.com

Freephone: 0800 027 7243 (UK only)

## Product Support

Email: product-support@eatechnology.com

Freephone: 0800 032 6657 (UK only)

Tel: +44 (0)151 347 2293

# 26 Record of Changes

| Date | Drawing Number | Changes |
|---|---|---|
| November 2016 | 2178/L/01/4 | Addition of 48Vdc Optional Hub |
| May 2016 | 2178/L/01/3 | RFCT safety information added.<br><br>FCC compliance statement added. |
| April 2015 | 2178/L/01/2 | Minor corrections from regional offices.<br><br>Description of Standard software features added. |
| February 2015 | 2178/L/01/1 | First release created from version H. |
| February 2015 | 2178/L/01/H | Corrections from proof reading. |
| January 2015 | 2178/L/01/G | Windows license agreement added as an appendix. |
| January 2015 | 2178/L/01/F | Corrections from proof reading. |
| January 2015 | 2178/L/01/E | Front Cover picture changed to UTM |
| January 2015 | 2178/L/01/D | Section on non-preferred installation within HV cubicles added. |
| January 2015 | 2178/L/01/C | Description of Airborne Ultrasonic Discharge Activity and Electromagnetic Discharge Activity in sections 2.2 and 2.3 corrected. |
| December 2014 | 2178/L/01/B | Second draft. |
| December 2014 | 2178/L/01/A | First draft. |

# 27 Notes

# Appendix I Windows License

**MICROSOFT SOFTWARE LICENSE TERMS**

**WINDOWS EMBEDDED STANDARD 7**

These license terms are an agreement between you and [OEM]. Please read them. They apply to the software included on this device. The software also includes any separate media on which you received the software.

The software on this device includes software licensed from Microsoft Corporation or its affiliate.

The terms also apply to any Microsoft

- updates,
- supplements,
- Internet-based services, and
- support services

for this software, unless other terms accompany those items. If so, those terms apply.

If you obtain updates or supplements directly from Microsoft, then Microsoft, and not [OEM], licenses those to you.

**As described below, using the software also operates as your consent to the transmission of certain computer information for Internet-based services.**

**By using the software, you accept these terms. If you do not accept them, do not use the software. Instead, contact** [OEM] **to determine its return policy for a refund or credit.**

**If you comply with these license terms, you have the rights below.**

**1. USE RIGHTS**

**Use.** The software license is permanently assigned to the device with which you acquired the software. You may use the software on the device.

**2. ADDITIONAL LICENSING REQUIREMENTS AND/OR USE RIGHTS**

**a. Specific Use.** [OEM] designed the device for a specific use. You may only use the software for that use.

**b. Other Software.** You may use other programs with the software as long as the other programs

- directly supports the manufacturer's specific use for the device, or
- provide system utilities, resource management, or anti-virus or similar protection.
- Software that provides consumer or business tasks or processes may not be run on the device. This includes email, word processing, spreadsheet, database, scheduling and personal finance software. The device may use terminal services protocols to access such software running on a server.

**c. Device Connections.** You may not use the software as server software. In other words, more than one device may not access, display, run, share or use the software at the same time.

You may use terminal services protocols to connect the device to a server running business task or processes software such as email, word processing, scheduling or spreadsheets.

You may allow up to ten other devices to access the software to use

- File Services,
- Print Services,

- Internet Information Services, and
- Internet Connection Sharing and Telephony Services.

The ten connection limit applies to devices that access the software indirectly through "multiplexing" or other software or hardware that pools connections. You may use unlimited inbound connections at any time via TCP/IP.

**d. Remote Access Technologies**. You may access and use the software remotely from another device using remote access technologies as follows.

Remote Desktop. The single primary user of the device may access a session from any other device using Remote Desktop or similar technologies. A "session" means the experience of interacting with the software, directly or indirectly, through any combination of input, output and display peripherals. Other users may access a session from any device using these technologies, if the remote device is separately licensed to run the software.

Other Access Technologies. You may use Remote Assistance or similar technologies to share an active session.

Other Remote Uses. You may allow any number of devices to access the software for purposes other than those described in the Device Connections and Remote Access Technologies sections above, such as to synchronize data between devices.

**e. Font Components**. While the software is running, you may use its fonts to display and print content. You may only

- embed fonts in content as permitted by the embedding restrictions in the fonts; and
- temporarily download them to a printer or other output device to print content.

**f. Icons, images and sounds**. While the software is running, you may use but not share its icons, images, sounds, and media.

**3**. **VHD BOOT**. Additional copies of the software created using the software's Virtual Hard Disk functionality ("VHD Image") may be pre-installed on the physical hard disk of the device. These VHD Images may only be used for maintaining or updating the software installed on the physical hard disk or drive. If the VHD Image is the only software on your device, it may be used as the primary operating system but all other copies of the VHD Image may only be used for maintenance and updating.

**4. POTENTIALLY UNWANTED SOFTWARE.** The software may include Windows Defender. If Windows Defender is turned on, it will search this device for "spyware," "adware" and other potentially unwanted software. If it finds potentially unwanted software, the software will ask you if you want to ignore, disable (quarantine) or remove it. Any potentially unwanted software rated "high" or "severe," will be automatically removed after scanning unless you change the default setting. Removing or disabling potentially unwanted software may result in

- Other software on your device ceasing to work, or
- Your breaching a license to use other software on this device

By using this software, it is possible that you will also remove or disable software that is not potentially unwanted software.

**5. SCOPE OF LICENSE.** The software is licensed, not sold. This agreement only gives you some rights to use the software. [OEM] and Microsoft reserve all other rights. Unless applicable law gives you more rights despite this limitation, you may use the software only as expressly permitted in this agreement. In doing so, you must comply with any technical limitations in the software that allow

you to use it only in certain ways. For more information, see the software documentation or contact [OEM]. You may not:

- work around any technical limitations in the software;
- reverse engineer, decompile or disassemble the software;
- make more copies of the software than specified in this agreement;
- publish the software for others to copy;
- rent, lease or lend the software; or
- use the software for commercial software hosting services.

Except as expressly provided in this agreement, rights to access the software on this device do not give you any right to implement Microsoft patents or other Microsoft intellectual property in software or devices that access this device.

**6. INTERNET-BASED SERVICES.** Microsoft provides Internet-based services with the software. Microsoft may change or cancel them at any time.

**a. Consent for Internet-Based Services.** The device may contain one or more of the software features described below. These features connect to Microsoft or service provider computer systems over the Internet. In some cases, you will not receive a separate notice when they connect. For more information about these features, visit go.microsoft.com/fwlink/?linkid=104604.

**By using these features, you consent to the transmission of this information.** Microsoft does not use the information to identify or contact you.

Computer Information. The following features use Internet protocols, which send to the appropriate systems computer information, such as your Internet protocol address, the type of operating system and browser, the name and version of the software you are using, and the language code of the device where you installed the software. Microsoft uses this information to make the Internet-based services available to you. [OEM] has elected to turn on the following features on the device.

- Plug and Play and Plug and Play Extensions. You may connect new hardware to your device. Your device may not have the drivers needed to communicate with that hardware. If so, the update feature of the software can obtain the correct driver from Microsoft and install it on your device.

- Web Content Features. Features in the software can retrieve related content from Microsoft and provide it to you. Examples of these features are clip art, templates, online training, online assistance and Appshelp. You may choose to switch them off or not use them.

- Digital Certificates. The software uses x.509 version 3 digital certificates. These digital certificates confirm the identity of user sending information to each other and allow you to encrypt the information. The software retrieves certificates and updates certificate revocation lists over the Internet.

- Auto Root Update. The Auto Root Update feature updates the list of trusted certificate authorities. You can switch off this feature.

- Windows Media Digital Rights Management. Content owners use Windows Media digital rights management technology (WMDRM) to protect their intellectual property, including copyrights. This software and third party software use WMDRM to play and copy WMDRM-protected content. If the software fails to protect the content, content owners may ask

Microsoft to revoke the software's ability to use WMDRM to play or copy protected content. Revocation does not affect other content. When you download licenses for protected content, you agree that Microsoft may include a revocation list with the licenses. Content owners may require you to upgrade WMDRM to access their content. Microsoft software that includes WMDRM will ask for your consent prior to the upgrade. If you decline an upgrade, you will not be able to access content that requires the upgrade. You may switch off WMDRM features that access the Internet. When these features are off, you can still play content for which you have a valid license.

- Windows Media Player. When you use Windows Media Player, it checks with Microsoft for
- compatible online music services in your region;
- new versions of the player; and
- codecs if your device does not have the correct ones for playing content.

  You can switch off this feature. For more information, go to: go.microsoft.com/fwlink/?LinkId=51331.
- www.support.microsoft.com/?kbid=890830 ("Malware") from your device. When the software checks your device for Malware, a report will be sent to Microsoft about any Malware detected or errors that occurred while the software was checking for Malware. No information that can be used to identify you is included in the report. You may disable the software's Malware reporting functionality by following the instructions found at www.support.microsoft.com/?kbid=890830. Malicious Software Removal/Clean On Upgrade. Before installation of the software, the software will check and remove certain malicious software listed at

- Network Awareness. This feature determines whether a system is connected to a network by either passive monitoring of network traffic or active DNS or HTTP queries. The query only transfers standard TCP/IP or DNS information for routing purposes. You can switch off the active query feature through a registry setting.

- Windows Time Service. This service synchronizes with www.time.windows.com once a week to provide your l device with the correct time. The connection uses standard NTP protocol.

- Search Suggestions Service. In Internet Explorer, when you type a search query in the Instant Search box or type a question mark (?) before your search term in the Address bar, you will see search suggestions as you type (if supported by your search provider). Everything you type in the Instant Search box or in the Address bar when preceded by a question mark (?) is sent to your search provider as you type. Also, when you press Enter or click the Search button, the text in the Instant Search box or Address bar is sent to the search provider. If you use a Microsoft search provider, use of the information sent is subject to the Microsoft Online Privacy Statement. This statement is available at go.microsoft.com/fwlink/?linkid=31493. If you use a third-party search provider, use of the information sent will be subject to the third party's privacy practices. You can turn search suggestions off at any time. To do so, use Manage Add-ons under the Tools button in Internet Explorer. For more information about the search suggestions service, see go.microsoft.com/fwlink/?linkid=128106.

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# Global Footprint

We provide products, services and support for customers in 90 countries, through our offices in Australia, China, Europe, Singapore, UAE and USA, together with more than 40 distribution partners.

# Our Expertise

We provide world-leading asset management solutions for power plant and networks.

Our customers include electricity generation, transmission and distribution companies, together with major power plant operators in the private and public sectors.

- Our products, services, management systems and knowledge enable customers to:
- Prevent outages
- Assess the condition of assets
- Understand why assets fail
- Optimise network operations
- Make smarter investment decisions
- Build smarter grids
- Achieve the latest standards
- Develop their power skills



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To differentiate our organisation in order to achieve continuous, sustainable growth, TDC endeavours to fully understand and exceed the expectations of our customers, and to work proactively to deliver Engineering Excellence.

TDC ENGINEERING EXCELLENCE

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