Read these instructions carefully before using this product.
Keep these instructions in a safe place for future reference.

EMS-5X / 10X / OS
Water Leak Detection System
Instruction Manual

Document Information

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Publication

Publisher: Aqualeak Ltd. Publication date: 22 December 2021. Version number: 1.0.

All possible care has been taken in the preparation of this manual, but Aqualeak, its agents and distributors accept no liability for any inaccuracies that may be found. This manual reflects the state of the product at the publication date below, but further enhancements while in service may mean that the manual does not precisely reflect your system. Aqualeak reserves the right to make changes without notice both to this manual and the products which it describes.

Purpose

This document provides installation and operating instructions for the Environmental Monitoring System (EMS-5X, EMS-10X, and EMS-OS) Water Leak Detection System.

Symbols and Notices Used

Important information has been highlighted throughout this document using the following symbols:

Warning

See relevant section

Take note of this information

Important Safety Information has been highlighted throughout the Safety Information section using the following warning notices:

DANGER	WARNING	CAUTION	DAMAGE
Death / serious injury (irreversible)	Death / serious injury (irreversible)	Minor injury (reversible)	Damage to property
Immediate risk	**Potential risk**	**Potential risk**	**Potential risk**

Contact Details

Address	Telephone	Email	Website
Aqualeak Detection Ltd. 11 Forest Gate Pewsham Chippenham Wiltshire, SN15 3RS United Kingdom	+44 (0)1249 715698	sales@aqualeak.com	www.aqualeak.com

Contents

Tables

Figures

1 Safety Information

To ensure your safety and the safety of others, please ensure that you read the Safety Information below **before** you install or operate this product.

1.1 Intended Use

Only use this product for the intended purpose described in this manual.

1.2 Statutory Obligations

- ✓ Installation and maintenance must comply with all relevant local laws and regulations ('statutory obligations'), particularly concerning electrics, water supplies, and building regulations.
- ✓ Statutory obligations always override manufacturer documentation.
- ✓ It is the responsibility of the customer to conduct a Health & Safety risk assessment prior to installing and operating this product.
- ✗ This product should not be operated by children or persons with reduced physical, sensory or mental capabilities. Where necessary, such Persons should be given supervision by a qualified person responsible for their safety.
- ✗ **DO NOT** position the unit (including its power cable) where it may violate Fire or Health and Safety regulations (e.g. block fire exits or stairwells, etc.).

1.3 Electrical Safety

⚠DANGER

RISK OF 230 VOLT ELECTRIC SHOCK

- ✓ ONLY qualified, competent and approved persons (e.g. 'electrical engineers') may undertake installations, repairs, or relocations of this product.
- ✓ The product must be earthed correctly.
- ✓ For **indoor use** only.
- ✓ Ensure that the building electrical system is compliant with Safety Regulations.

⚠WARNING

RISK OF DEATH OR SERIOUS INJURY

- ✗ **DO NOT** allow children or any other unqualified or unapproved persons to install, repair, clean, relocate, or otherwise interfere or tamper with the product.
- ✗ **DO NOT** immerse the unit or its peripherals in liquid.
- ✗ **DO NOT** install outdoors, near hot works, or where there is a danger of freezing.

1.4 Installation Safety

⚠DAMAGE

RISK OF DAMAGE

- ✓ Install the product on a **hard, solid, and level** surface.
- ✓ Follow the instructions provided in this manual. Where necessary, refer to the Aqualeak website (www.aqualeak.com) for contact and support information.

⚠CAUTION

RISK OF INJURY

- ✓ Be aware of any existing electrical (e.g. wiring), water (e.g. pipes), or other installations in the vicinity (including within or behind the surface used for mounting.
- ✓ Where applicable, this manual should be read in conjunction with manufacturer documentation for any components specified in the installation requirements of this manual.

1.5 Post-Installation Safety

Once installed:

1. Perform a test run to ensure normal operation.
2. Explain all safety precautions to the end user.
3. Provide a copy of this manual to the end user.

- ✓ It is the responsibility of the end user to supply this manual to any other subsequent users.
- ✓ All goods are sold subject to our 'Conditions of Sale'.
- ✓ As Aqualeak Detection Ltd. continuously improves products, they may be modified without notice. In such circumstances, this manual and other relevant documentation should be disregarded. Updated documentation will be produced, supplied with new product ranges, and made available on request.

SAVE THESE INSTRUCTIONS

2 Product Overview

The EMS-05 supports both **RS232/RS485 protocols**. RS485 is the default protocol and an Aqualeak Engineer will be required if RS232 is required.

The **Aqualeak Environmental Monitoring System** (EMS) **Water Leak Detection System** series are standalone leak detection systems designed to be integrated with larger Building Management Systems (BMS) and networks.

Designed for continuous operation with minimal human intervention, the EMS series is also compatible with a wide variety of sensing technologies (sold separately) to detect the presence of water and other liquids.

With 5 (EMS-5X) or 10 (EMS-10X) input channels as standard, these models are ideal for applications ranging from small multi-room offices to medium-sized industrial and commercial complexes. Alternatively, the scalable and modular EMS-OS is ideal for large scale industrial and commercial applications.

Figure 1: *Aqualeak EMS-5X / 10X / OS Water Leak Detection System*

Features

- Highly versatile with bespoke configuration
- Programmable relay outputs
- Remote Status Monitoring (via email)
- Email, Modbus and multiple digital outputs
- Supports Modbus TCP/IP and Modbus RTU RS232/RS485
- Touch screen display
- Designed and built in the United Kingdom
- CE Compliant
- Monitors for leaks, sensor cable breaks and internal system faults

Operation

In operation, the EMS-05 continuously monitors all independent sensing circuits connected to it to reduce risks from flooding. If a leak or cable break is detected, the EMS-05 will and/or can be configured to:

- Activate a visual alarm
- Activate an audible alarm
- Shut off local water supplies
- Activate default and user-defined outputs
- Report to any network via Modbus, digital output, and/or email

EMS Series Models

Model	Channels	Configuration	Notes
EMS-01	1	DIP switches	Single zone applications
EMS-5X	5	Touch screen	Small scale applications
EMS-10X	10	Touch screen	Medium scale applications
EMS-OS	Variable	Touch screen	Large scale applications
EMS-5	5	None	Operates ‘out of the box’ with no configuration required
EMS-10	10	None	

2.1 Technical Specifications

	Name	Specification	Notes
Master Panel / EMS Unit	Dimensions	335 x 270 x 110 mm	**Millimetres**. Width x Height x Depth
	Weight	4.5 KG	**Kilograms**
	Supply Voltage	80 – 264 VAC	**Volts / Alternating Current**. 50/60 Hz frequency
	Motherboard Output Relay Voltage Rating	250 VAC	
	Motherboard Output Relay Current Rating	8 A	**Amps**. Maximum into resistive load
	Relay Minimum Load	10 mA	**Milliamps**. At 5 VDC (Volts / Direct Current)
	Detection Response Time	1 second	
	Ingress Protection (IP) Code	IP51 (dust protected and dripping water)	Ingress Protection to IEC 60529. Holes drilled during installation may affect unit IP
	USB Port	2.0	For software and configuration file updates
	Operating System	Android	Android Application Package (.apk)
	Configuration File	XML	Extensible Markup Language (.xml)
	Alarm (Audible)	85 dB	**Decibels**. Within 0.6 m range
	Alarm (Visible)		Via LCD Touch Screen
	Input channels	5 / 10 / Multiple	OS model expandable to over 620 zones
	Leader Cable	Belden 9534	Variable length
Outstation	Dimensions	180 x 130 x 77 mm	**Millimetres**. Width x Height x Depth
	Weight	1.0 KG	**Kilograms**
	Supply Voltage	24 VDC	**Volts / Direct Current**. 50/60 Hz frequency (+/- 10% variance)
	Ingress Protection (IP) Code	IP64 (dust-tight and splashing water)	Ingress Protection to IEC 60529. Holes drilled during installation may affect unit IP
	Input channels	5	
EMS & Outstation	Operating Temperature	**0 to +50˚C**	Degrees Centigrade**. Ambient temperature**
	Operating Humidity	10 to 95%	Relative humidity (non-condensing) at 45˚C
	Operating Altitude	0 to 3,000 m	**Metres**
	Storage Temperature	-20 to +70˚C	
	Sensor Cable Length (per input channel)	100m (or maximum 20 probes)	Use recommended yellow Sensor Cable. Also requires End of Line (EOL) terminator
	Electrical Interface Adapter (EIA) Communication Port	User defined	

Table 1: *EMS-5X, 10X and OS Technical Specifications*

2.2 Input-Output Connections

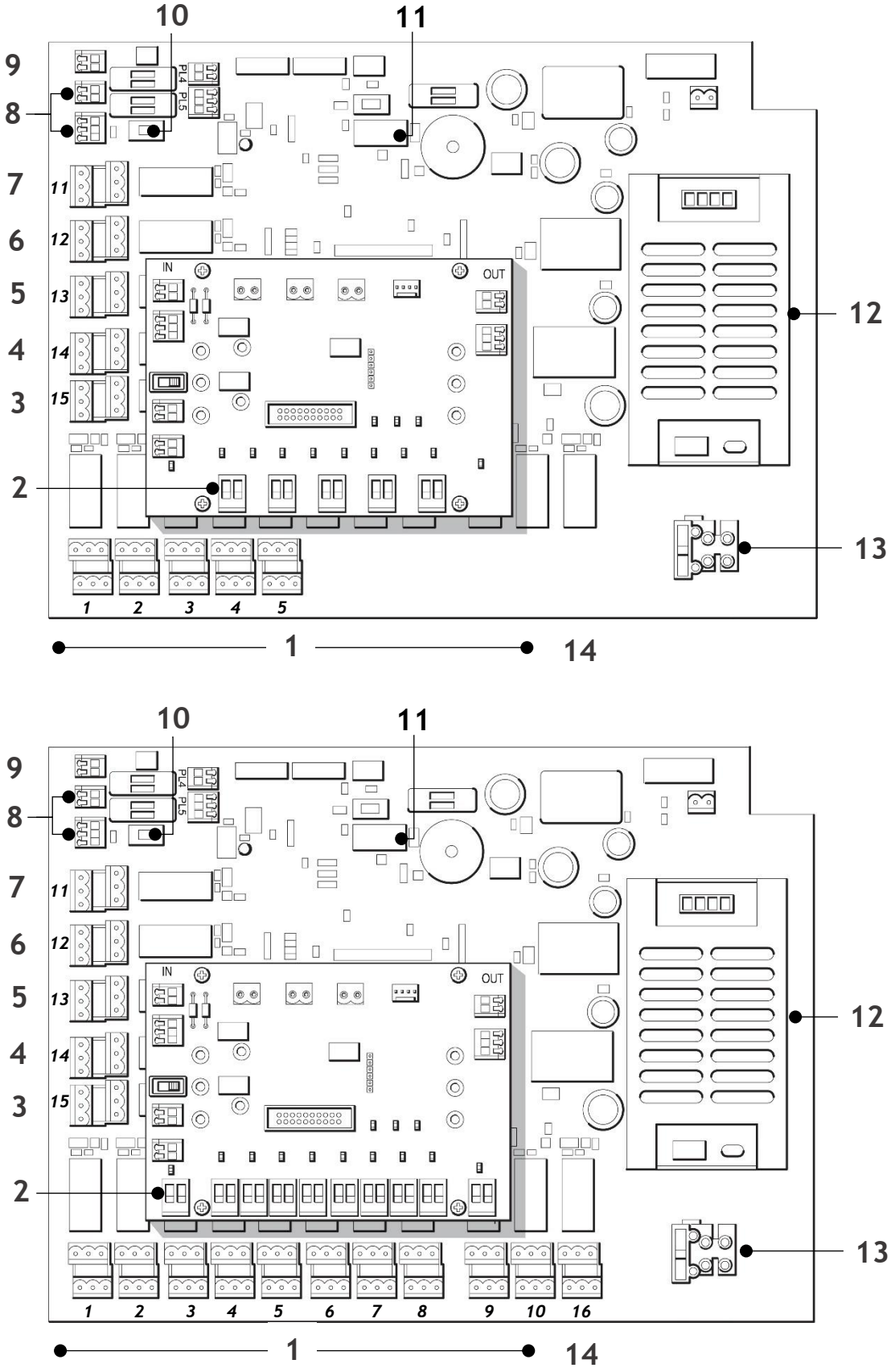


Figure 2: EMS-5X (Top) and 10X / OS (Bottom) Input-Output Connections

Item	Name	Notes	Relay Abbreviations
1	Configurable Relays	5 or 10 Configurable Relays	Relay terminals are marked **NC | COM | NO** **NO** = Normally Open **NC** = Normally Closed **COM** = Common
2	Interface Board	5 or 10 Zone Inputs	
3	Watchdog Relay	Relay 15	
4	Configurable Alarm / Fault Relay	Relay 14	
5	Alarm Relay	Relay 13	
6	Cable Break Relay	Relay 12	
7	Common Alarm / Fault Relay	Relay 11	
8	Interface Board Power	PL7	**Mains Abbreviations**
	Communications Terminals	PL8	Mains terminals are marked **L | E | N** **L** = Live **E** = Earth **N** = Neutral
9	12/24 VDC Output Terminals	PL6	
10	12/24 VDC Selector Switch	SW2	
11	Reboot Relay Switch	SW1	
12	230 VAC to 24 VDC Power Supply Unit		
13	230 VAC Mains Cable Input Terminals		
14	Spare / Unused Relay	Relay 16	

Table 2: *EMS-X / OS Input-Output Connections*

2.3 Multiple Zone Application Examples

Aqualeak EMS water leak detection and prevention systems are based on a **modular design**. Parts supplied depend upon intended application and particular requirements. Once the individual components have been selected, the bespoke system can be built and installed.

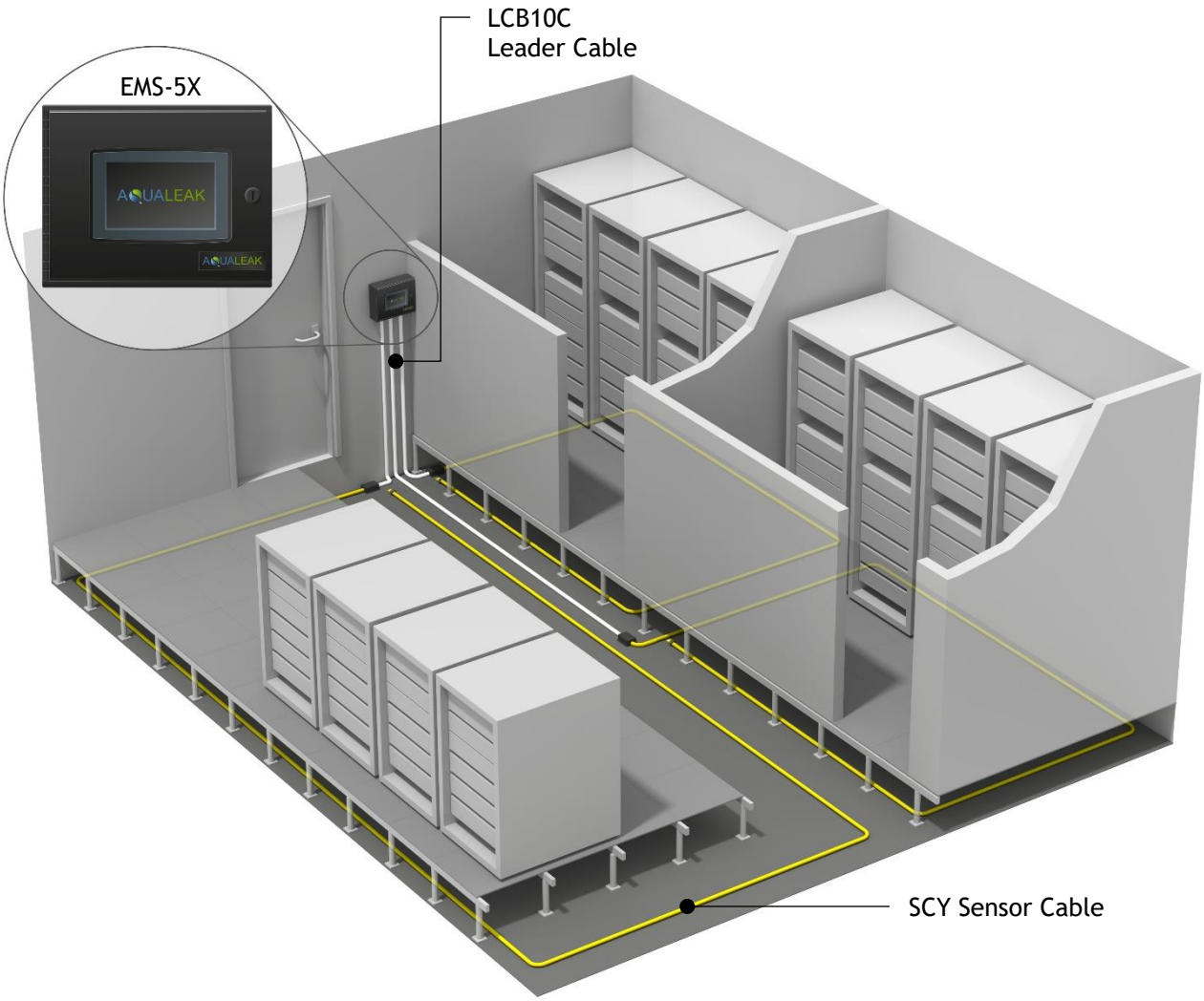


***Figure 3**: EMS-5X Three-Zone Communications Room Example*

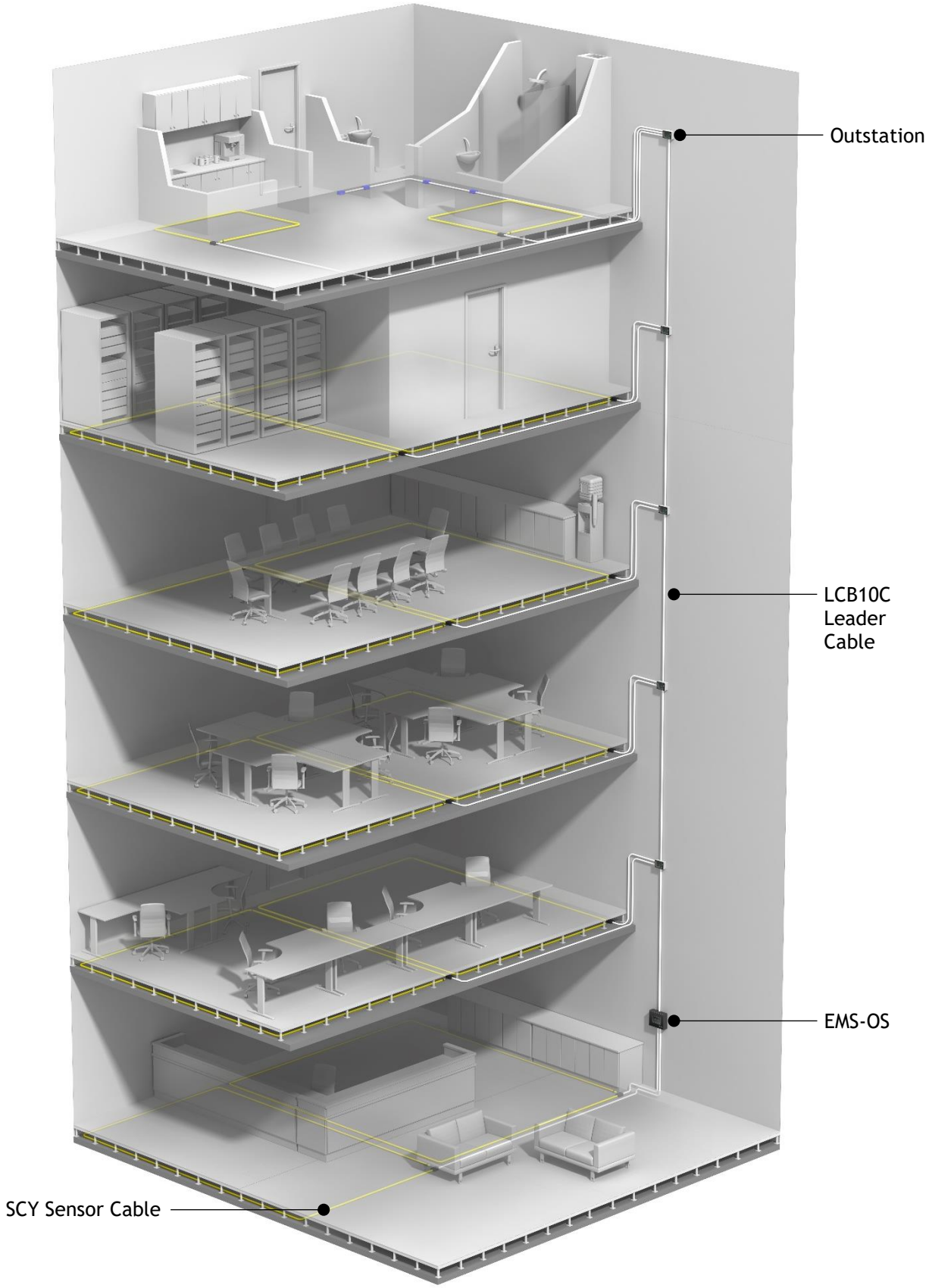


Figure 4: *EMS-OS Multiple Zone / Floor Example Using Outstations*

3 Installation

Risk of electric shock and equipment damage! Ensure you have read section **1 Safety Information** before attempting installation.

3.1 Master Panel Installation

3.1.1 Mounting

The Master Panel has knock-outs for electrical cables on the top, bottom and lower rear of its enclosure.

Mount the Master Panel as follows:

1. Ensure the Master Panel has been properly removed from its packaging.
2. Securely mount the Master Panel in a **suitable location**, making cable entries as required.
3. Bring the cables through into the Master Panel **before** starting to make final connections

3.1.2 Power Connection

A competent person must install a **230 VAC unswitched fused spur** near to the EMS. The switched fused spur must be clearly marked as the **disconnecting device** for the EMS. Where available, the EMS unit should be connected to a **UPS-backed power supply**.

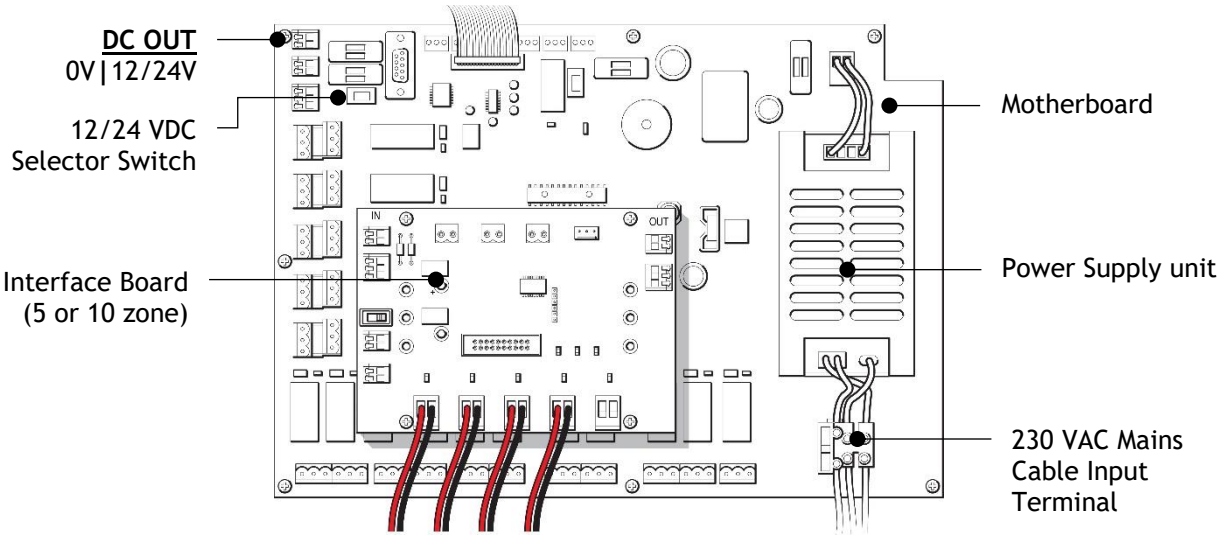


Figure 5: Master Panel Electrical Power Connections

Connect power to the EMS as follows:

1. Route the **power cable** from the **unswitched fused spur** into the **Master Panel** through a suitable containment or cable protection method.
2. Connect the **power cable** (i.e. Live, Neutral and Earth) to the Master Panel **mains cable input** terminal (**Figure 5**).

3.2 Relays and Sensors

Although multiple sensors and sensor types may be connected to the unit, there must always be an **end of line (EOL) terminating resistor** at the end of the sensing circuit to allow for **cable break monitoring** and **alarm reference set point**. The unit relies upon a terminating resistor of value **47k ohms**.

The unit should be **powered OFF** when making connections. Sensors should be installed so that they remain **accessible for maintenance**.

3.2.1 Relay Functions and Triggers

Relay	Function	Description and Triggers	
1-10	Individual zone	Software configurable. Used to operate auxiliary devices.	
11	Common Alarm / Fault	Relay latched upon alarm until acknowledged by User or Engineer.	
		✓ Zone cable break ✓ Zone Alarm ✓ interface board / Outstation communication failure	✓ Ethernet connection failure ✓ Modbus TCP/IP connection failure ✓ Motherboard communication failure
12	Cable break	Relay latched upon alarm until acknowledged by User or Engineer.	
		✓ Zone cable break	
13	Alarm	Relay latched upon alarm until acknowledged by User or Engineer.	
		✓ Zone alarm	
14	Configurable	User configurable to latch on Alarm (13) and/or Cable Break (12). Relay latched only when alarm or cable break present in real time.	
		✓ See Alarm (13) and/or Cable Break (12)	
15	Watchdog	Relay normally energised. De-energised upon any system fault.	
		✓ Motherboard loss of power ✓ Interface Board / Outstation loss of power ✓ Complete power failure to EMS	✓ Motherboard communication failure ✓ Interface Board / Outstation communication failure
16	Spare	Unused	
		✗ Not applicable	

Table 3: *Relay Functions and Notes / Triggers*

3.2.2 Reboot Relay

The **reboot relay switch SW1** must be returned to the **OFF** position when testing of or updates to the EMS have been completed.

Power to the **TFT LCD Touch Screen Computer** is supplied via a **re-boot relay.** If communications between the Motherboard and the touch screen are lost for more than **60 seconds**, this relay will operate to **re-boot the computer**.

This function can be bypassed by **switch SW1** for testing purposes or when **updating** the EMS software. When the switch is in the **OFF** position the relay is bypassed and power is permanently supplied to the touch screen.

3.2.3 Sensor Connections

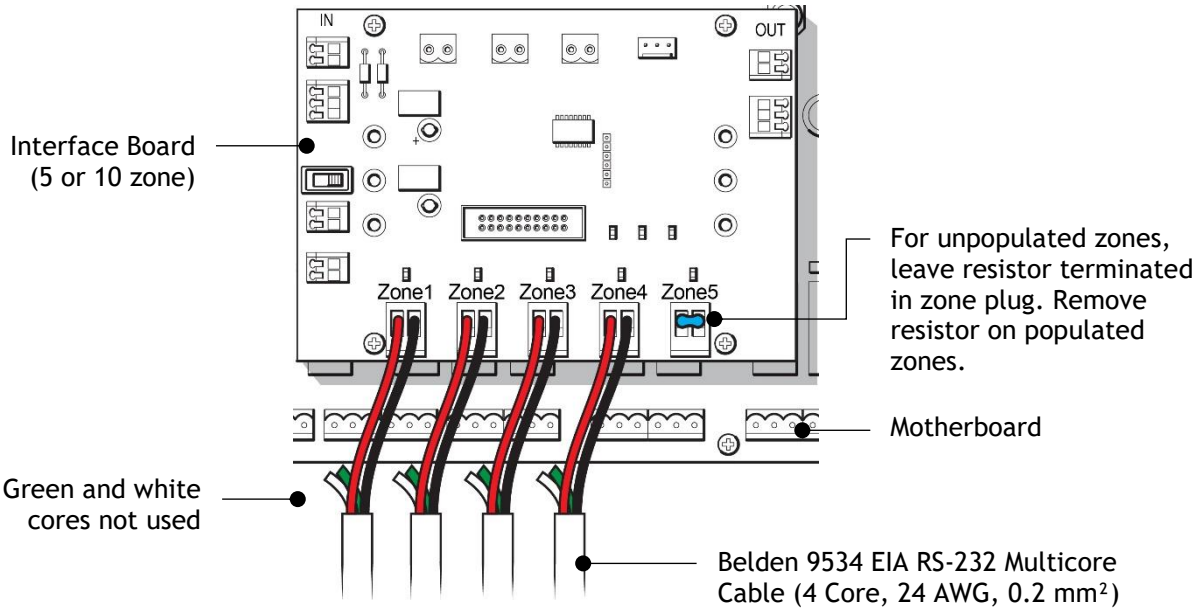


***Figure 6**: Sensor Cable Connection to Interface Board*

A. Sensor Cable (SCY) using LC10C and End of Line

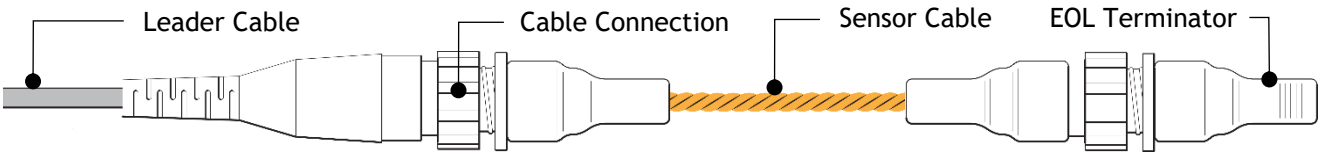


***Figure 7**: Sensor Cable Connection using Leader Cable (LC10C)*

Connect the Sensor Cable using LC10C and End of Line as follows:

1. Ensure that the unit is powered OFF. Connect the **leader cable** into the **sensor input terminals** on the **interface board**. Do not connect the green or white cores (**Figure 6**).
2. When connecting the leader cable to its respective sensor input terminals, ensure that the factory-issued **terminating resistor** is removed. Retain all resistors for future fault finding/testing.
3. Plug the opposite end of the **leader cable** into the **sensor cable** (**Figure 7**).
4. Once all sensor cables are connected, plug the **End of Line (EOL) terminator** into the end of the last run of the **sensor cable**.

B. Sensor Cable (SCY) using LC10/LCB100 and Start of Line

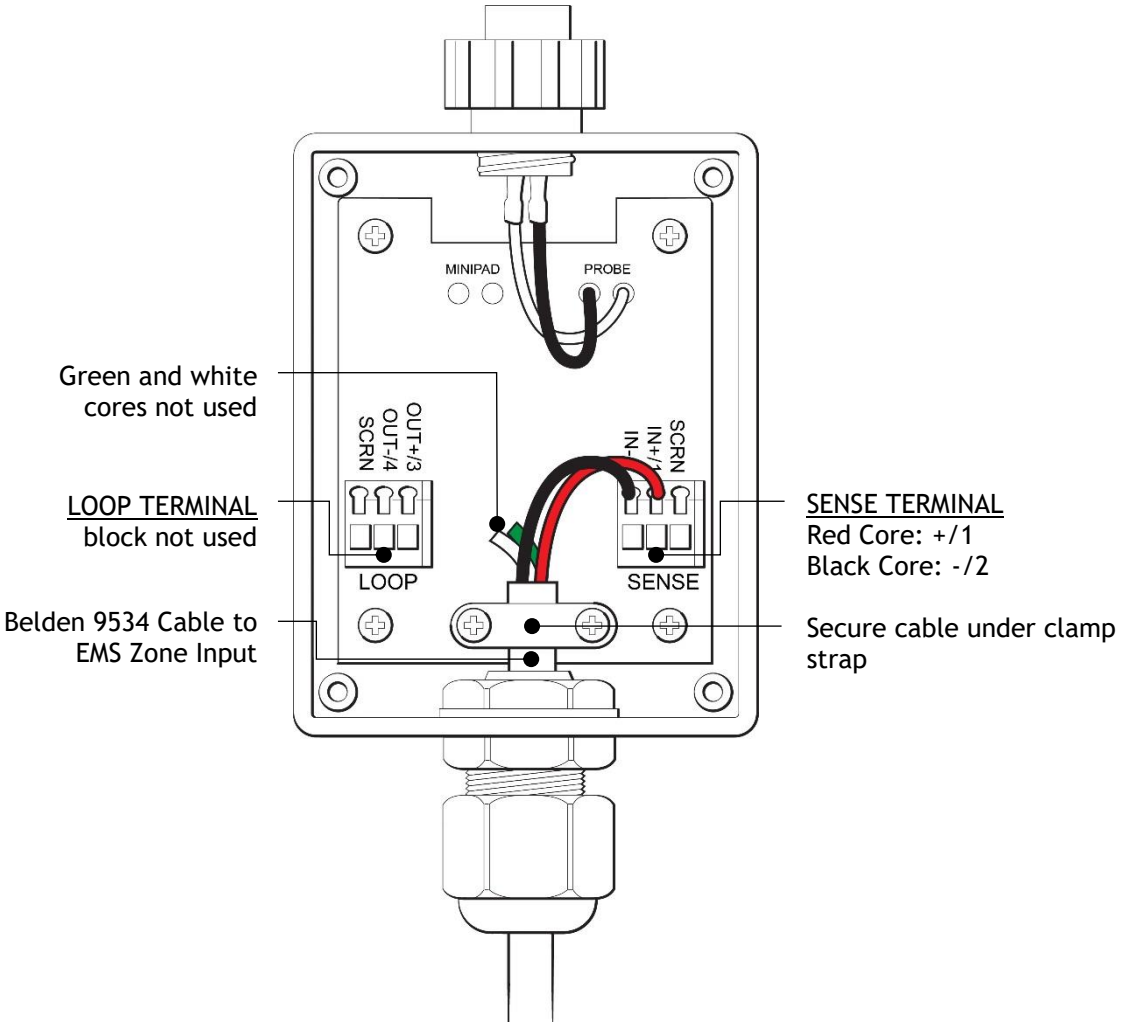


***Figure 8**: Sensor Cable using LC10/LCB100 and Start of Line*

Connect the Sensor Cable using LC10/LCB100 and Start of Line as follows:

1. Ensure that the unit is powered OFF. Connect the **leader cable** into the **sensor input terminals** on the **interface board**. Do not connect the green or white cores (**Figure 6**).
2. When connecting the leader cable to its respective sensor input terminals, ensure that the factory-issued **terminating resistor** is removed. Retain all resistors for future fault finding/testing.
3. Cable the opposite end of the **leader cable** in to the **Start of Line** (SOL; **Figure 8**).
4. Plug the **sensor cable** into the connection on the **SOL**.
5. Once all sensor cables are connected, plug the **End of Line (EOL) terminator** into the end of the last run of the **sensor cable.**

C. Single Environmental Sensing Device (ESD) Sensor Probe

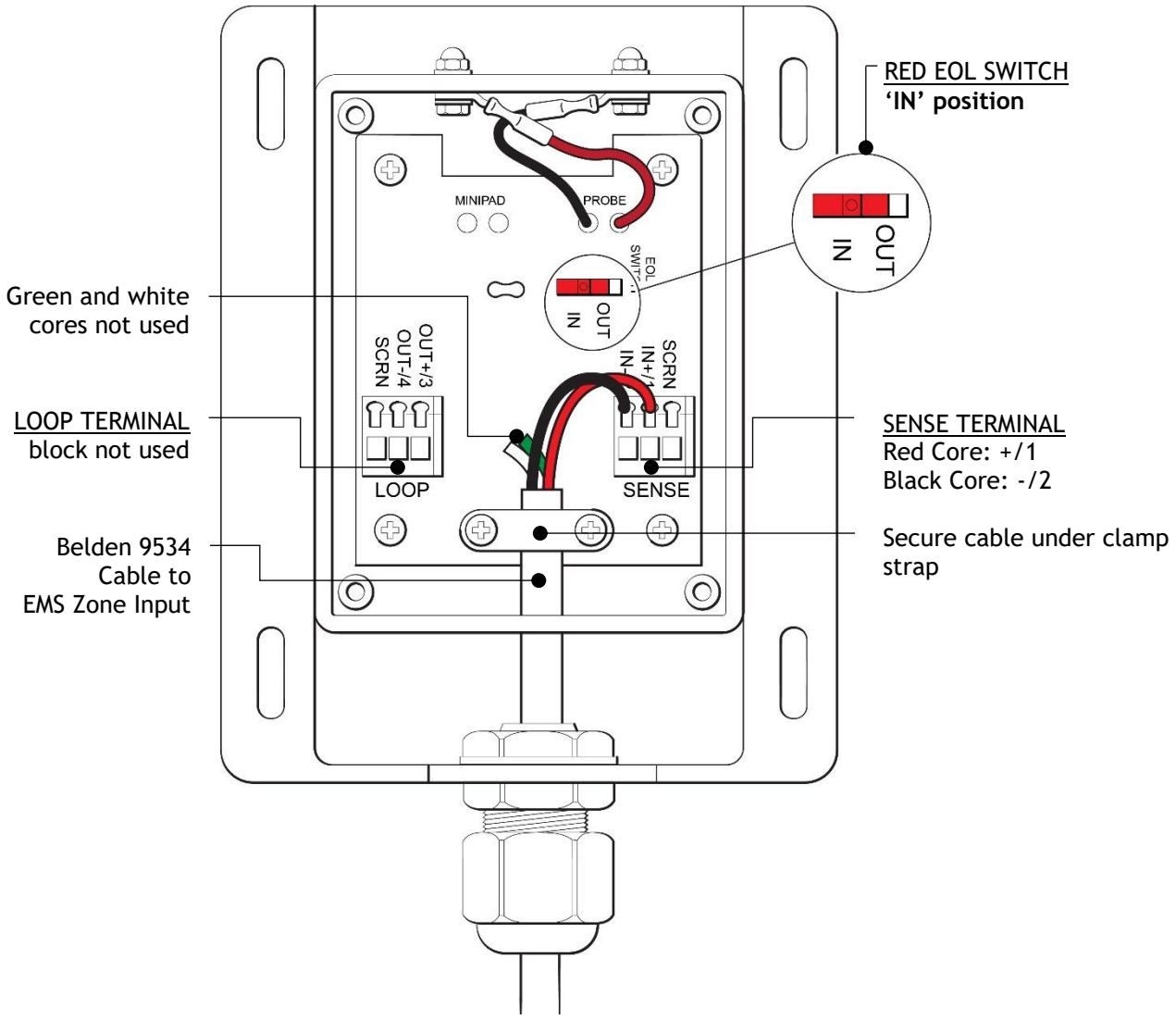


***Figure 9**: Sensor Cable using Single ESD Sensor Probe*

Connect the single ESD Sensor Probe as follows:

1. Ensure that the unit is powered OFF. Connect the **leader cable** into the **sensor input terminals** on the **interface board**. Do not connect the green or white cores (**Figure 6**).
2. When connecting the leader cable to its respective sensor input terminals, ensure that the factory-issued **terminating resistor** is removed. Retain all resistors for future fault finding/testing.
3. Connect the opposite end of the **leader cable** to the **ESD probe** (**Figure 9**).

D. Multiple Environmental Sensing Device (ESD) Sensor probes to a Single Zone

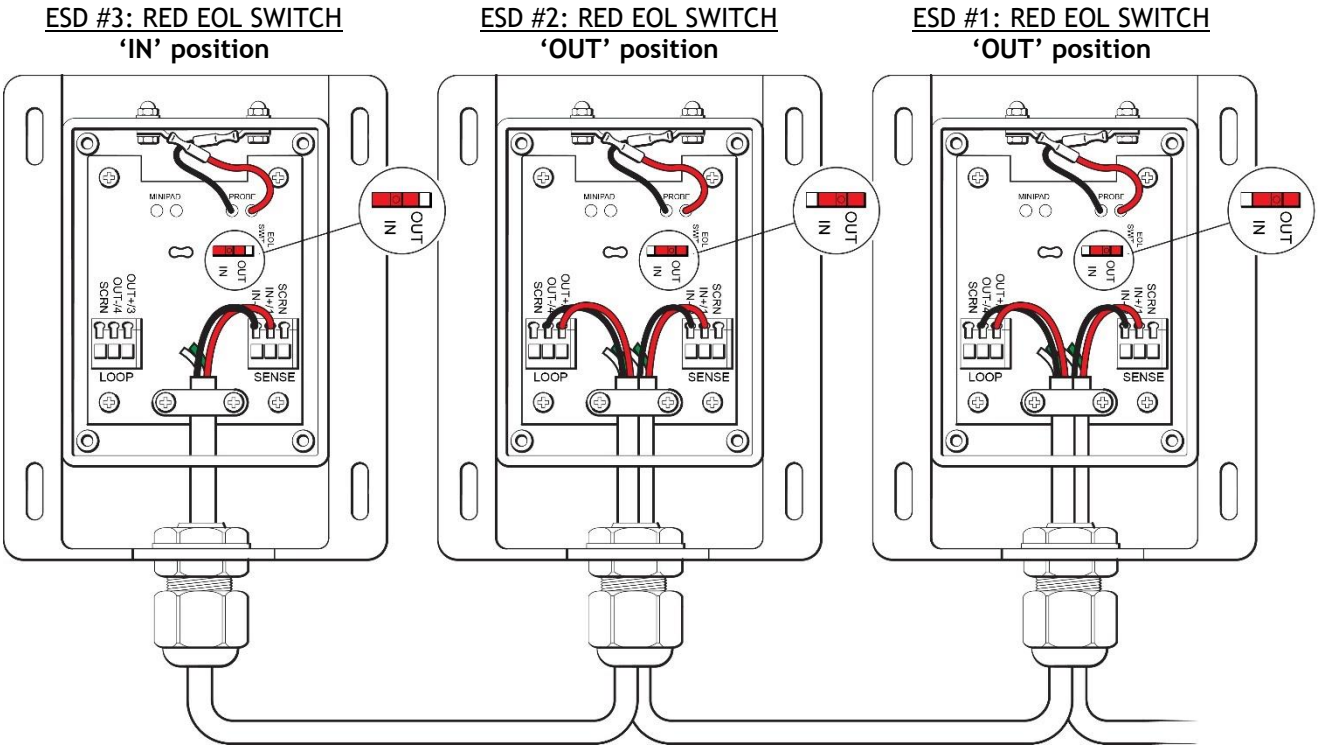


Figure 10: Multiple ESD Sensor Probes to a Single Zone

Connect multiple ESD sensor probes to a single zone as follows:

1. Ensure that the unit is powered OFF. Connect the **leader cable** into the **sensor input terminals** on the **interface board**. Do not connect the green or white cores (**Figure 6**).
2. When connecting the leader cable to its respective sensor input terminals, ensure that the factory-issued **terminating resistor** is removed. Retain all resistors for future fault finding/testing.
3. Connect the series of ESD probes. Ensure that:
   a. **All EOL switches except the last** are set to the **'OUT' position.**
   b. The last EOL switch should be set to the 'IN' position (e.g. **Figure 10**).

3.3 Ancillary Devices

3.3.1 Signalling to Ancillary Device

The EMS can be connected to provide a signal to a range of ancillary devices such as a Building Management System (BMS) or Short Message Service (SMS) alarm unit.

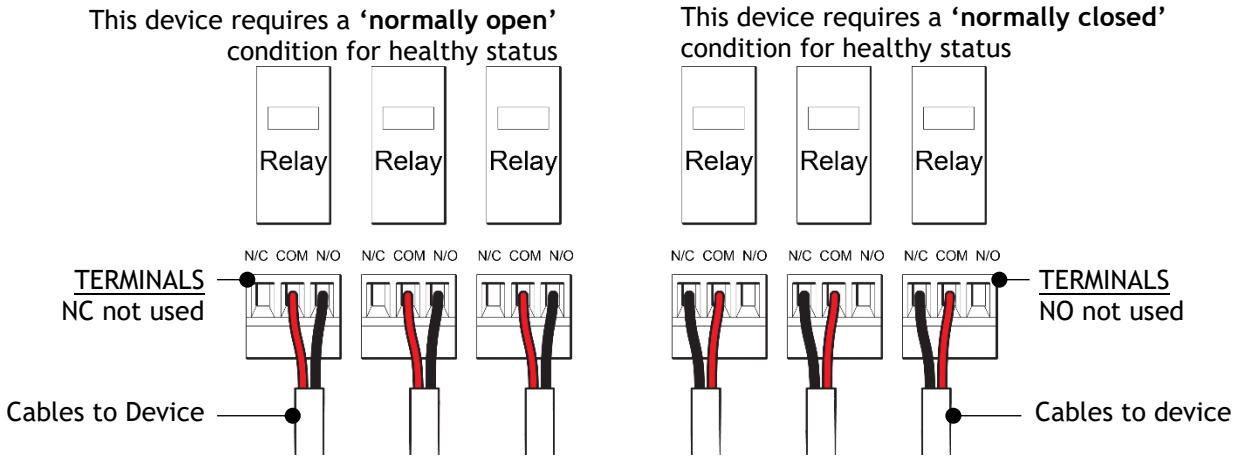


Figure 11: Connection of Master Panel for Signalling to an Ancillary Device

Connect the EMS Master Panel to an ancillary device as follows:

1. Ensure that the unit is powered OFF. Refer to **Table 3** (**3.2.1 Relay Functions and Triggers**) to select the correct **relay** for the application.
2. Connect to the relevant relay **(Figure 11;** core colours are for illustrative purposes only and may differ during application).

3.3.2 12/24V Output to Ancillary Device

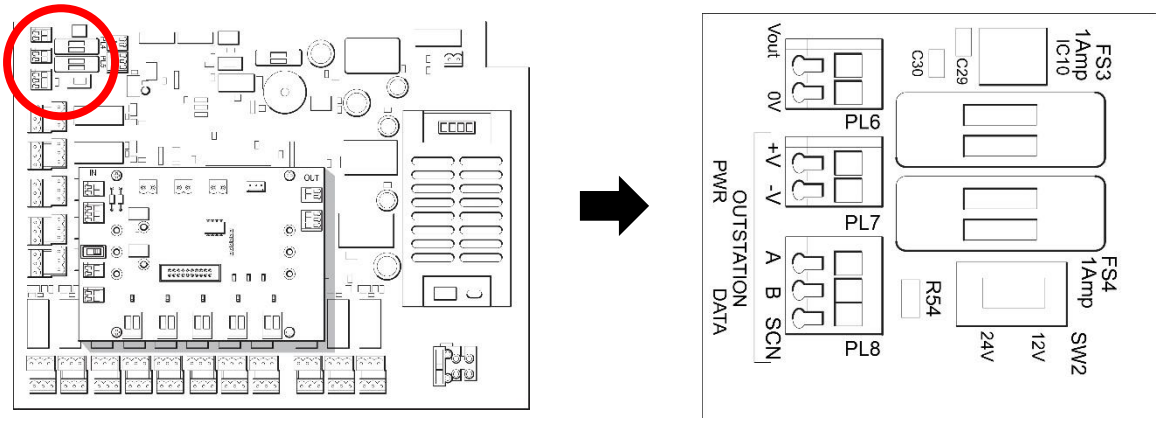


Figure 12: Using the 12/14 Output to Power an Ancillary Device

Use the 12/24V auxiliary output to power an ancillary device as follows:

1. Ensure that the unit is powered OFF. Use the **voltage selector switch SW2 (Figure 12)** to set the output to the correct voltage for your device.
2. Connect your device to the 12/24V output (**Figure 12**).

3.3.3 230V Output to Ancillary Device

The EMS can be used to control a powered ancillary device such as beacons or solenoid valves.

Maximum demand of all connected ancillary devices will be governed by the supply fuse in the unswitched spur and cable of a suitable cross-sectional area should be used.

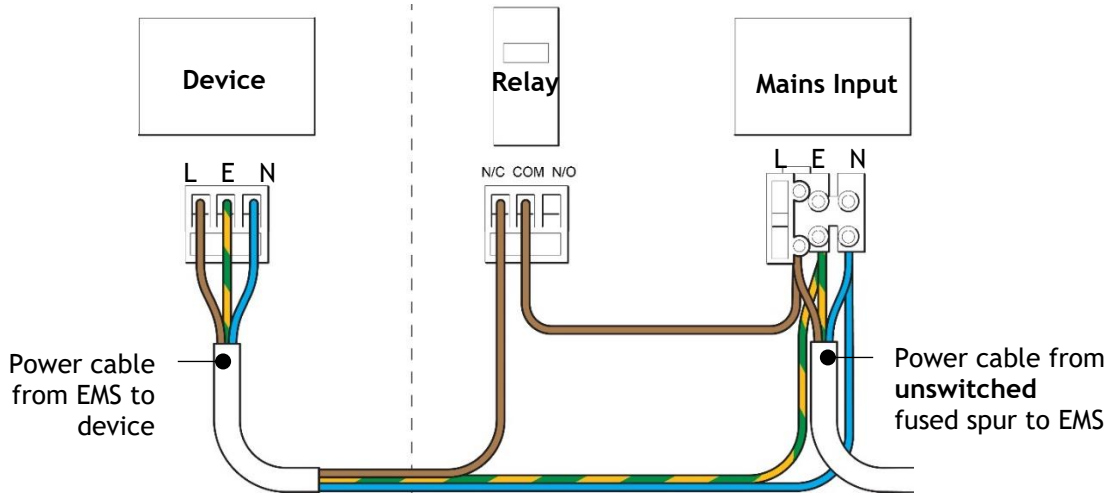


Figure 13: Using the EMS to Power a 230V Ancillary Device (Normally Closed)

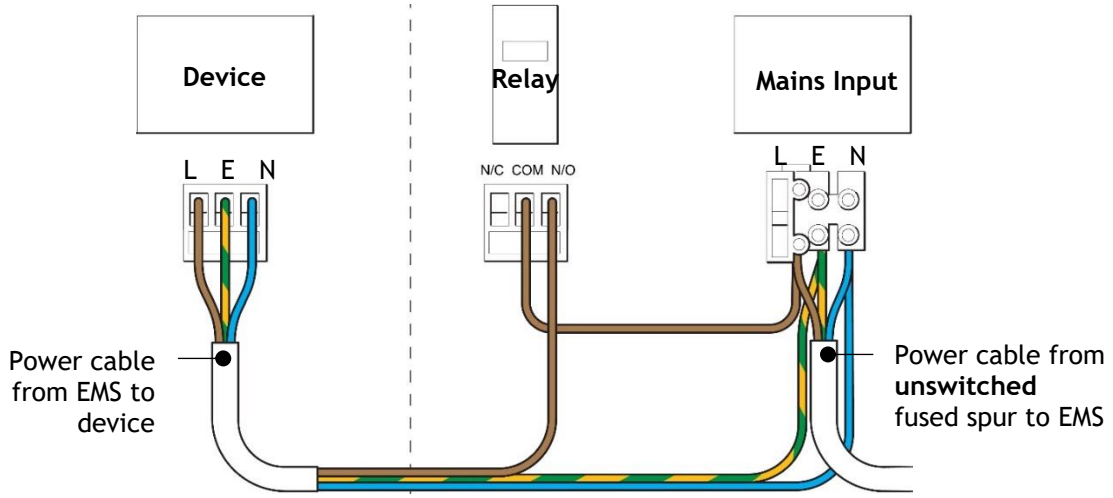


Figure 14: Using the EMS to Power a 230V Ancillary Device (Normally Open)

Use the EMS to power a 230V ancillary device as follows:

1. Refer to **Table 3** (**3.2.1 Relay Functions and Triggers**) to select the correct **relay**.
2. Wire the device (**Figure 13** and **Figure 14**).

   If the device is not within the immediate vicinity of the EMS panel, a **local isolator** must be installed **next to the device** for safe isolation and maintenance. The fuse rating of the local isolator should be less than that in the supply spur for circuit discrimination.

3.4 Outstations

Each Outstation has 5 input channels. Up to 125 Outstations may be connected to the EMS-OS, totalling up to 625 zones. See **8 Outstation Dip Switch Address Sheet** for Outstation addresses.

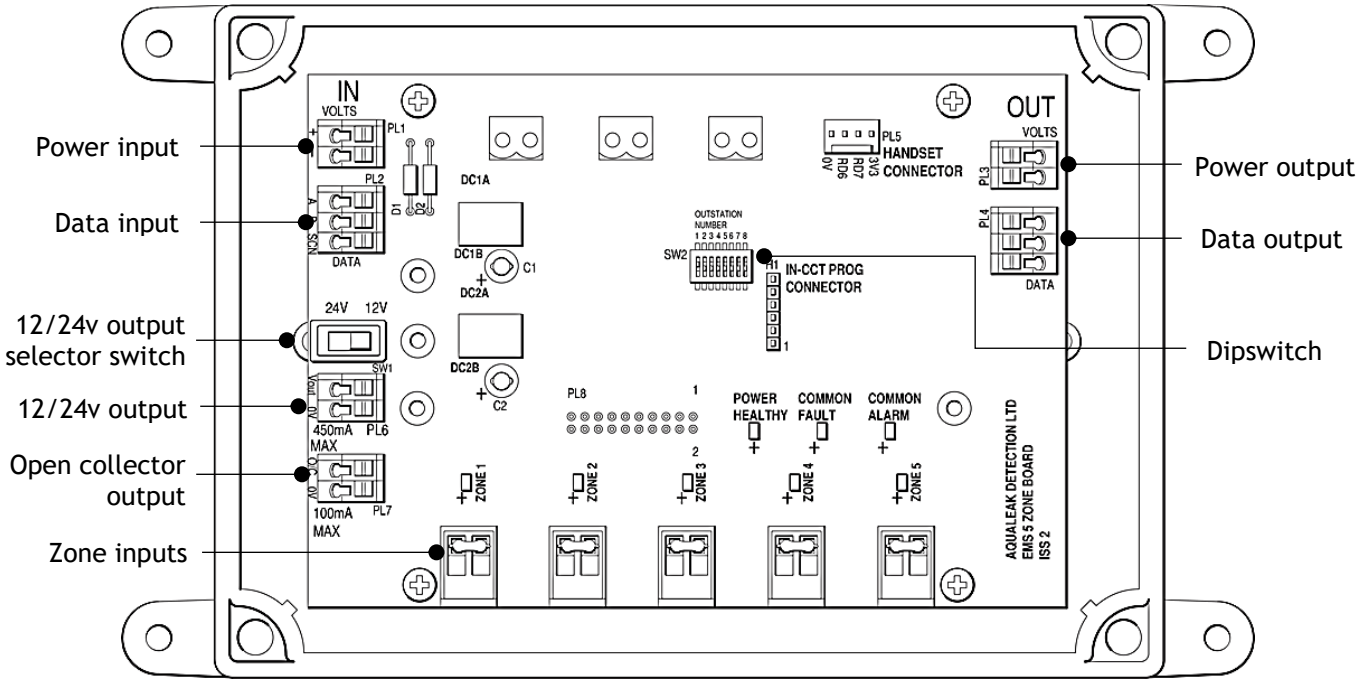


Figure 15: Outstation Panel

Install each Outstation as follows:

1. Mount the enclosure in a suitable location.

   It may be necessary to remove the PCB from the enclosure temporarily whilst mounting the enclosure and making required cable entries. The PCB should be handled with care and stored in a safe environment whilst it is out of the enclosure.

2. Terminate the power & data bus cable (RS485) into the top left terminals of the outstation PCB (**Figure 15**).

   For the first outstation, power & data into the outstation terminals will be fed from the outgoing terminals of the interface board of the master panel.

   Power and data for the next outstation will be fed from the outgoing terminals of the preceding outstation on the top right of the outstation PCB.

3. Sensor connections are as per the instructions for the master panel (**Figure 6**).

4. Address the outstation using the DIP switch on the PCB. The master panel will have either 1 or 2 interface boards, which will occupy either address 1, or addresses 1 and 2.

5. Outstations should be addressed sequentially, so the first outstation will be either address 2, or address 3, depending on the variant of master panel.

6. If the 12/24v output is to be used, complete necessary connections, and ensure the correct voltage is selected. OC output is for Aqualeak engineer use.

7. Reinstate the lid.

4 Configuration

An **Engineer PIN** must be used to access the **Engineers' Menu** to update software and configure the unit. The factory-default Engineer PIN is **1234**.

When any changes are made to the **.xml configuration file**, the **configuration version**, **date**, and **author** should always be updated, as well as the .xml configuration **file name** itself.

The EMS-05 is highly configurable; options include:

- EMS Settings
- User PIN types and numbers
- Network & Modbus settings
- Email settings
- Relay settings
- Interface Board settings

4.1 USB Port

The **USB Port** (2.0) located at the **rear of the unit** is used with a standard **USB stick** (sold separately) to transfer and update **operating system .apk software** and the **.xml configuration file**. Open the front of the Master Panel to access the USB Port located at the rear of LCD display:

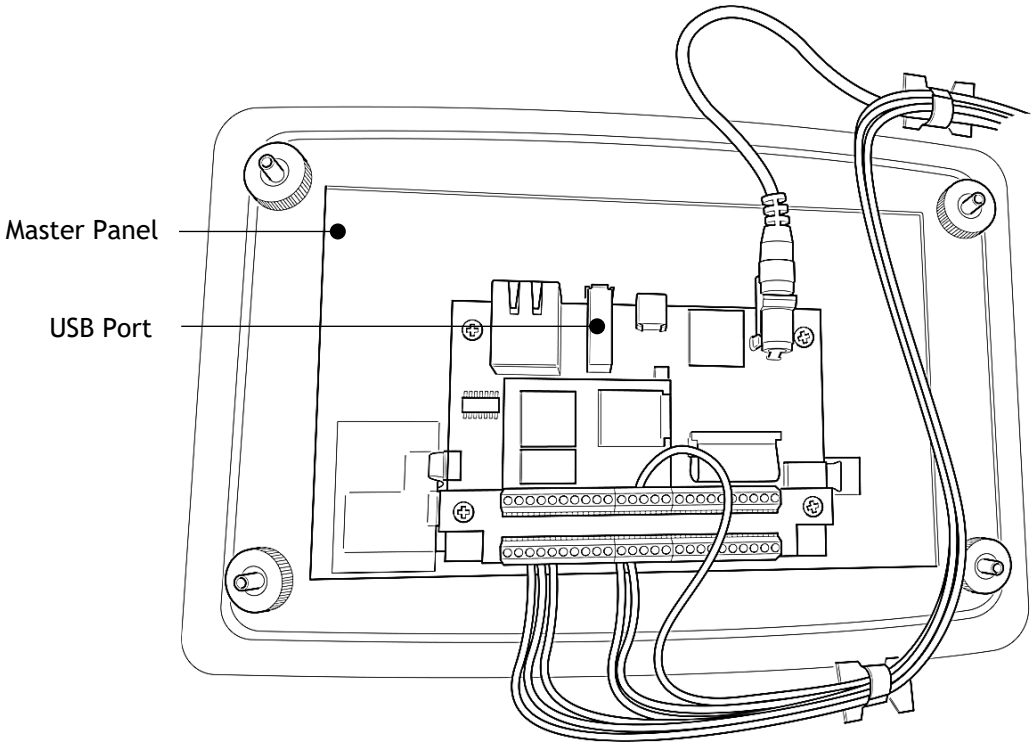


***Figure 16**: Rear of EMS-5X / 10X / OS Main Panel Showing USB Port*

4.2 XML Configuration File

Some XML editors require an associated **XML Schema file** (i.e. EMSSettings.xsd) to be in the **same directory** as the .xml configuration file to work correctly. Others such as **XML Notepad** do not.

Do not edit the .xml configuration file with a **word-processor** such as Microsoft Word, as this may **corrupt the file**.

The EMS-05 uses a single **Extensible Markup Language** (.xml) configuration file. It may be examined and/or edited using a **USB stick** to transfer the file to a PC or laptop with a suitable **XML or text editor** installed.

XML Notepad is free and open-source (FOSS) option that may be without restriction copied, distributed, and used, including for **commercial purposes**. Licence information and download options are available from the **Microsoft GitHub website**: https://github.com/microsoft/XmlNotepad

4.2.1 Export to USB

The factory-default .xml configuration file is less than **10 Kilobytes** (10KB) in size. Thousands of copies can be easily stored on a modest USB stick with a 128 Megabyte (MB) storage capacity.

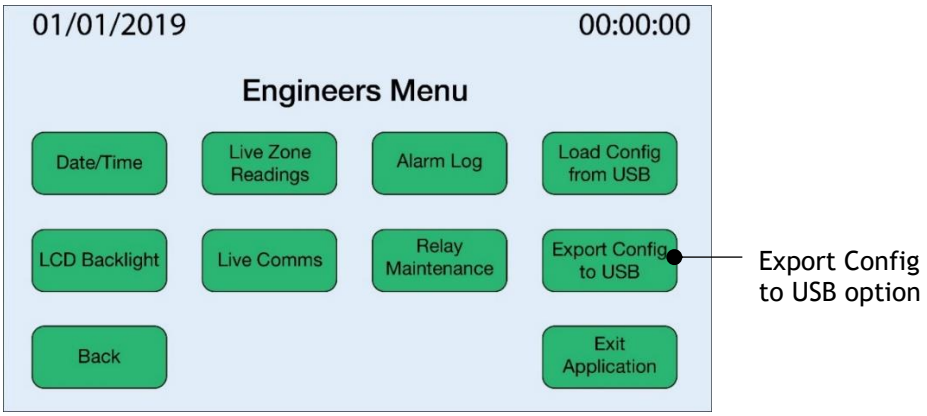


Figure 17: EMS Engineers Menu

To examine or edit the **.xml configuration file**, it is necessary to first **export** it to a standard **USB stick**.

Export the .xml configuration file to a USB stick as follows:

1. Ensure the EMS is powered ON and at the **Summary Screen**. Open the front of the Master Panel to access the **USB Port** located at the rear of LCD display.
2. Plug a **USB stick** into the **EMS USB port**. Wait a few seconds for the USB stick to be recognised.
3. **Summary Screen:** Tap 'Engineer' > Enter Pin (**default: 1234**) > Tap 'Export Config to USB' (**Figure 17**).
4. The .xml **configuration file** will be exported to the USB as: **'Site Name - System Name - Config.xml'** (site name and system name can be changed according to preference; see **4.2.2 EMS Settings**).
5. Plug the USB stick into a **PC or laptop USB port** to view and edit the exported configuration file in an **XML or text editor. Ignore any warnings referring to the repair of the USB stick.**

4.2.2 EMS Settings

The **SystemType** element of the **EMSSettings** attribute folder is factory-set and should **not be altered**. Instructions assume the **exported .xml configuration file** has already been opened in an **XML or text editor**.

The **EMSSettings** attribute folder contains all primary **setting elements** and other **attribute folders** for the EMS system:

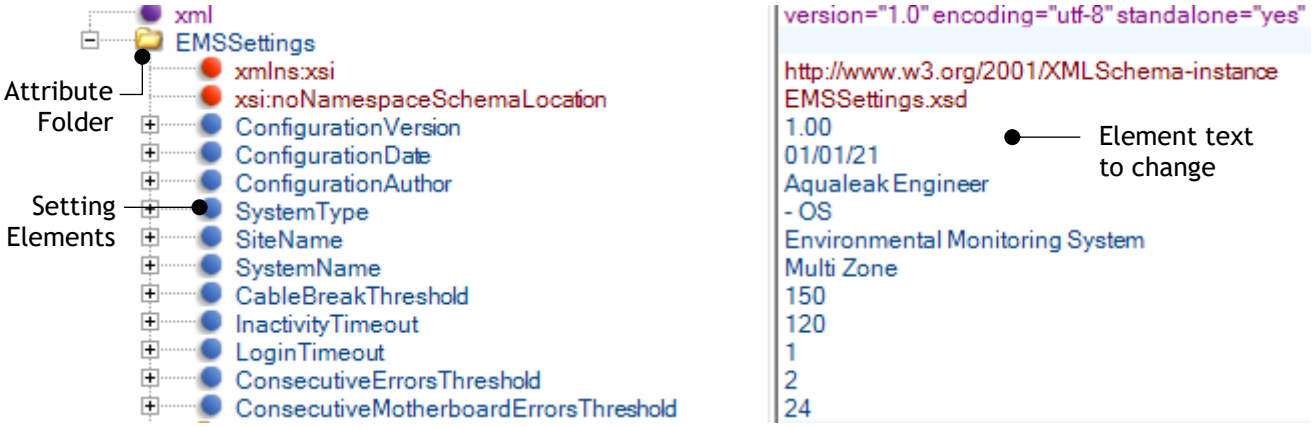


***Figure 18**: Expanded EMSSettings Folder*

EMS Settings	Description
ConfigurationVersion	Configuration version (update when changes made).
ConfigurationDate	Configuration Date (update when changes made).
ConfigurationAuthor	Configuration Author (update when changes made).
SystemType	Factory set. Do not change as this will corrupt the EMS system.
SiteName	Site Name (e.g. 'Environmental Monitoring System').
SystemName	Location of unit (e.g. '5 Zone').
CableBreakThreshold	Sensor reading to trigger a **Cable Break alarm**. Sensor readings are scaled from **0 (short circuit / leak)** to **255 (open circuit / cable break).** Typically set to **150**.
InactivityTimeout	How long the system will **wait in seconds for user input**. When expired, the system will switch back to the Summary Screen. Typically set to **120 seconds** for most installations.
LoginTimeout	How long the system will **wait in seconds for users to perform functions**. When expired, the system will automatically log out the user. Typically set to **1 second** (i.e. the end user has to enter a pin code every time they perform an alarm acknowledgment).
ConsecutiveErrorThreshold	How many times the Master Panel will interrogate each **internal interface board** during every scan. Typically set to a **value of 2** to cover temporary interference in communications. The threshold can be increased if short term communications failures are observed, but this will result in an increase in overall scan time.
ConsecutiveMotherboardThreshold	Factory set. Do not change as this will corrupt the EMS system.

***Table 4**: EMS Configuration File Settings*

Change EMS settings as follows:

1. Click the ⊞ icon next to the **EMSSettings** attribute folder to expand it. Configurable elements will appear immediately below, along with the **text to change** in the right column (**Figure 18**).
2. Click on the **element text to change** to highlight and edit as required (**Table 4**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number.

4.2.3 User PIN Types and Numbers

Ensure each user is provided with the appropriate **PIN** (Personal Identification Number) type for system security. Please do not use factory-default or easily-guessed PINs. Instructions assume the parent **EMSSettings** attribute folder has already been expanded.

Any number of **Users** and **Engineers** can be set up on the EMS system with an appropriate pin type:

PIN Settings	Description
UserPin	User profile folder. Contained in the **UserPins** attribute folder. Users may acknowledge alarms and access alarm logs.
EngineerPin	Engineer profile folder. Contained in the **EngineerPins** attribute folder. Engineers have access to all system functions.
Name	User or Engineer name.
Pin	Personal Identification Number. User default: **0000**. Engineer default: **1234**.

Table 5: User PIN Settings

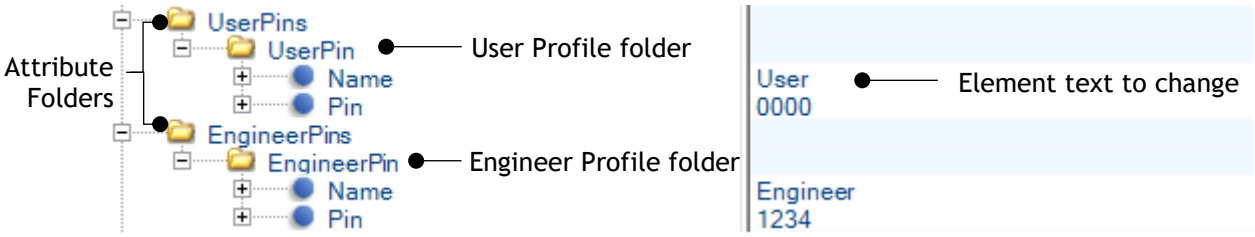


Figure 19: Expanded UserPins and EngineerPins Folders

Set up a new User or Engineer profile as follows:

1. Click the ⊞ icon next to the **UserPins** or **EngineerPins** attribute folder to expand them. At least one existing **profile folder** will appear below (**Figure 19**).
2. Click a **profile folder** to highlight it. Copy the profile folder (e.g. press **'CTRL'** and **'C'** together).
3. Click the **UserPins** or **EngineerPins** attribute folder above to highlight it. **Paste** the **copied profile** in (e.g. press **'CTRL'** and **'V'** together). A **duplicate profile** will appear below.
4. Click the ⊞ icon next to the **duplicate profile** if not already expanded. The **Name** and **Pin** elements are below, along with the **element text to change** in the right column.
5. Click the element text to change to highlight and edit as required (**Table 5**).
6. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number.

4.2.4 Network Settings

If the EMS is connected to any device via an **Ethernet cable** then network settings must be configured. If DHCP is disabled, a fixed IP address and gateway address must be entered (see **Table 6**).

Instructions assume the parent **EMSSettings** attribute folder has already been expanded.

The **NetworkSettings** attribute folder contains all element settings for **EMS network connections**:

Figure 20: Expanded NetworkSettings Folder

Network Settings	Description
EnableDHCP	Set to **1** to **enable** connection to a network with a **DHCP server**. Set to **0** to **disable DHCP**. If disabled, A fixed **IP address** and **Gateway address** must be entered (**Figure 20**). Consult with Network Administrator before editing the Network Settings section.
IPAddress	Fixed IP address. Must be entered if DHCP is disabled.
SubNetMask	Sets IP address range available within the network.
Gateway	Gateway address. Interface to send information. Must be entered if DHCP is disabled. If there is **no gateway address (eg for isolated networks; BMS/SCADA)**, enter the fixed IP address **but change the final digits of this attribute** (after the last decimal point) to **'254'**. For example: IP address: 192.168.0.0 Gateway address: 192.168.0.**254**
DNS	Domain Name System. Set DNS to be the same as the Gateway address.

Table 6: EMS Network Settings

Configure network settings as follows:

1. Click the ⊞ icon next to the **NetworkSettings** attribute folder to expand it. All configurable elements will appear below, along with **element text to change** in the right column (**Figure 20**).
2. Click the **element text to change** to highlight and edit as required (**Table 6**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number.

4.2.5 Modbus Settings

If monitoring the EMS via **Modbus TCP/IP** then enable Modbus in the **TCPModbusSettings** attribute folder (see subsection **A. Ethernet / TCP Configuration**).

If monitoring the EMS via **Modbus RTU** then enable Modbus in the **SerialModbusSettings** attribute folder (see subsection **B. Serial Link / RTU Configuration**).

Instructions assume the parent **EMSSettings** attribute folder has already been expanded.

- The system only responds to **Modbus Function 03** (READ HOLDING REGISTERS). All other Modbus messages are ignored.
- The corresponding Bit value for **Register 0** is **1 less** than the Relay number (e.g. Bit 0 corresponds to Relay 1, etc).

Using either an Ethernet/TCP or Serial/RTU Modbus configuration, **Register 0** (Master Station Relay Bits) and **Register 1** (Interface Board; Register 2 onwards for Outstations are identical) are:

REGISTER 0 **Master Station Relays**	
Bit	**Corresponding Relay**
0	Relay 1: Configurable
1	Relay 2: Configurable
2	Relay 3: Configurable
3	Relay 4: Configurable
4	Relay 5: Configurable
5	Relay 6: Configurable
6	Relay 7: Configurable
7	Relay 8: Configurable
8	Relay 9: Configurable
9	Relay 10: Configurable
10	Relay 11: Common Alarm / Fault Relay
11	Relay 12: Cable Break
12	Relay 13: Alarm
13	Relay 14: Configurable
14	Relay 15: Watchdog
15	Relay 16: Spare / Unused

REGISTER 1 **Interface Board**	
Bit	**Corresponding Function**
0	Interface board online
1	Zone 1 fault
2	Zone 2 fault
3	Zone 3 fault
4	Zone 4 fault
5	Zone 5 fault
6	Zone 1 alarm
7	Zone 2 alarm
8	Zone 3 alarm
9	Zone 4 alarm
10	Zone 5 alarm
11	Not Used.
12	
13	
14	
15	

Table 7: *Register 0 Corresponding Replays and Register 1 Corresponding Functions*

A. Ethernet / TCP Configuration

Do not enable both Ethernet/TCP and Serial/RTU Modbus connections at the same time.

The **TCPModbusSettings** attribute folder contains element settings for Modbus **Ethernet** connections to Modbus master devices:

Figure 21: Expanded TCPModbusSettings Folder

TCP Modbus Settings	Description
EnableModbus	Set to **1** to **enable M**odbus connection via **Ethernet**. Set to **0** to **disable.**
PortNumber	Port Number. The standard number for Modbus TCP is **502.**
ConnectionTimeout	Connection Timeout in **seconds**. This should be set to a value **just longer** than the polling interval of the BMS/SCADA system. Default is **5**.

Table 8: Modbus Ethernet/TCP Settings

Configure the Modbus TCP settings as follows:

1. Click the ⊞ icon next to the **TCPModbusSettings** attribute folder to expand it. All configurable elements will appear below, along with **element text to change** in the right column (**Figure 21**).
2. Click the **element text to change** to highlight and edit as required (**Table 8**).
3. Do not enable the Serial Modbus in the **SerialModbusSettings** attribute folder.
4. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number.

B. Serial Link / RTU Configuration

Do not enable both Ethernet/TCP and Serial/RTU Modbus connections at the same time.

The EMS-05 supports both **RS232/RS485 protocols**. RS485 is the default protocol, and an Aqualeak Engineer will be required if RS232 is required.

The **SerialModbusSettings** attribute folder contains element settings for **Modbus serial link connections** to Modbus master devices:

Figure 22: Expanded SerialModbusSettings Folder

Serial Modbus Settings	Description
EnableModbus	Set to **1** to **enable** modbus connection via serial link. Set to **0** to **disable.**
SerialModbusMode	Serial Bus Mode. Set to **rtu** or **ascii** to match the SCADA/BMS system. Where able, **ascii** is recommended as this mode is more tolerant to timing problems.
SlaveAddress	Slave Address. Set to match the SCADA/BMS system.
BaudRate	Baud Rate. Set to match the SCADA/BMS system.
BitCount	Bit Count. Set to **7** or **8** to match the SCADA/BMS system.
StopBits	Stop Bits. Set to **1** or **2** to match the SCADA/BMS system.
Parity	Set to **0 (none)**, **1 (even)**, or **2 (odd)** to match the SCADA/BMS system.

Table 9: Modbus Serial Link/RTU Settings

Configure the Modbus serial link settings as follows:

1. Click the ⊞ icon next to the **SerialModbusSettings** attribute folder to expand it. All configurable elements will appear below, along with **element text to change** in the right column (**Figure 22**).
2. Click the **element text to change** to highlight and edit as required (**Table 9**).
3. Do not enable the Ethernet Modbus in the **TCPModbusSettings** attribute folder.
4. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number

4.2.6 Email Settings

The **EmailSettings** attribute folder contains element settings for **email alerts** if an alarm occurs:

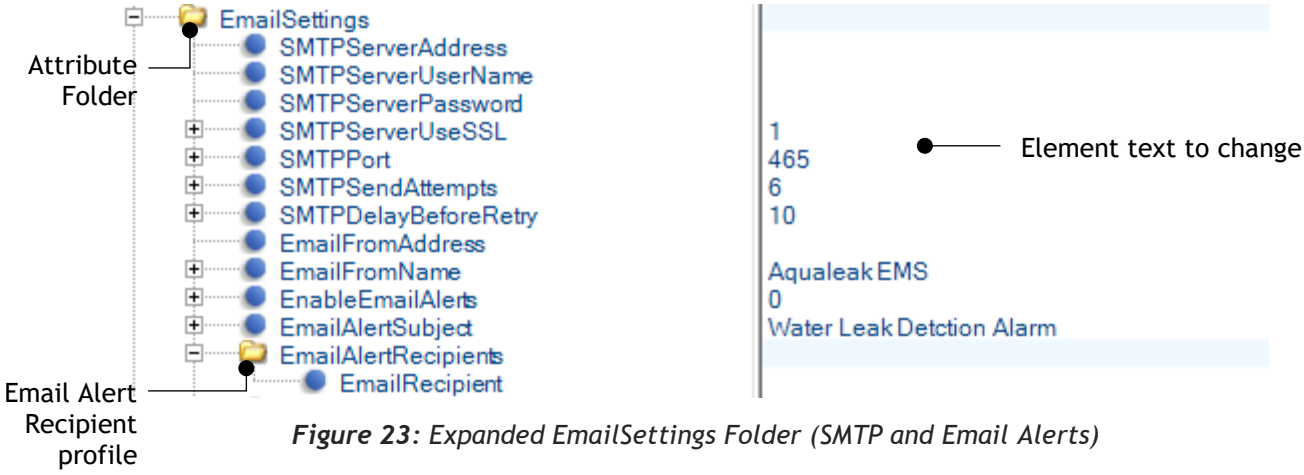


***Figure 23**: Expanded EmailSettings Folder (SMTP and Email Alerts)*

A. Configure Email Alert Settings

	Email Settings	Description
Email Alert Elements	**SMTPServerAddress**	Simple Mail Transfer Protocol (SMTP) Server address.
	SMTPServerUserName	Server User Name (email address).
	SMTPServerPassword	Server Password.
	SMTPServerUseSSL	Set to **1** to **enable** Secure Sockets Layer (SSL). Set to **0** to **disable.**
	SMTPPort	SMTP port number to suit SMTP email account credentials.
	SMTPSendAttempts	Number of attempts to resend email(s) on delivery failure.
	SMTPDelayBeforeRetry	Delay in seconds before resending email(s) on delivery failure.
	EmailFromAddress	Email address of EMS.
	EmailFromName	Name of person sending email.
	EnableEmailAlerts	Set to **1** to **enable** email alerts if an alarm occurs. Set to **0** to **disable.** The alarm text contained in the body of email alerts consists of the Alarm Text for the latest alarm (as displayed in the Alarm List and Alarm Log).
	EmailAlertSubect	Subject line of email (e.g. 'Water Leak Detection Alarm')
	EmailAlertRecipients	Recipient profile folder. Contains alert email address elements.
	EmailRecipient	Alert email addresses in the **EmailAlertRecipients** profile folder.

***Table 10**: Email Alert Settings*

Configure email alert settings as follows:

1. Click the ⊞ icon next to the **EmailSettings** attribute folder to expand it. All configurable elements will appear below, along with **element text to change** in the right column (**Figure 23**).
2. Click the **element text to change** to highlight and edit as required (**Table 10**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to re-name the file to the updated version number.

Set up a new email alert recipient as follows:

1. Click the ⊞ icons next to the **EmailSettings** attribute folder and the **EmailAlertRecipients** profile folder to expand them. At least one existing **EmailRecipient element** will appear below (**Figure 23**).
2. Click an **EmailRecipient element** to highlight it (i.e. in the left column, not the text to change in the right column). Copy the element (e.g. press **'CTRL'** and **'C'** together).
3. Click the **EmailAlertRecipients** attribute folder above to highlight it. **Paste** the **copied element** in (e.g. press **'CTRL'** and **'V'** together). A **duplicate recipient** will appear below.
4. Click the **duplicate recipient element text to change** to highlight and edit as required (**Table 10**).
5. A maximum of **5 email recipients** are recommended for alerts.
6. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

B. Configure Email Summary Request Settings

Email Summary requests require access to an **Internet Message Access Protocol** (IMAP) server. The server must also have an account configured with a **User Name** and **Password**. The **EmailSettings** attribute folder contains element settings for email alerts if an alarm occurs:

Figure 24: Expanded EmailSettings Folder (Email Summary Requests and IMAP)

	Email Settings	Description
Summary Request Elements	**EnableEmailSummaryRequests**	Set to **1** to **enable** email summary requests. Set to **0** to **disable.**
	EmailSummarySubjectTag	Summary Subject Tag. Set to desired key code or word. The default '**Status**'. When an email with this **tag in the subject field** is received, the EMS will reply to the sending email address. Note that the Subject Tag needs to match the email subject field exactly, and is case sensitive. The reply will contain a **summary of the current status** of the unit including: • Number of alarms • EMS software version • Number of faults • EMS configuration details
	IMAPServerAddress	
	IMAPServerUserName	
	IMAPServerPassword	Internet Message Access Protocol (IMAP) Server Password.
	IMAPServerUseSSL	Set to **1** to **enable** Secure Sockets Layer (SSL). Set to **0** to **disable.**
	IMAPPort	Port. Standard Port number is **143**.

Table 11: Email Summary Request Settings

Configure email summary request settings as follows:

1. Click the ⊞ icon next to the **EmailSettings** attribute folder to expand it (**Figure 23**). All configurable elements will appear below, along with **element text to change** in the right column (**Figure 24**).
2. Click the **element text to change** to highlight and edit as required (**Table 11**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

4.2.7 Relay Settings

The unit has **16 output relays** (section **3.2 Relays and Sensors**). Relays 11, 12, 13, 15, and 16 are dedicated to specific functions and **cannot be changed**. Functions of remaining relays (1-10 and 14) are configurable.

The **RelaySettings** attribute folder contains element settings to configure relays and relay alarms:

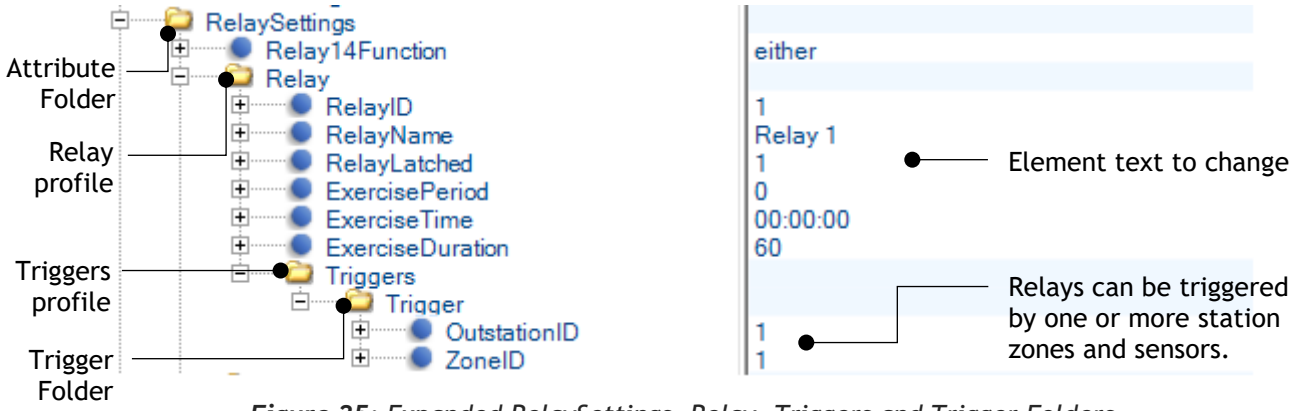


***Figure 25**: Expanded RelaySettings, Relay, Triggers and Trigger Folders*

A. Relay 14 Configuration

Relay 14 Setting	Description
Relay14Function	Relay 14. Set to respond to **alarm**, **cablebreak**, or **either**. Text must be **lowercase**. The relay will reset as soon as faults or alarms have been cleared (section **5.4 Alarms**).

***Table 12**: Relay 14 Settings*

Configure relay 14 as follows:

1. Click the ⊞ icon next to the **RelaySettings** attribute folder to expand it. The **Relay14Function** element will appear below, along with its **element text to change** in the right column (**Figure 25**).
2. Click the Relay14Function **element text to change** to highlight and edit as required (**Table 12**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

B. Relay 1 to 10 Configuration

Relays 1-10 are normally used to **trigger actions** (e.g. close a valve) in the event of an **alarm**. Each relay may have up to **10 alarms**.

System components may be inactive for long periods of time. Exercising them will help keep the entire system in best operational health, i.e. exercising a solenoid valve regularly will keep it from seizing.

	Relay 1-10 Settings	Description
Relay 1-10 Elements	***Relay***	Profile folder containing relay elements and the Triggers profile folder. There may be up to 10 Relay folders (i.e. one for each configurable relay).
	RelayID	Relay ID. Enter number of a relay to be operated (1-10).
	RelayName	Relay Name (e.g. 'Relay 1; see **Figure 25**).
	RelayLatched	Set to **1** to **latch Relay.** The relay will remain set until the alarm has cleared and the Relay message in the Alarm List has been reset by the operator (**section 5.4**). Set to **0** to **disable.** The relay will de-energise once all Trigger alarms are clear.
	ExercisePeriod	Relay exercise period. **1** will exercise relays **every day (24 hours); 30** will exercise relays every **30 days (720 hours)**. Set to **0** to **disable**.
	ExerciseTime	Relay exercise time. If **ExercisePeriod** is enabled, set in **24-hour format** (e.g. 00:00:00 will set the exercise time to midnight). When setting relay exercising to operate at a certain time of day it is highly advisable to staggering the relay operation times to avoid overloading the power supply fuse and/or cause water hammer/surges.
	ExerciseDuration	Relay exercise duration. If **ExercisePeriod** is enabled, set period of time **in seconds** to exercise the relay (default is **60 seconds**).
	Triggers	Profile folder that can contain up to **10 Trigger** folders. The relay can therefore be triggered by up to **10 different alarms** from any sensor input on any zone.
	Trigger	Folder containing Interface board identification and Zone identification elements to trigger the relay.
	OutstationID	Interface board ID. Station number to trigger relay. Contained in the **Trigger Folder**.
	ZoneID	Zone ID. Sensor to trigger relay (e.g. **Figure 25** shows Relay 1 will be triggered by the Interface board, Sensor 1). Contained in **Trigger Folder**.

Table 13: Relay 1-10 Settings

Configure a relay (1-10) as follows:

1. Click the ⊞ icon next to the **RelaySettings** attribute folder to expand it. All relay profile folders and configurable elements will appear below, along with **element text to change** in the right column (**Figure 25**).
2. Click the **element text to change** to highlight and edit as required (**Table 13**).
3. To set up **sensor triggers** (alarms) for the relay, or another relay, see the instructions below.
4. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

Set up a new sensor trigger (alarm) for a relay profile as follows:

1. Configure the relay by following the instructions above.
2. Click the ⊞ icon next to the **Triggers** profile folder to expand it. At least one existing **Trigger** folder will appear below (**Figure 25**).
3. Click a Trigger **folder** to highlight it. Copy the folder (e.g. press 'CTRL' and 'C' together).
4. Click the **Triggers** attribute folder above to highlight it. Paste the **copied folder** in (e.g. press 'CTRL' and 'V' together). A **duplicate trigger folder** will appear.
5. Click the ⊞ icon next to the **duplicate trigger folder.** All configurable elements will appear below, along with the **element text to change** in the right column.
6. Click the **element text to change** to highlight and edit as required (**Table 13**).
7. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

Set up a new relay profile as follows:

1. Click the ⊞ icon next to the **RelaySettings** attribute folder to expand it. At least one existing **relay profile** folder will appear below (**Figure 25**).
2. Click a relay profile to highlight it. Copy the folder (e.g. press 'CTRL' and 'C' together).
3. Click the **RelaySettings** attribute folder above to highlight it. Paste the **copied folder** in (e.g. press 'CTRL' and 'V' together). A **duplicate relay profile** folder will appear.
4. Click the ⊞ icon next to the **duplicate relay folder.** All configurable elements will appear below, along with the **element text to change** in the right column.
5. Click the **element text to change** to highlight and edit as required (**Table 13**).
6. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

4.2.8 Interface Board and Outstation Settings

The Interface Board (i.e. Master Panel) and Outstations are configured the same way. As such, both share the same attribute and profile folder names in the .xml configuration file.

The first (or only) Outstation profile will be for Interface Board configuration (**Figure 26**); the second profile onwards are to configure Outstations.

The **Outstations** attribute folder contains element settings to configure the Interface Board (i.e. connected to the master panel in the unit) and outstations (i.e. mounted elsewhere) zone inputs:

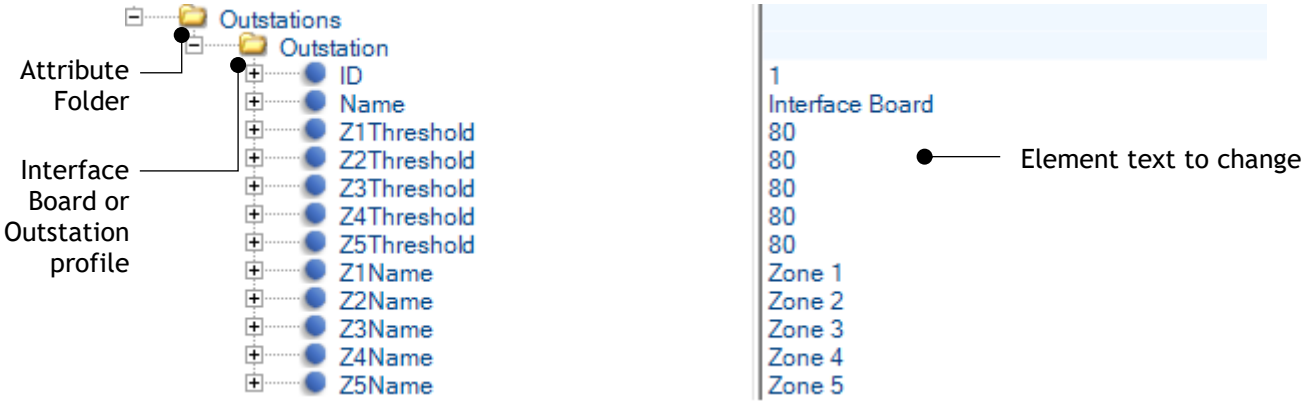


***Figure 26**: Expanded Outstation profile Folder (First Profile for Interface Board)*

Interface Setting	Description
ID	Identification number. Linked to the Internal station ID element used for relays 1-10 in the **RelaySettings** attribute folder (see **4.2.7B. Relay 1 to 10 Configuration**).
Name	Default set to **ID1**.
Z1T, Z2T, Z3T, Z4T, and Z5T	Sensor Alarm thresholds for each sensor on the internal station board. Range is from **0 (short circuit / leak)** to **255 (open circuit / cable break)**. Typically set to **80.** Adjust to a lower value of the sensor is in a very damp environment. Adjust to a higher value if in a very dry area and/or very small leaks are to be detected.
Z1Name, Z2Name, Z3Name, Z4Name, and Z5Name (etc.)	Zone identities, e.g. Comms Room, Plant Room, Tea Point etc. Default is Zone 1, Zone 2, Zone 3, etc.

***Table 14**: Interface Board and Outstation Settings*

Configure Interface Board and Outstation settings as follows:

1. Click the ⊞ icon next to the **Outstations** attribute folder and then the **Outstation** folder to expand them. All configurable elements will appear below, along with element text to change in the right column (**Figure 26**).
2. Click the **element text to change** to highlight and edit as required (**Table 14**).
3. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

Set up a new Outstation Profile as follows:

1. Click the ⊞ icon next to the **Outstations** attribute folder to expand it. At least one existing **Outstation profile** folder will appear below (**Figure 26**).
2. Click an Outstation profile to highlight it. Copy the folder (e.g. press 'CTRL' and 'C' together).
3. Click the **Outstations** attribute folder above to highlight it. Paste the **copied folder** in (e.g. press 'CTRL' and 'V' together). A **duplicate Outstation profile** folder will appear.
4. Click the ⊞ icon next to the **duplicate Outstation folder.** All configurable elements will appear below, along with the **element text to change** in the right column.
5. Click the **element text to change** to highlight and edit as required (**Table 14**).
6. Once editing of the file is complete, update the **configuration version**, **date**, and **author**. Use the XML or text editor 'Save As' option to rename the file to the updated version number.

4.2.9 Configuration File Installation

During installation, the EMS-05 will automatically install the **first .xml file found** in the **root directory** of the connected **USB stick**, regardless of file name or modification date.

To prevent misconfiguration, **any other .xml files** (e.g. old configuration files) should be stored elsewhere, such as in a **subdirectory of the USB stick**.

Before uploading the revised .xml configuration file, ensure that:

- The **configuration version**, **date**, and **author** have been updated (see **4.2.2 EMS Settings**).
- The **file name** has been edited to include the updated **configuration version** number.

Install the revised .xml configuration file as follows:

1. Copy the .xml file to a **USB stick**. Ensure it is the **only .xml file** in **the root directory**. Any other .xml files must be stored elsewhere (e.g. a subdirectory of the USB stick) to prevent misconfiguration.
2. Open the **front of the Master Panel** to access the **USB Port** located at the rear of LCD display. Plug the USB stick in and wait a few seconds for the system to recognise the USB stick.
3. **Summary Screen:** Tap 'Engineer' > Enter Pin (**default: 1234**) > Tap 'Load Config from USB'.
4. The system will reboot with the new configuration. If the file is **invalid** for any reason, it will not be loaded and a **warning message** will appear. In this event, the system will default to the factory-set configuration (i.e. custom settings will be reset).
5. **Summary Screen**: Tap the **Aqualeak logo** to check the loaded file.

4.3 Operating System Updates

DO NOT install any software or operating system updates other than those provided by **Aqualeak Detection Ltd.**

- The EMS-05 **Android operating system** may be periodically updated to improve functionality and performance.
- The appropriate **Android Application Packages** (.apk files) for this purpose will be provided by Aqualeak Detection Limited.

Figure 27: EMS Software Update Process

Part 1 of 3: Prepare the .apk software update as follows:

1. Copy the **EMS software to install** (.apk file) onto a **USB stick**.
2. Ensure the EMS is powered ON and at the **Summary screen**. Open the front of the Master Panel to access the USB Port located at the rear of LCD display.
3. If appropriate, **switch SW1** can be set to the **ON** position to bypass the **reboot relay** (section **3.2.2 Reboot Relay**).
4. Plug the **USB stick** into the **EMS USB port**. Wait a few seconds for the USB stick to be recognised.

Part 2 of 3: Install the .apk software update as follows:

1. **Summary screen:** Tap 'Engineer' > Enter Pin (**default 1234**) > Tap 'Exit Application'.
2. **EMS screen:** Tap the **Menu Icon** (i.e. the circular button with 6 dots; **Figure 27**). The Android Operating System menu will appear, along with the **ASTRO File Manager icon**.
3. Tap the **ASTRO File Manager icon** (**Figure 23**). The ASTRO File Manager screen will appear, and the USB disk will be opened automatically.
4. Tap the **.apk software update icon** to install (**Figure 27**).
5. A **'Complete action using' dialog box** will appear. Tap 'Package Installer' and then 'Just Once' (**Figure 27**).
6. A **confirmation dialog box** will appear. Tap **'Install'** to confirm and begin installation (**Figure 27**).
7. After a while, the confirmation dialog box will state that the .apk software update has been successfully installed (**Figure 27**).
8. If the confirmation dialog box does not close automatically, tap **'Done'** to close it (**Figure 27**). The EMS will return to the **ASTRO File Manager screen**.

Part 3 of 3: Finalise the .apk software update as follows:

1. **ASTRO File Manager screen:** Tap the **three dots** in the **top bar** located in the **right-hand corner**. A drop-down menu will appear (**Figure 27**).
2. Tap **Exit** in the drop-down menu to leave the ASTRO File Manager and return to the **Android menu**.
3. Tap the **EMS icon** to load the new .apk software update.
4. The procedure for loading new software onto the EMS Main Panel is now complete. Ensure **switch SW1** is set to the **OFF** position (see **3.2.2 Reboot Relay**). Remove the USB stick from the EMS USB Port.

5 Operation

Ensure you have read section **1 Safety Information** before operating this product.

5.1 Master Panel LCD Touch Screen

There are minor differences between displays of the EMS-5X, 10X and OS. In addition to model numbers (e.g. **Figure 28** and **Figure 29**), the EMS-OS will also display additional information regarding the status of connected Outstations (i.e. number configured and online).

The EMS is controlled using a **Touch Screen Computer** on the front of the **Master Panel**. The EMS will automatically turn on when power is supplied (i.e. via a mains connection) and display the **Aqualeak logo**. The unit will then boot and display the following screens display in order:

- **1. Boot screen:** includes software version and configuration status (**Figure 28**).
- **2. Summary screen:** includes system status and log-in (**Figure 29** and **Figure 30**).

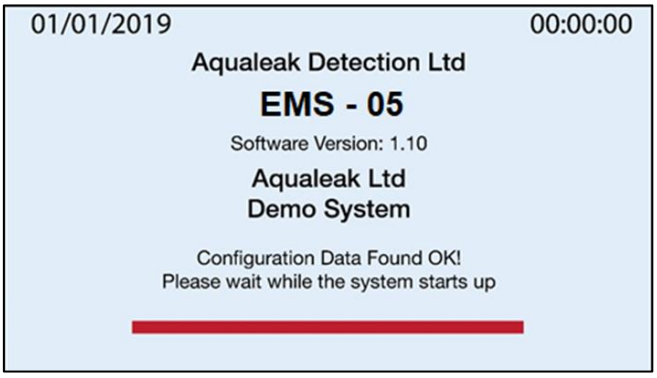


Figure 28: EMS-5X Boot Screen (Loading .xml Configuration)

5.1.1 Summary Screen

Users may **log in**, view the status of connected Outstations, and view and act on **alarms** at the **Summary screen**. An alarm will also change the display:

System Healthy icon in bottom-left corner. See **5.2 User Menu** and **5.3 Engineers Menu.**

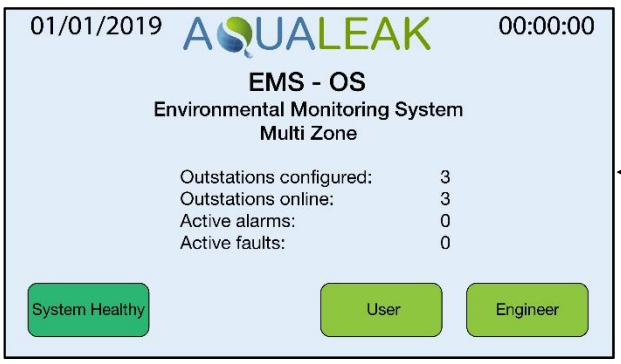


Figure 29: Healthy EMS-OS Summary Screen

Active Alarms and **Mute** buttons in bottom-left corner. See **5.2.4 Alarm Log** and **5.4 Alarms.**

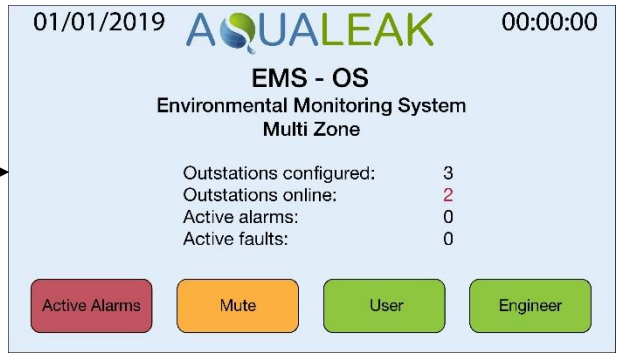


Figure 30: Active Alarm EMS-OS Summary Screen

5.2 User Menu

The **User Menu** allows standard users to:

- Set the **Date and Time**
- Set the **LCD backlight**
- Examine **Live Zone** readings
- Examine the **Alarm Log**

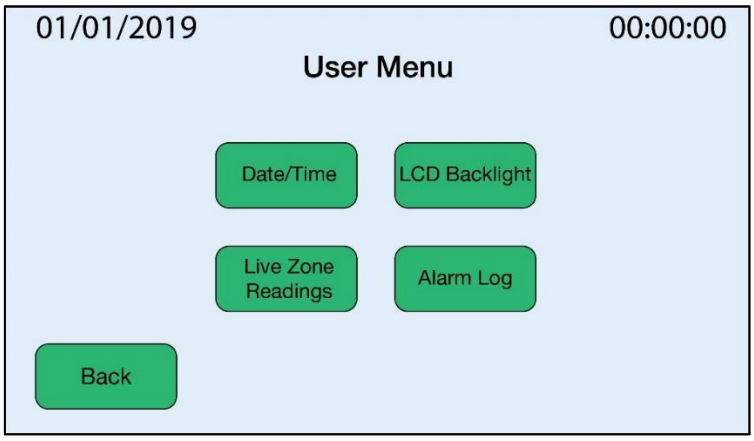


Figure 31: EMS User Menu

Access the User Menu as follows:

1. **Summary screen:** Tap the green **'User'** button. A **numeric keypad** will display.
2. Enter the **User PIN Number** (default: **0000**; see **section 4.2.3** to configure PIN Numbers to any 4-digit code).
3. The **User Menu** will display (**Figure 31**).

5.2.1 Date / Time

The EMS-05 will automatically change the time according to **British Summer Time (BST)**.

Set the date and time as follows:

1. Open the **User menu** (see **5.2 User Menu**).
2. Tap the **'Date/Time'** button. The **Set Time and Date** screen will display.
3. Tap the relevant **+** (increment) or **-** (decrement) buttons adjacent to the **Date / Time displays** to change their settings.
4. Tap the **'Save'** button to set the new Date / Time.
5. Tap the **'Back'** button to return to the **User Menu**.

5.2.2 LCD Backlight

Set the period of inactivity to **0** seconds to disable automatic screen dimming.

The screen Backlight Control is used to set the period of user inactivity in seconds before the backlight dims. Setting the screen to dim after a set time will extend the life of the screen backlight.

Set the Backlight Control as follows:

1. Open the **User menu** (see **5.2 User Menu**).
2. Tap the '**LCD Backlight**' button. The **Backlight Control** screen will display.
3. Tap the relevant **+** (increment) or **-** (decrement) buttons to set the period of inactivity.
4. Once set, tap the '**Back**' button to return to the **User Menu**.

5.2.3 Live Zone Readings

Live Zone Readings are useful when investigating faults or water leak conditions.

The **Live Zone Readings** screen is used to view the status of all monitored zones:

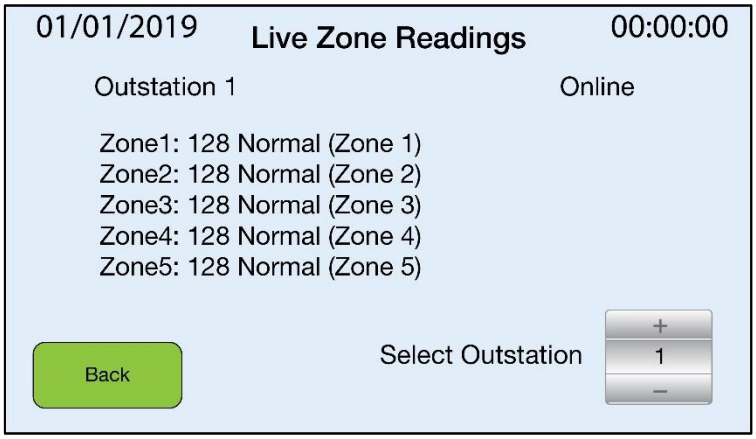


Figure 32: EMS Live zone readings

Access Live Zone Readings as follows:

1. Open the **User menu** (see **5.2 User Menu**).
2. Tap the '**Live Zone Readings**' button. The **Live Zone Readings** screen will display.
3. Live Zone Readings are on a scale of **0 (short circuit / leak)** to **255 (open circuit / cable break)**. A normal reading with a dry sensor is around **128**.
4. Where Outstations are connected, tap the relevant **+** (increment) or **-** (decrement) buttons to select the appropriate Outstation.
5. Tap the '**Back**' button to return to the **User Menu**.

5.2.4 Alarm Log

If log entries cannot be displayed on one screen, a scroll bar will be present on the right-hand side to view a limited number of earlier entries.

There is a limit on how many entries can be displayed by the EMS Alarm Log. Where necessary, export the log file to an external **USB memory stick** to view all entries on a **PC** (see below).

An Alarm will occur when a water leak or a cable break is detected. The **Alarm Log** is a historical record of Alarms and responses and actions taken as a result of those Alarms.

View the Alarm Log as follows:

1. Open the **User menu** (see **5.2 User Menu**).
2. Tap the '**Alarm Log**' button. The **Alarm Log** screen will display.
3. Tap the '**Back**' button to return to the **User Menu**.

To prevent the file becoming too large, the Alarm Log should be periodically copied to a USB memory stick for user records. When this process has completed, the current log file is cleared.

Export the Alarm Log to a USB stick as follows:

1. Ensure the EMS is powered ON and at the **Summary screen**. Open the **front of the Main Panel** to access the **USB Port** located at the rear of LCD display (see **4.1 USB Port**).
2. Plug a **USB memory stick** into the **EMS USB port**. Wait a few seconds for the USB stick to be recognised.
3. Tap the '**Alarm Log**' button. The **Alarm Log** screen will display.
4. Tap the '**Copy Log to USB**' button (bottom-right corner).
5. Once the Alarm Log has been copied, tap the '**Back**' button to return to the **User Menu**.
6. Remove the USB memory stick. Plug it into a **PC USB port** to view the **exported Alarm Log**.

5.3 Engineers Menu

The **Engineers Menu** is only used during installation (see **3 Installation**), configuration (see **0** Configuration), and failure diagnosis (see **5.3.1 Live Communications**).

As installation and configuration are discussed earlier, only the **Live Comms** and **Relay Maintenance** options are discussed in this section.

The **Engineers Menu** has all functions available to a standard **User** (see **5.2 User Menu**), plus the following:

- Live Communications (Comms)
- Relay Maintenance
- Load Configuration from USB
- Export Configuration to USB
- Exit Application (i.e. to update software; see **4.3 Operating System Updates**)

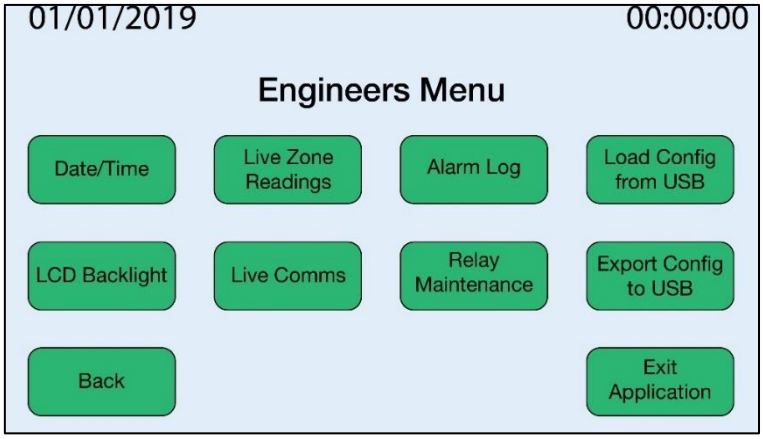


Figure 33: EMS Engineers Screen with Additional Options

Access the Engineers Menu as follows:

1. **Summary screen:** Tap the green '**Engineer**' button. A **numeric keypad** for the engineer PIN will display.
2. Enter the **Engineer PIN** (default: **1234**; see **section 4.2.3** to configure PIN Numbers to any 4-digit code).
3. The Engineers Menu will display (**Figure 33**).

5.3.1 Live Communications

The **Live Comms** (i.e. live communications) screen is useful for failure diagnosis:

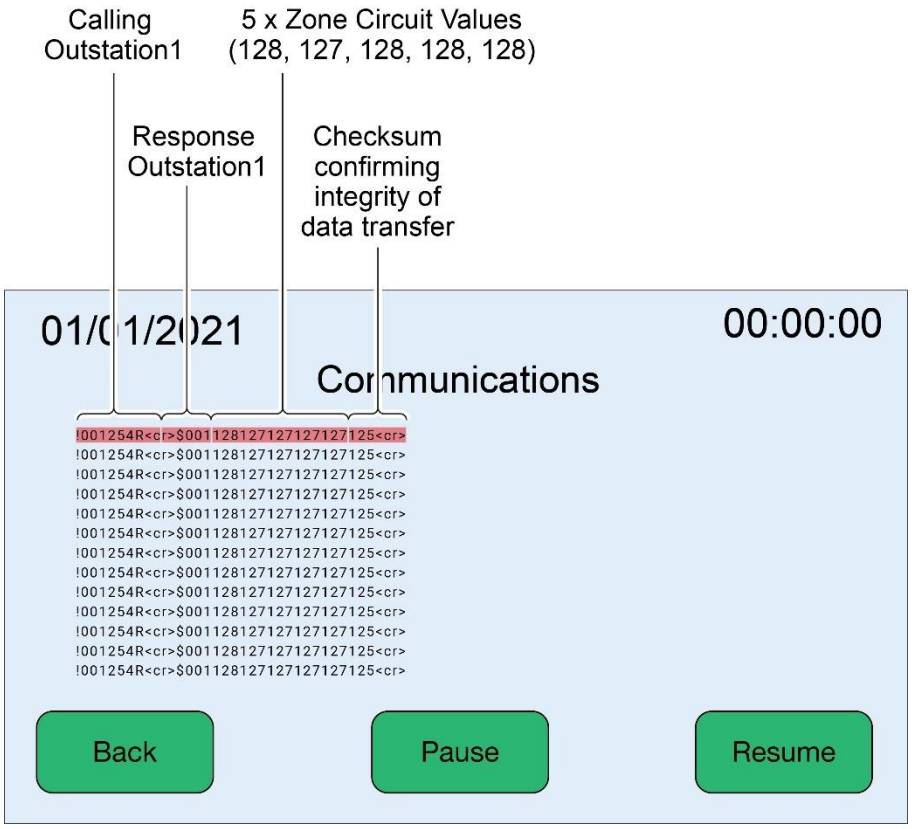


Figure 34: Live Comms Screen

Access the Live Comms screen as follows:

1. Open the **Engineers Menu** (i.e. if on a different screen).
2. Tap the **Live Comms** button (**Figure 33**). The live communications screen will display (**Figure 34**).

5.3.2 Relay Maintenance

Relay 15 (watchdog) cannot be selected.

The **Relay Maintenance screen** (**Figure 35**) is used to test the operation of the output relays for the Master Panel and its ancillary devices by latching and unlatching them:

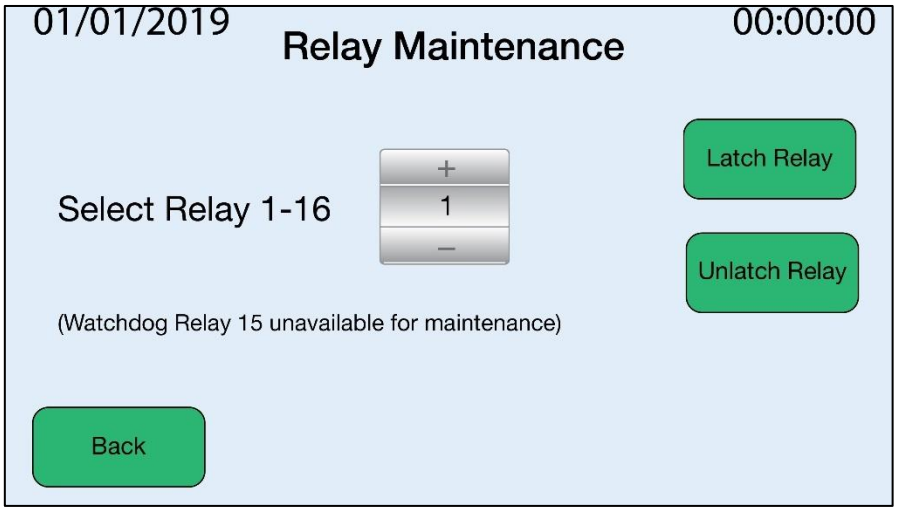


Figure 35: EMS Relay Maintenance Screen

Test the operation of output relays as follows:

1. Open the **Engineers Menu** (i.e. if on a different screen).
2. Tap the '**Relay Maintenance**' button (**Figure 33**). The Relay Maintenance screen will display (**Figure 35**).
3. Tap the relevant **+** (increment) or **–** (decrement) buttons to select a relay to test (1-14 and 16).
4. Tap the '**Latch Relay**' and '**Unlatch Relay**' buttons to test the relay.
5. Once complete, tap the '**Back**' button to return to the **Engineers Menu**.

5.4 Alarms

If a leak, Cable break, or system fault is detected, the **Summary screen** will display the number of faults and/or alarms, as well as a red flashing **Active Alarms** button and an amber **Mute** button:

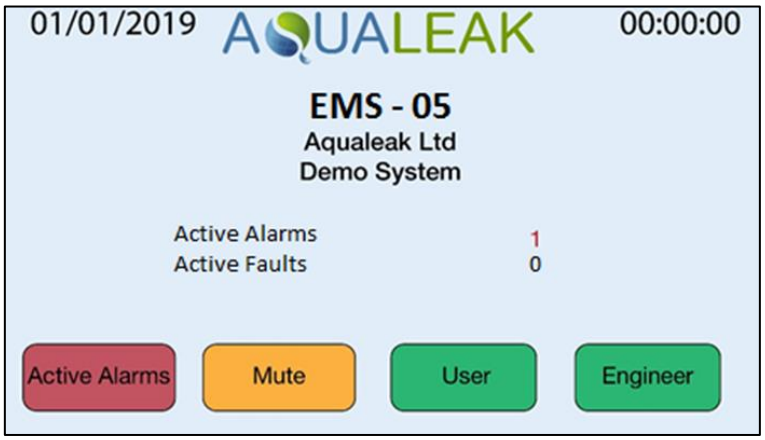


Figure 36: EMS Summary Screen with Alarm Activated

5.4.1 Active Alarms

Active Alarms are displayed on the **Alarms** screen (**Figure 37**), where the user may:

- **Acknowledge** individual alarms
- **Acknowledge all** alarms (engineer only)
- **Refresh** the alarm list
- **Reset** relays

In **Figure 37** (below), water has been detected in zones 1 and 2 (Interface Board) and the zone relays are activated (i.e. **latched**):

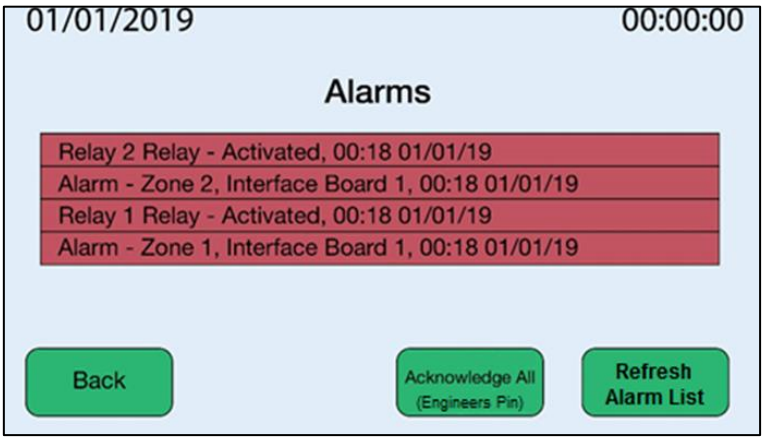


Figure 37: EMS Alarms Screen with Active Alarms Listed

List Active Alarms as follows:

1. Open the **Summary screen** (i.e. if on a different screen).
2. Tap the red '**Active Alarms**' button (**Figure 36**). The **Alarms** screen will display (**Figure 37**).

A. Acknowledge Alarms

- **Engineers** may acknowledge all alarms at the same time.
- **Users** must acknowledge each alarm individually.

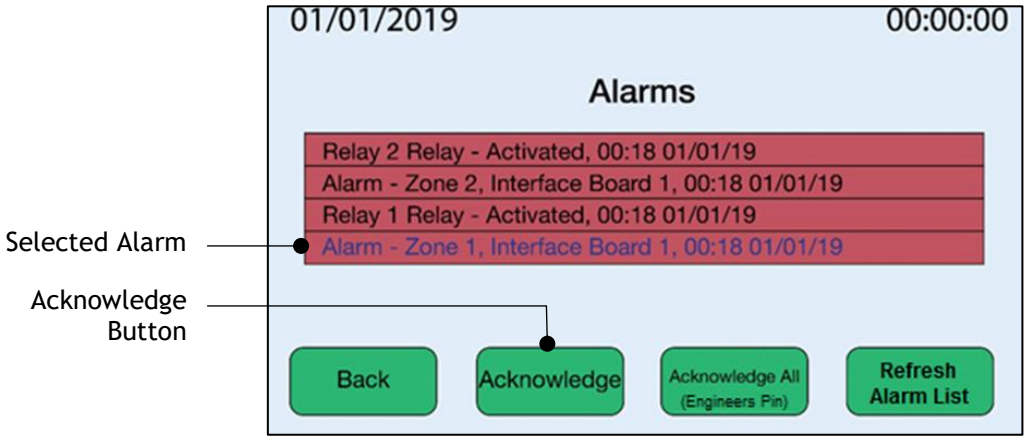


Figure 38: EMS Alarms Screen with Selected Alarm and Acknowledge Button

Acknowledge all alarms at once as an engineer as follows:

1. Open the **Alarms screen** (i.e. if on a different screen).
2. Tap the '**Acknowledge All (Engineers Pin)**' button. A **numeric keypad** for the engineer PIN will display (**Figure 38**).
3. Enter an **engineer PIN** (default: **1234**; see **4.2.3 User PIN Types and Numbers** to configure PIN Numbers to any 4-digit code).
4. All Alarms will be acknowledged and turn to green on the list.
5. Tap the '**Refresh Alarm List**' button to clear all acknowledged alarms on the list.
6. Once complete, tap the '**Back**' button to return to the **Summary screen**.

Acknowledge individual alarms as a user as follows:

1. Open the **Alarms** screen (i.e. if on a different screen).
2. Tap an **Alarm listed** to acknowledge it. Its **text colour** will change from black to **blue**. A green '**Acknowledge**' button will also appear (bottom centre-left; **Figure 38**).
3. Tap the '**Acknowledge**' button. A **numeric keypad** for the user PIN will display.
4. Enter a **user PIN Number** (default: **0000**; see **4.2.3 User PIN Types and Numbers** to configure PIN Numbers to any 4-digit code).
5. The selected Alarm will be acknowledged and turn green on the list. The '**Acknowledge**' button will also disappear.
6. Tap the '**Refresh Alarm List**' button to clear the acknowledged Alarm form the list.
7. Once complete, tap the '**Back**' button to return to the **Summary screen.**

B. Reset Output Relay

Relays 1-5 are programmed to **latch** (i.e. activate) when their associated **zones** develop an alarm condition (e.g. Zone 1 latches Relay 1, Zone 2 latches Relay 2, etc.). Relays must be reset individually. There is a **log** of all alarm activity (see **5.2.4 Alarm Log**).

After an Alarm has been **acknowledged** (see subsection **A Acknowledge Alarms**) and its associated **sensor** has been dried, the output **relay** must be **unlatched** (i.e. reset).

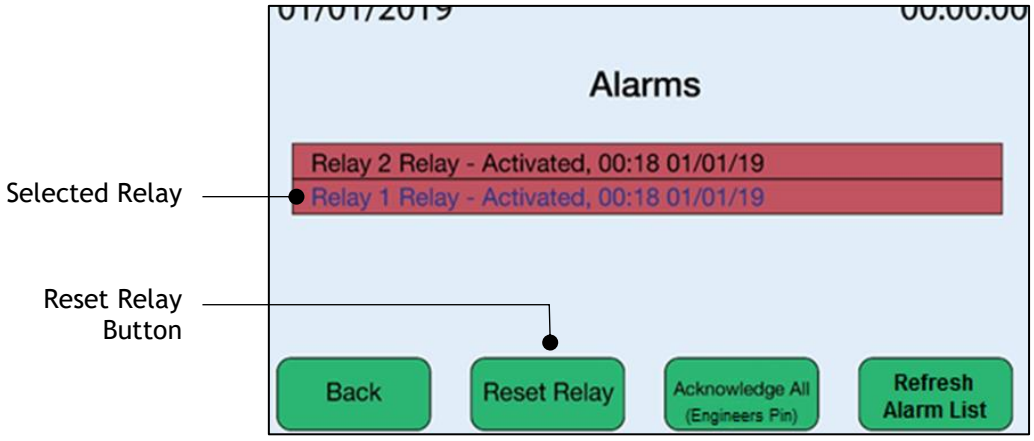


Figure 39: EMS Alarms Screen with Selected Relay and Reset Relay Button

Unlatch an output relay as follows:

1. Open the **Alarms** screen (i.e. if on a different screen).
2. Tap a **relay** listed with a red background to reset. The text colour will change from **black** to **blue**. A green **'Rest Relay'** button will also appear (bottom centre-left; **Figure 39**). A **numeric keypad** for the user PIN will display.
3. Enter a **user PIN** (default: **0000**; see **4.2.3 User PIN Types and Numbers** to configure PIN Numbers to any 4-digit code).
4. The selected **relay** will be reset and turn green on the list. The **'Reset Relay'** button will also disappear.
5. Tap the **'Refresh Alarm List'** button to clear the reset relay.

5.4.2 Mute Alarms

The Mute button will not silence **external sounders** wired through the system relays. This can only be done by **acknowledging the alarm** (see subsection **5.4.1A Acknowledge Alarms**).

Mute the Master Panel's internal buzzer as follows:

1. Open the **Summary screen** (i.e. if on a different screen).
2. Tap the amber **'Mute'** button (**Figure 36**).
3. Once complete, tap the **'Back'** button to return to the **Summary screen**.

6 Maintenance

Ensure you have read the Safety Information in **Section 1** before undertaking maintenance.

6.1 Cleaning

✓ Clean the outside of the EMS-05. Use a dry, clean cloth.

✗ **DO NOT** use abrasive agents or solvents to clean the equipment.

6.2 Relays

The **Relay Maintenance** screen (**section 5.3.2**) is used to test the operation of the output relays for the Master Panel and its ancillary devices by latching and unlatching (i.e. activating and deactivating) them.

6.3 Troubleshooting

The table below lists the most common problems and their solutions. If a problem cannot be solved then please call support on **+44 (0)1249 715698** or visit our website at www.aqualeak.com.

Problem	Possible Cause	Possible Solution
System does not power on	**Power cable** is incorrectly connected to the Master Panel.	Check the power cable. Review **3.1.2 Power Connection.**
	Switched fused spur is faulty or inactive.	Check fuses and power on the switched fuse spur. Review **3.1.2 Power Connection.**
Sensor data is intermittent or inactive	Sensors not connected properly.	Check Leader Cable and connections. Review **3.2.3 Sensor Connections.**
	Sensors not configured properly.	Review **4.2 XML Configuration File.**
Leak detected but no leak present	Sensor cable is touching something conductive.	Check Leader Cable and connections. Review **3.2.3 Sensor Connections.**
	Sensor cable is over 100 metres in length.	
	Sensor cable had debris on it.	Clean sensor cable.
Ethernet network connection is intermittent or inactive	Network has not been configured properly (e.g. DHCP not enabled).	Ensure DHCP and Modbus are not both enabled. Review **4.2.4 Network Settings.**
Serial Link network connection is intermittent or inactive	Network has not been configured properly (e.g. Modbus not enabled).	Ensure DHCP and Modbus are not both enabled. Review **4.2.5 Modbus Settings.**
Email Alerts are intermittent or inactive	Email Alerts have not been configured properly.	Review **4.2.6 Email Settings.**

***Table 15:** Troubleshooting*

7 Warranty

The Aqualeak Environmental Monitoring System (EMS-05) Water Leak Detector has a **1-year back-to-base warranty** as standard, and a **5-year warranty where installed and annually maintained by Aqualeak**.

The warranty is applicable from the original purchase date and includes repair or replacement if the product is defective. The following exclusions apply:

- ✕ If the system is purchased second hand. Only new products are covered.
- ✕ Persons not named as the original purchasers on the order information.
- ✕ Physical damage to the unit due to abuse, accident, neglect, or misuse. This includes:
  - Damage caused by water or other liquids.
  - Damage caused by connection to incompatible power sources.
  - Damage caused by connection to incompatible devices not manufactured by Aqualeak.
  - Damage caused by improper installation (i.e. not following the instructions provided).
  - Normal wear and tear.
  - Unauthorised attempts to repair, modify, or disassemble the item by unqualified persons.

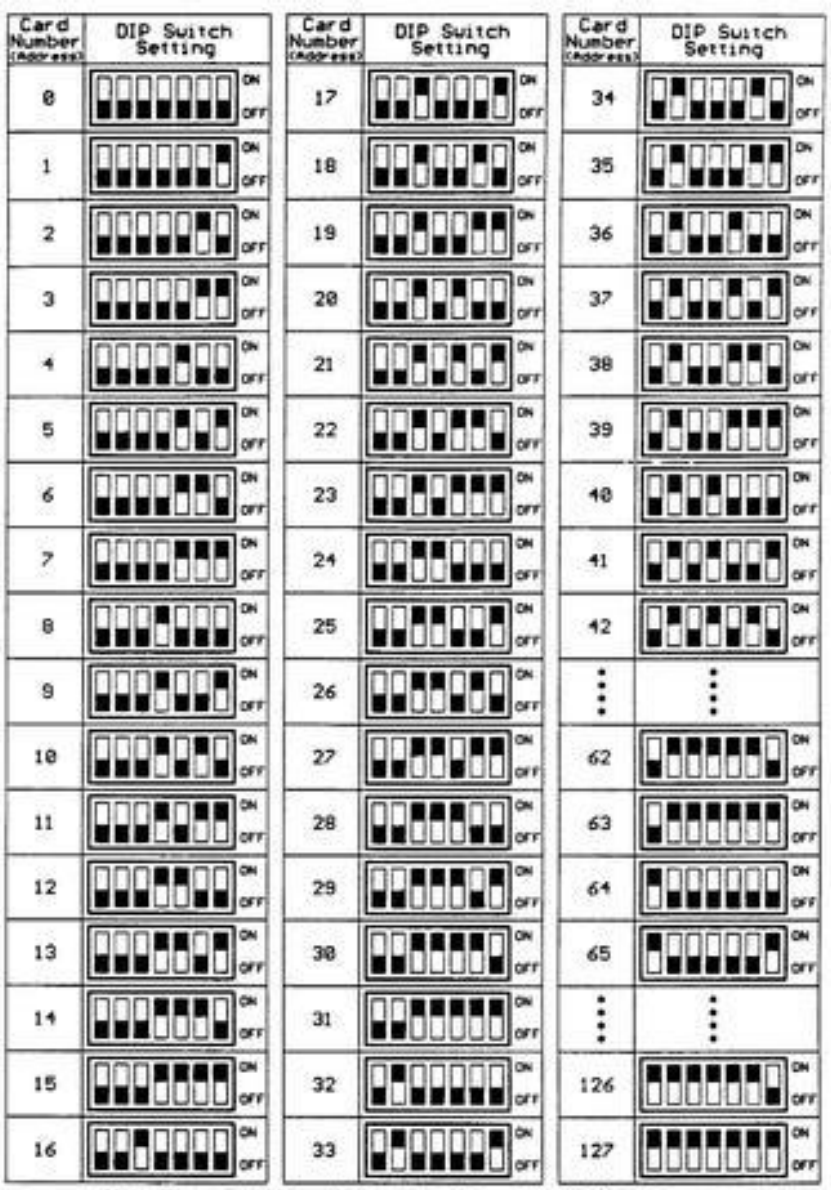
For further information on the warranty and returns procedure, contact us on **+44 (0)1249 715698** or visit our website at www.aqualeak.com.

8 Outstation Dip Switch Address Sheet

See section **3.4 Outstations** for further information.

Address each outstation using the DIP switches on the PCB (). The master panel will have either 1 or 2 interface boards, which will occupy either address 1, or addresses 1 and 2.

Outstations should be addressed sequentially, so the first outstation will be either address 2, or address 3, depending on the variant of master panel.



Note: There are 128 possible nodes addresses (0 – 127) and only 64 possible I/O card addresses (0 – 63)

AQUALEAK

Do not dispose with household waste!

According the European Guideline 2002/96/EC for Waste Electrical and Electronic Equipment and its implementation into national right, measuring tools that are no longer usable must be collected separately and disposed of in an environmentally correct manner.