FIREvac VOICE ALARM CONTROL PANEL
INSTALLATION & MAINTENANCE MANUAL

FIREvac

HOCHIKI

This manual details the operation of:

FIREvac Voice Alarm Control Panel

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Contents

1 Important Notes

This equipment must be installed and maintained by a suitably skilled and technically competent person.

This equipment is a piece of Class 1 equipment and MUST BE EARTHED.

This equipment operates with hazardous voltages present inside its enclosure. DO NOT leave the enclosure door open during normal operation

ALWAYS make sure the end of line devices (supplied) are fitted after the last loudspeaker. If they are not, calibration may succeed but loudspeaker circuit faults will not be detected.

ALWAYS measure the speaker circuit loads using a Loadmaster or LCR meter before calibration. The maximum load for each circuit is 60 watts, which is equivalent to a minimum impedance of 167 ohms. **DO NOT** use a multimeter as the results will be meaningless.

The most common installation problem on voice alarm systems is loudspeakers being tapped at too high a wattage and overloading the amplifier which causes clipping of the monitoring tone signal.

1.1 Items Supplied

This product is supplied with an installation and maintenance manual, a user manual, an Allen key (for unfastening/securing the lid) and an electrical accessory pack containing a red battery lead, a black battery lead, a battery link lead, two loudspeaker end of line modules, a 6K8 0.25 W resistor, a spare primary mains fuse, a spare battery fuse and a selection of spare jumper links.

A FIREvac master/slave record sheet (AP101) is also provided in the FIREvac's accessory pack. We strongly recommend the relevant side of this sheet (master or slave) is completed by the engineer for future reference. Should you experience any technical problems with FIREvac our technical department will require information from this sheet in order to assist you.

1.2 System Design

Voice alarm system design is beyond the scope of this document. A basic understanding of general voice alarm system components and their use is assumed.

We strongly recommend that a suitably qualified and competent person is consulted in connection with the design of the voice alarm system and that the system is commissioned and serviced in accordance with the project specification and national standards. The client/fire officer concerned with the property should be contacted at an early stage in case he or she has any special requirements.

We recommend you read BS 5839 Part 8 (1998) : The code of practice for the design, installation & servicing of voice alarm systems and BS EN 60849 (1998): Sound systems for emergency purposes (or any subsequent revisions) both of which are available at your local reference library or or can be purchased from the British Standards Institute, Customer Services Dept., 389 Chiswick High Road, London, W4 4AL.

Tel: +44 (0)20 8996 9001. Web: www.bsi-global.com.

1.3 Equipment Guarantee

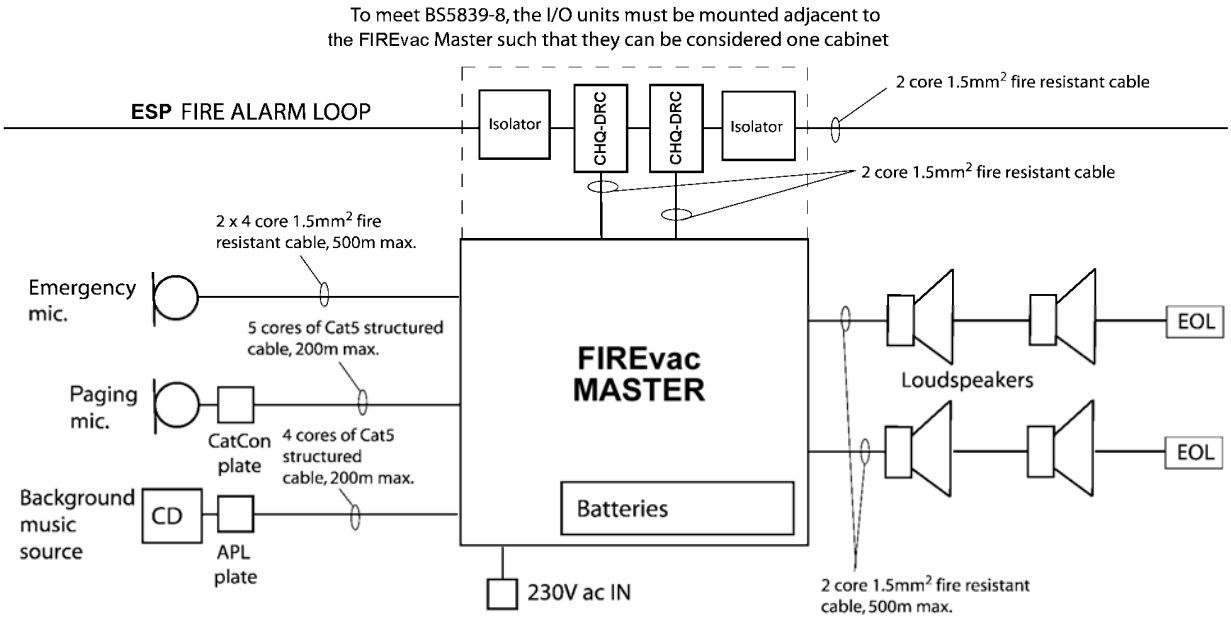
This equipment is not guaranteed unless the complete system is installed and commissioned in accordance with national standards by an approved and competent person or organisation.

This product has been manufactured in conformance with the requirements of all applicable EU Council Directives.

2 Short Form Wiring Instructions

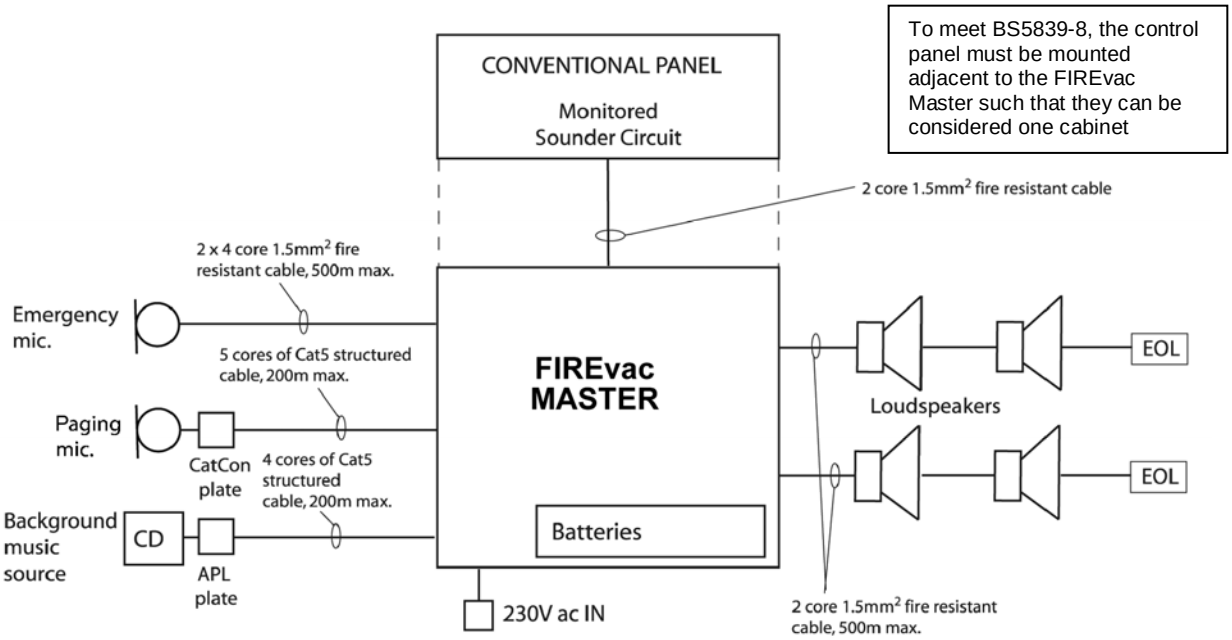
2.1 FIREvac Connected to an ESP Analogue Fire Alarm Loop

Numbers on the diagram below refer to the pages you should read for further information.



For FIREvac Slave Panel wiring refer to section "Slave FIREvac Connection" on page 28.

2.2 FIREvac Connected to a Conventional Fire Alarm Panel



For FIREvac Slave Panel wiring refer to section "Slave FIREvac Connection" on page 28.

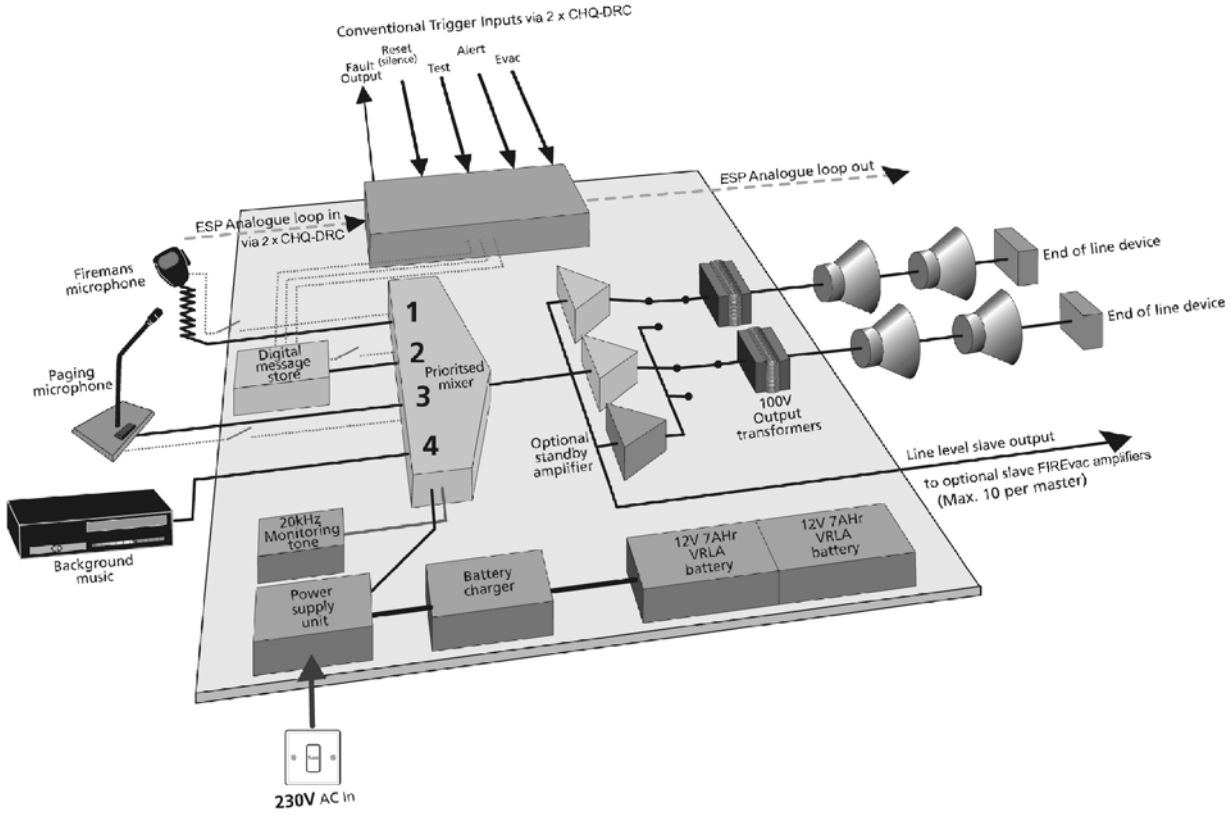
3 Overview of the FIREvac System

3.1 Introduction

FIREvac is a low-cost, high-quality modular voice alarm system specially designed to simplify the provision of a fully BS 5839 part 8 (1998) compliant voice alarm system. In one compact wall-mountable enclosure, FIREvac comprises:

- A conventional fire alarm interface which can be connected to the ESP loop using a CHQ Module such as the CHQ-DRC Dual Relay Controller).
- A high-quality digital message store containing programmable Evacuate, Alert and Test messages.
- A prioritised mixer.
- Three balanced line level inputs for the (optional) connection of an emergency microphone, paging/public address equipment and a background music source.
- Two x 60 watt Class D amplifiers (plus an optional standby amplifier), each of which will accommodate up to 60 watts of loudspeaker load.
- An EN54-4 compliant switch-mode power supply and battery charger.
- Space for 2 x 7 AHr VRLA batteries typically providing at least 24 hours standby and 30 minutes alarm running time.
- A slave line level output allowing the connection of up to 10 slave FIREvacs. (Slave FIREvacs are typically used to extend loudspeaker coverage in areas such as warehouses. They also allow greater flexibility in the segregation of public address paging and background music distribution as they have their own paging and background music inputs).

The fact that multiple FIREvacs (and slaves) can be connected to one host fire detection system makes the FIREvac voice alarm system ideal not just for simple one zone installations but for virtually all small to medium sized applications, including phased evacuation projects, in areas such as hotels, leisure centres and licensed premises.



An overview of a FIREvac Master

3.2 Operation

When a message trigger is received by the FIREvac (via its analogue or conventional fire alarm interface), it responds by playing an appropriate message from its digital message store. This message is amplified and broadcast around the site via the system's loudspeakers.

If the fireman's microphone, a paging microphone, background music source and/or additional message triggers are active at the same time, the FIREvac's prioritised mixer ensures only the most urgent audio signal is broadcast, as indicated on the chart below:

Priority	Description
1	**Emergency/Fireman's microphone**
2	**Evacuate, Alert or Test message (Evacuate overrides Alert, Alert overrides Test)**
3	**Paging / public address microphone**
4	**Background music**

3.3 The Fire Alarm Interface

A fire detection system can be connected to FIREvac via three polarized, opto-isolated trigger inputs - Evacuate (M1), Alert (M2) and Test (M3). These inputs are designed to control the FIREvac's digital message store and will activate when 24 V d.c. is applied to them (if an external voltage is not available, a local 24 V d.c. output is provided for switching into the inputs under the control of the fire

detection system). All inputs are prioritised according to the messages they trigger and can be set for latching or non-latching operation via an internal link.

When set to latch (required by BS 5839-8), once triggered messages will play continuously until a higher priority message/input is asserted or the FIREvac's reset input (RES) is activated. When set for non-latching operation, messages will stop when the input stimulus is removed (please check with the approving authority that this is permissible prior to installation). This facility is provided to allow fire detection systems without a silence output.

NOTE: FIREvac cannot interpret a pulsing sounder input as Alert - all trigger inputs must be continuous.

The FIREvac can be connected directly to the Hochiki ESP loop via dual relay controllers such as the CHQ-DRC (or CHQ-R). When connected in this way the FIREvac's EVACUATE, ALERT and TEST messages are selected by the relays activating the M1, M2 and M3 triggers.

The FIREvac can also be reset from the main fire alarm control panel via the CHQ-DRC (or CHQ-R) activating the RES trigger. The relays will need to be configured via the control panel software to ensure they operate as required. Refer to “The Conventional Interface” on page 22 for correct connections.

3.4 Monitoring

In order to comply with British and European life safety standards, FIREvac's loudspeaker lines, PSU, batteries, emergency microphone and digital message store are all monitored for short circuits, open circuits, earth faults, discharge, disconnection and data corruption as appropriate.

Non-critical inputs such as public address paging and background music are not monitored and, in the event of mains failure, are automatically cut off to conserve battery life. This contributes to the FIREvac's extremely efficient standby time - typically 24 hours (plus 30 minutes running) using 2 x 7 A Hr VRLA batteries.

Provided the system is wired as detailed in this manual, a fault condition will be reported as a sounder fault on the fire detection system to which it is connected, with more detailed fault indication provided on the front of the FIREvac.

3.5 Digital Message Selection

All digital messages are stored in MP3 format on a monitored, non-volatile memory card that plugs directly onto the Main PCB.

The content of these messages can be adjusted to suit the application using a series of internal links. For example, the Evacuate message can be configured to state that ‘a situation has arisen’ or ‘a fire has been reported’ and to warn people - if appropriate - not to use the building’s lifts.

3.6 Amplifier and Speaker Circuits

FIREvac is supplied with a minimum of two separate 60 watt Class D amplifiers (A and B). These are designed to drive two loudspeaker circuits, each of which will accommodate up to 60 watts of loudspeaker load, through 100 V line transformers, which step up the voltage for distribution around the site.

An end of line device must be connected across the terminals of the last loudspeaker on each circuit and both circuits must be calibrated at commissioning using the calibrate button to ensure correct monitoring.

Some FIREvacs feature an additional ‘hot-swap’ standby amplifier that will switch in if either of the regular amplifiers (A or B) fail, a requirement of some life safety voice alarm specifications.

3.7 Multiple FIREvacs and Slave Amplifiers

There is no limit to the number of master FIREvacs that can be used per system. Please note however that the FIREvac-EM emergency microphone can be daisy-chained to a maximum of 10 masters only.

To increase audio coverage in areas such as warehouses, etc., up to 10 slave FIREvacs can be connected to one master.

Slaves repeat all emergency microphone and digital message broadcasts that are made at the master to which they are connected. They also feature their own paging and BGM inputs. Therefore, if multiple masters and/or slaves are used, localised paging and background music can be easily implemented.

4 Planning the Wiring

All System wiring should be installed to meet the appropriate parts of BS 5839-8 (1998), BS EN 60849 (1998) and BS 7671 (Wiring Regulations). Other national standards of installation should be adhered to where applicable.

To comply with BS5839-8 we recommend the use of fire-resistant cables for all life safety functions (loudspeaker, fire alarm interface, emergency microphone and master to slave wiring).

Non-life safety functions, such as paging and background music, can be wired using Cat 5 structured cable (always wire Audio + and Audio – in the same twisted pair).

Always give due consideration to voltage drop.

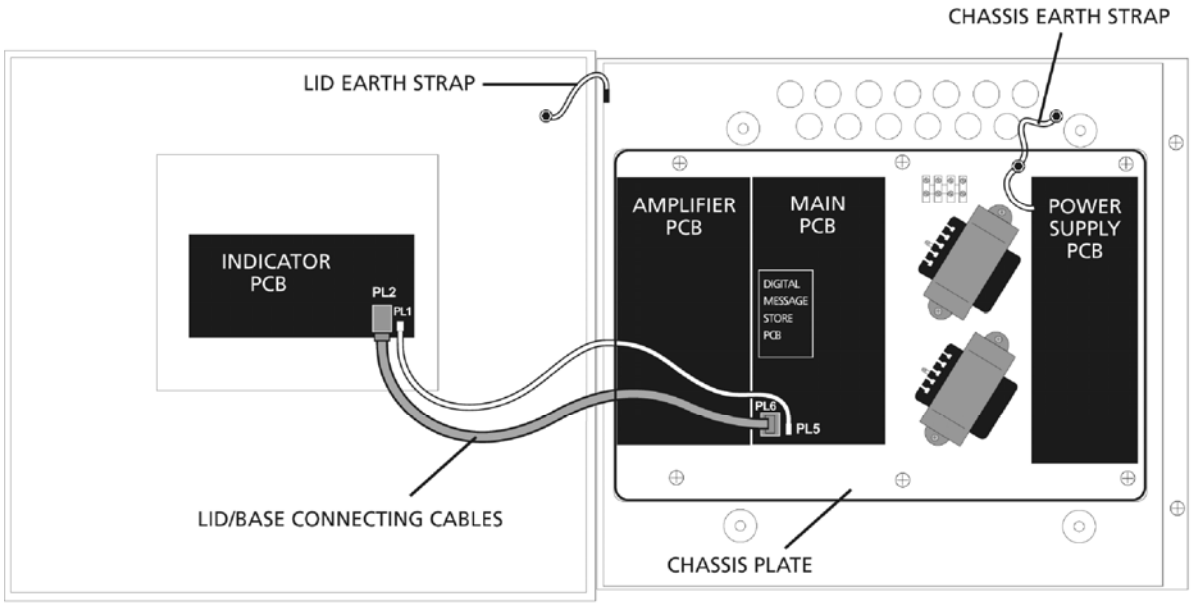
All wiring should come into the enclosure via the knockouts provided and be fixed tidily to the relevant terminals. For an overview of the connections required for the fire alarm interface, loudspeakers, emergency microphone, paging/background music equipment and slave FIREvacs, please refer to the relevant sections later in this manual (see Contents).

Note that correct cable glanding is essential and due regard should be paid to any system specifications which demand a certain cable type (providing it meets the appropriate national wiring regulations).

5 Mounting FIREvac

The enclosure can be surface or semi-flush mounted (see “Fixing the Base to the Wall” on page 14). It comprises a hinged metal lid and metal back box containing all of the system’s electronics. To protect the electronics against damage during first fix installation, most of the PCBs are located on a removable chassis plate, as shown below.

The enclosure must be sited internally in an area not subject to conditions likely to affect its performance, e.g. damp, salt-air, water ingress, extremes of temperature, physical abuse, etc. It should be positioned at a height where it is easily accessible and in a prominent position within the building. Ideally, the indicators on the front of the enclosure should be at eye level.



The FIREvac Enclosure

5.1 Removing the Lid and Chassis Plate

To expose all of the base mounting holes, the lid and chassis plate should be removed from the enclosure prior to first fix installation.

	**Anti-static handling guidelines**: Prior to handling any of the FIREvac's internal components, operators should rid themselves of any personal electro-static charge by momentarily touching any sound connection to safety earth, e.g. a radiator.

5.1.1 To remove the lid:

- Undo the two screws on the right hand side of the FIREvac using the Allen key provided.
- Hinge the lid 180° to the left and remove the lid earth strap from the base earth connection (take care not to over bend the hinges).
- Disconnect the lid/base connecting cables (PL6 and PL5) from the Main PCB. Take care to depress the telecoms-style locking tab on the PL6 connector to prevent damage.
- Carefully remove the four wing nuts and washers that secure the hinges.

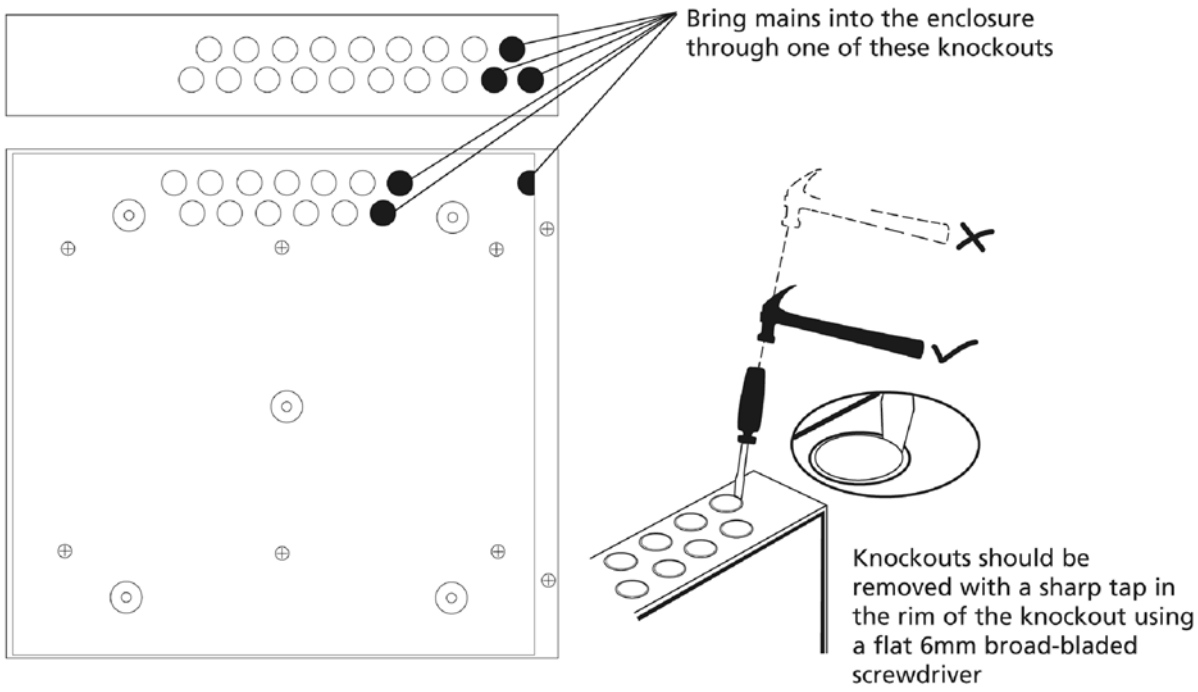
5.1.2 To remove the chassis plate:

- Ensure power has been removed from the FIREvac and that the Power Supply PCB is safe to handle (see section 7 on page 17).
- Pull the chassis earth strap off the spade connector on the base earth point.
- Remove all of the chassis plate's retaining screws with the exception of the two keyhole retaining screws at the top of the chassis plate which should be loosened by about three turns.
- Push the chassis plate up and over the two keyhole retaining screws.

The lid and chassis plate can now be removed from site to prevent accidental damage. They should be stored in a clean, dry place which is free from vibration, dust and excessive heat.

5.2 Planning the Cable Layout in the Enclosure

All low voltage wiring coming into the enclosure should be segregated away from the 100 V loudspeaker lines and incoming mains voltages. Refer to the diagram below for guidance and important information on how to remove the enclosure's knockouts. Always ensure that if a knock-out is removed, the hole is filled with a good quality cable gland. Any unused knockouts must be securely blanked off.



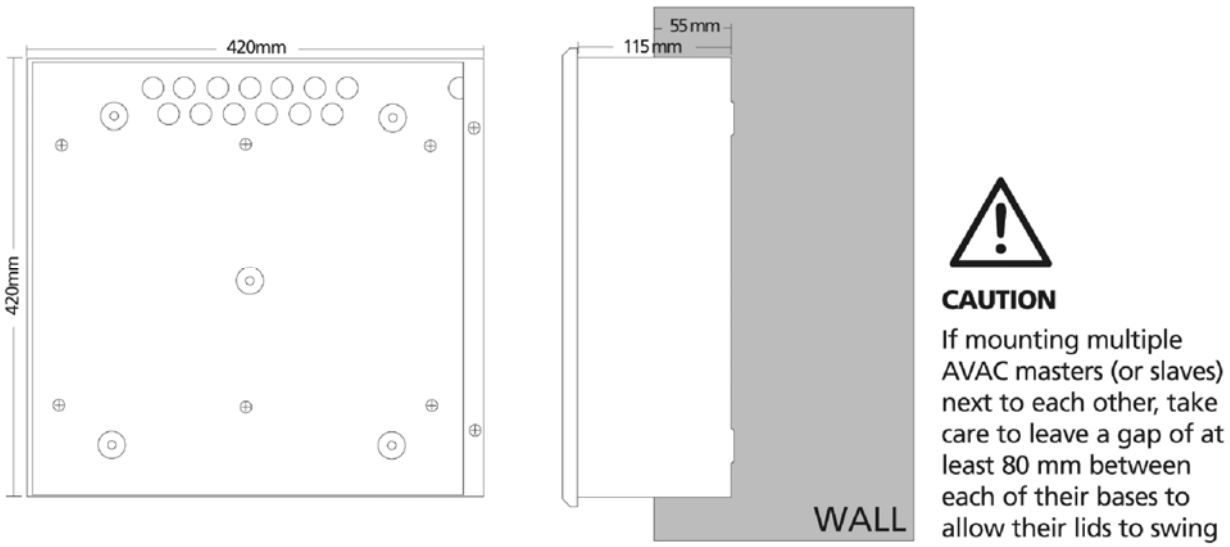
Location of knockouts for cable entry and knockout removal details

5.3 Fixing the Base to the Wall

Using the five mounting holes provided (see diagram below), fix the base securely onto/into the wall. The mounting holes are suitable for use with No.8-10 or 4-5mm countersunk screws.

Assess the condition and construction of the wall and use a suitable screw fixing.

Any dust or swarf created during the fixing process must be kept out of the enclosure and great care must be taken not to damage any wiring or components.



Internal view of the back box with PCBs removed / side view for semi-flush mounting

6 Connecting the Panel

Connect FIREvac's internal wiring immediately prior to commissioning and after you have refitted the lid, chassis mounting plate, lid/base connecting cable and earth straps by reversing the process described in “Removing the Lid and Chassis Plate” on page 13.

Before connecting any wiring to the PCBs, we recommend you check all third-party equipment (loudspeakers, emergency microphone, paging panels, background music sources, etc) to ensure they are correctly fitted and that cable integrity is verified throughout the installation.

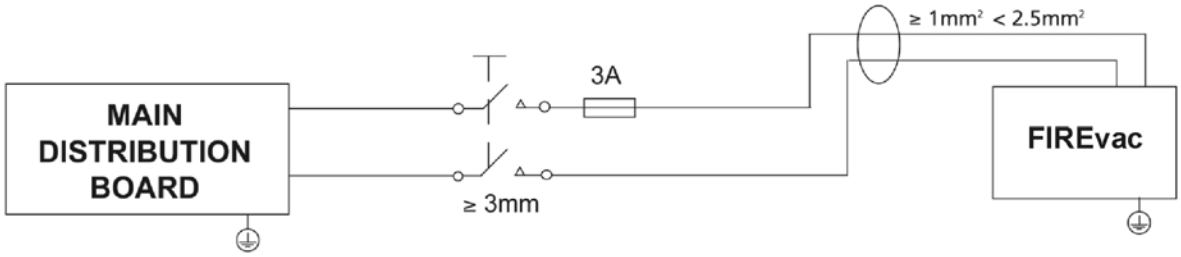
It is essential that the wiring and loudspeakers are tested with an impedance meter to ensure that the total load connected to each of the loudspeaker circuits is not greater than 60 watts (not less than 166 Ohms) at 1 kHz. See section 9.2 "Loudspeaker Circuits" on page 20 for important information on the loading of loudspeaker circuits.

DO NOT use a high voltage insulation tester with any electronic devices connected.

7 Mains Wiring & Connection Details

The general requirement for the mains supply to FIREvac's power supply PCB is fixed wiring, using three core cable (no less than 1mm^2 and no more than 2.5mm^2) or a suitable three conductor system, fed from an isolating switched fused spur, fused at 3A. This should be secure from unauthorised operation and be marked 'FIRE ALARM SYSTEM: DO NOT SWITCH OFF'. The mains supply must be exclusive to the FIREvac unit.

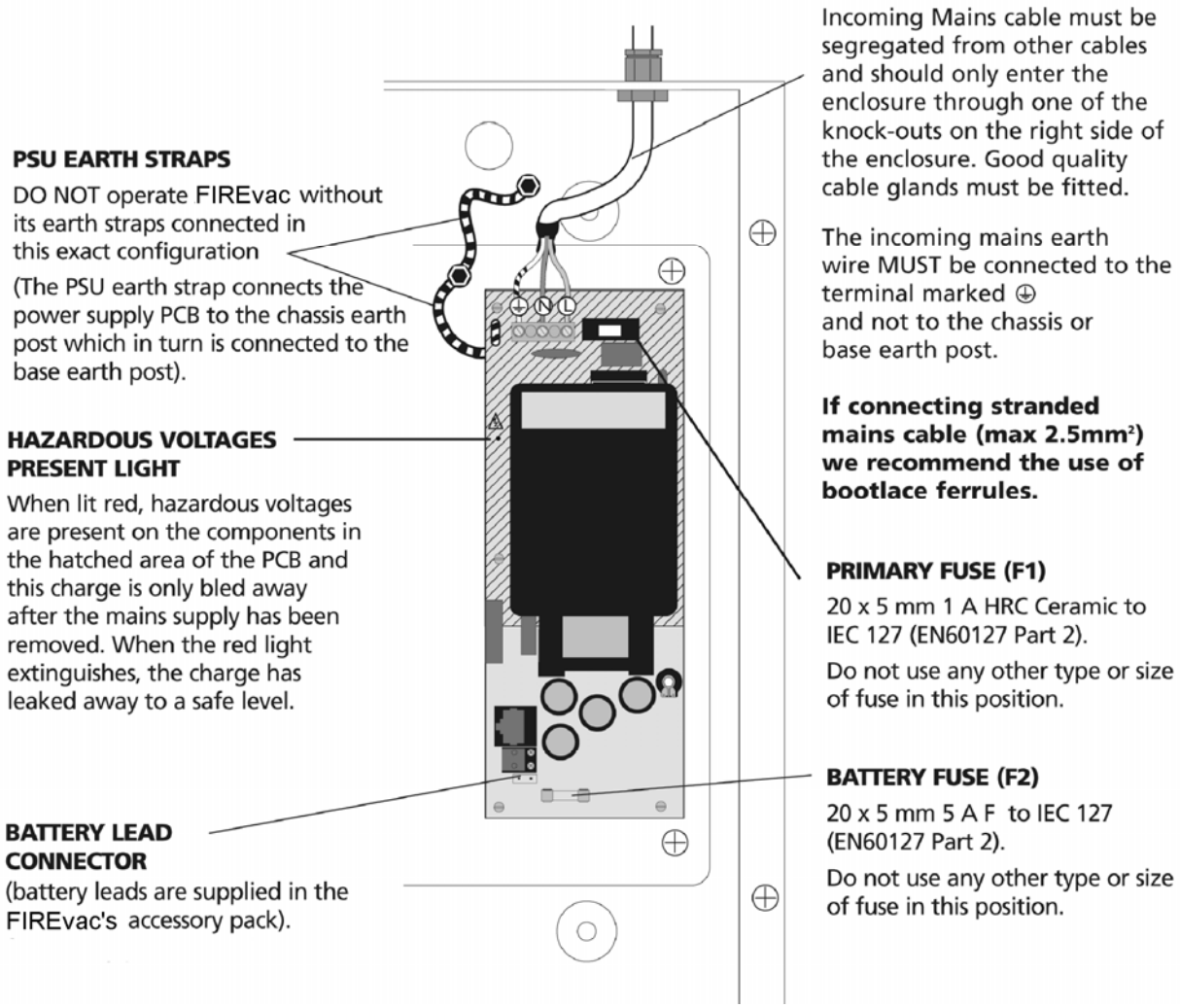
(As an alternative to a switched fused spur, a double pole isolating device may be used (see diagram below) providing it meets the appropriate national wiring regulations).



DO NOT attempt to connect mains to the FIREvac until you are fully conversant with the layout and features of the power supply PCB, as described below.

The power supply PCB combines the functions of a mains to d.c. switched mode power supply unit, battery charging unit and battery monitoring unit.

	**THE POWER SUPPLY PCB STORES VOLTAGES AT UP TO 400 Vd.c. AND MAY BE LETHAL IF TOUCHED. DO NOT TOUCH THE PCB WHILST THE RED 'HAZARDOUS VOLTAGES PRESENT' INDICATOR IS LIT.**



Power Supply PCB

8 Standby Battery Connection

We recommend two new, good quality and fully charged 7 AHr 12 V valve regulated lead acid batteries are used as the FIREvac's emergency stand-by power supply. These will typically provide at least 24 hours standby time and 30 minutes alarm running time.

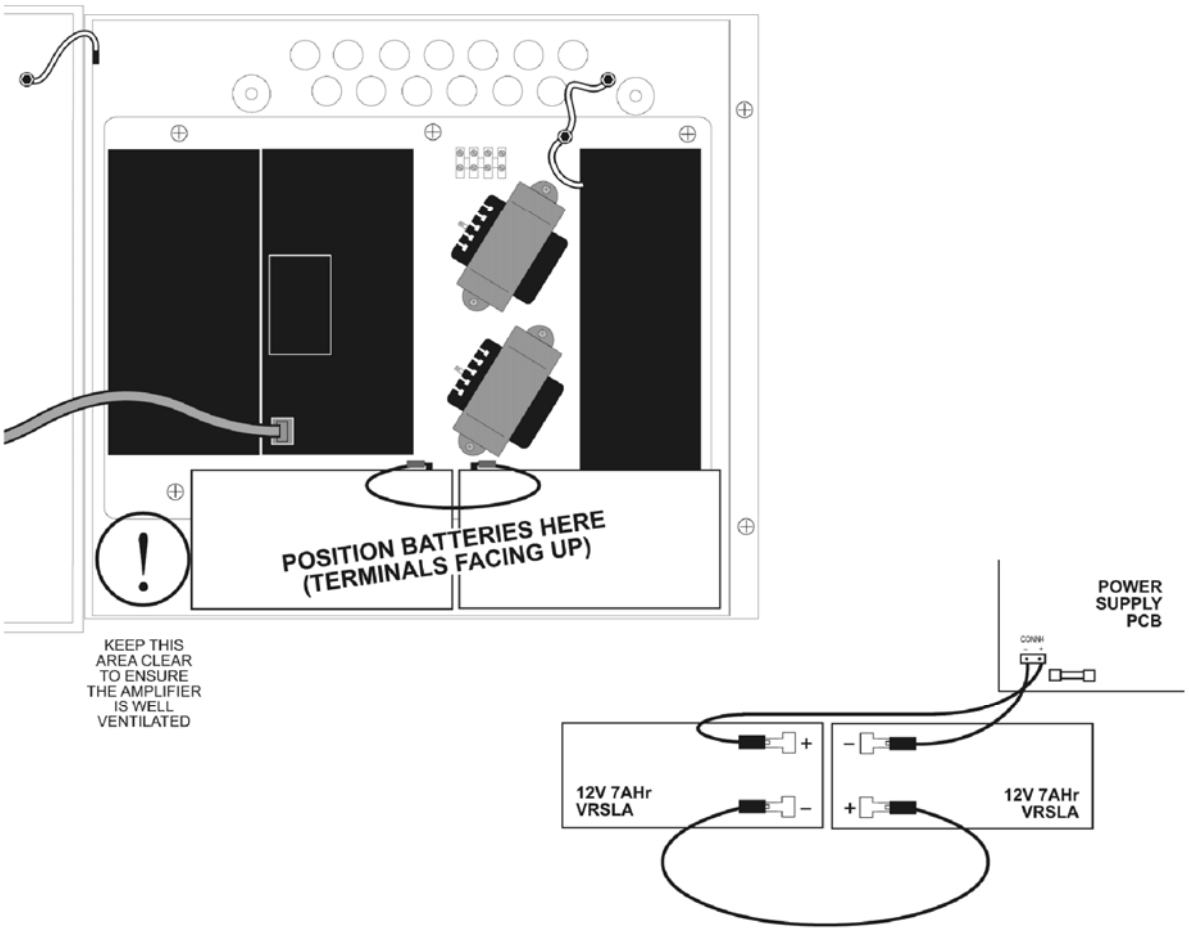
Note that batteries are required at all FIREvac masters and slaves.

Caution: No other type of battery should be used due to risk of explosion and smaller batteries will reduce the standby time of the system considerably.

The batteries should be connected in series and located in the enclosure as shown in the diagram below. The battery leads and link wire are provided in the accessory pack.

A sophisticated battery monitoring unit protects the batteries against deep discharge by activating a cut off circuit when the stand-by supply voltage reaches 21 V approx. If batteries are not fitted, are discharged or in poor condition, a PSU fault will show at the FIREvac.

Always dispose of used batteries according to the battery manufacturer's instructions.



Standby battery location and connection

9 Loudspeaker Connection

9.1 Loudspeaker Tapping

The most common installation problem on a voice alarm system is the incorrect tapping of loudspeakers. If they are tapped at too high a wattage, the amplifier may be overloaded. If they are tapped at too low a wattage, the sound may be too quiet.

9.2 Loudspeaker Circuits

FIREvac has two loudspeaker outputs, each of which can accommodate up to 60 watts of loudspeaker load. For example 20 loudspeakers tapped at 3 watts or 40 loudspeakers tapped at 1.5 watts. We recommend however that you allow 20% spare capacity on each loudspeaker circuit to accommodate future changes and/or tolerances within the circuit.

The continuous average output power of each circuit is 60 watts. Signals above this level will be compressed and the 'Audio Limit' LED will illuminate to indicate that the sound source is overdriving – see "Emergency (Fire) Microphone Connection" on page 25, "Public Address Paging Connection" on page 26 and "Background Music (BGM) Connection" on page 27 for further details.

To determine the actual loading (in watts) of a loudspeaker circuit with the speakers connected, disconnect the loudspeaker circuit at the main PCB and measure the impedance of the cable and loudspeakers using a Loadmaster or LCR meter. Remember that the maximim load for each circuit is 60 watts, which is equivalent to a minimum impedance of 166 ohms.

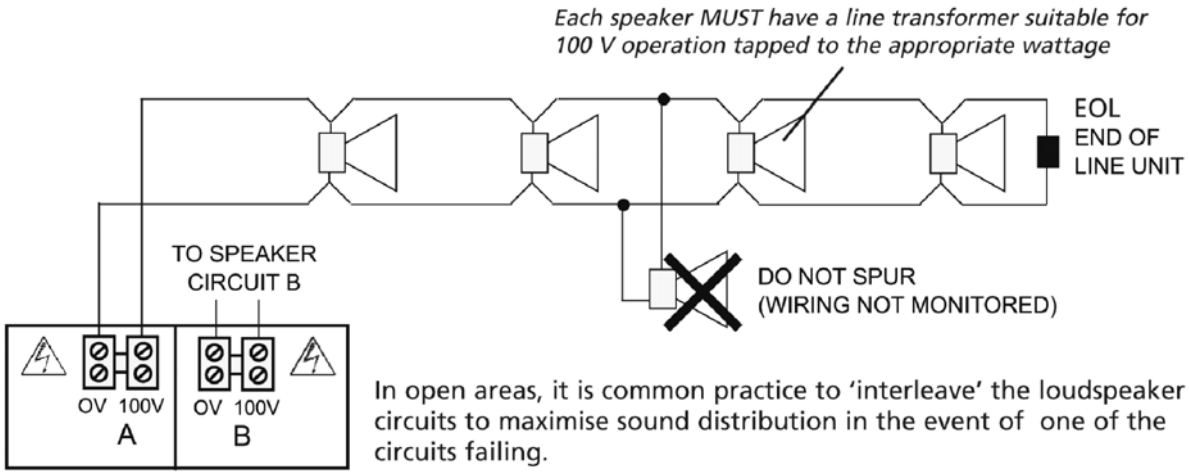
To convert impedance into power, use the following equation:
P (power in watts) = 10,000 / Z (impedance in Ohms)

Example:- Z (impedance in ohms) = 334 ohms.
10,000 / 334 = 29.94. Therefore P = 30 watts.

An end of line module (EOL) provided in the accessory pack must be physically secured and connected across the terminals of the last loudspeaker to allow the wiring to be monitored for open or short circuit fault conditions. In order to check that the loudspeaker line monitoring is operating correctly, fit the EOL in an accessible location.

We recommend Hochiki voice alarm loudspeakers are used as these have been tested for correct operation with FIREvac. All loudspeakers must be suitable for 100 volt line operation. Low impedance loudspeakers will not work, will overload the amplifier and may be seriously damaged.

Note: A form is provided in section 17 "Appendix 1" on page 39 where you can record the number, type, location and tapping of each loudspeaker used.



IMPORTANT

To ensure the loudspeaker circuits are monitored correctly, they MUST be calibrated using the SW1 button on the Indicator PCB inside the lid. See "Calibrating the Loudspeaker, Fire Mic. and Master to Slave circuits" below for details.

Typical loudspeaker circuit wiring

9.3 Calibrating the Loudspeaker, Fire Mic. and Master to Slave circuits

The loudspeaker circuits are monitored by an intermittent 20 kHz tone which is passed down the loudspeaker lines. Each circuit's end of line device absorbs the tone and the current taken is measured against the current drawn at system setup (known as the 'reference' value).

To store the reference value, the commissioning engineer must activate FIREvac's calibration feature. Note that FIREvac's Fire Mic and Master to Slave circuits will be calibrated at the same time and that prior to calibration the unit will always show a Fire Mic fault.

Calibration should ONLY be done when:-

1) **Both loudspeaker circuits are complete**, in other words, all loudspeakers are connected, appropriately tapped and verified and when the end of line devices (supplied) are fitted after the last loudspeaker on each circuit.

2) **Both loudspeaker circuits have been measured using a Loadmaster or LCR meter and you have confirmed that the load on each circuit is no greater than 60 watts** (equivalent to a minimum impedance of 166 ohms).

3) **The Fire Mic's PTT input is in an untriggered state, i.e. only the 6k8 end of line is present.** If calibration is done with the Fire Mic's PTT input in a triggered state, FIREvac will calibrate the Fire Mic. circuit incorrectly and the Fire Mic. may not work as expected.

4) **The PLK2 Local Fault link has been temporarily removed from ALL slave FIREvacs**. Note you MUST refit the PLK2 Local Fault links to all slaves when calibration is complete.

To start the calibration procedure, press and continue to hold down the calibration button (SW1) on the Indicator PCB. The indicator light (IND1) on the Main PCB will pulse slowly.

DO NOT LET GO OF THE CALIBRATION BUTTON UNTIL THE INDICATOR LIGHT STARTS TO FLASH MORE QUICKLY. Once the flashing speeds up, let go of the calibration button. When the indicator light goes out, the calibration procedure is complete.

Always test the system for correct operation after calibrating or recalibrating the circuits.

If any changes are made to the loudspeaker, fire mic. or master to slave circuits at any time - for example, if a loudspeaker is added, removed or its tapping is changed - the calibration process should be repeated to establish a new 'reference' level.

For more specific loudspeaker wiring information, please refer to each loudspeaker's individual installation instructions for advice.

10 Fire Alarm Interface Connection

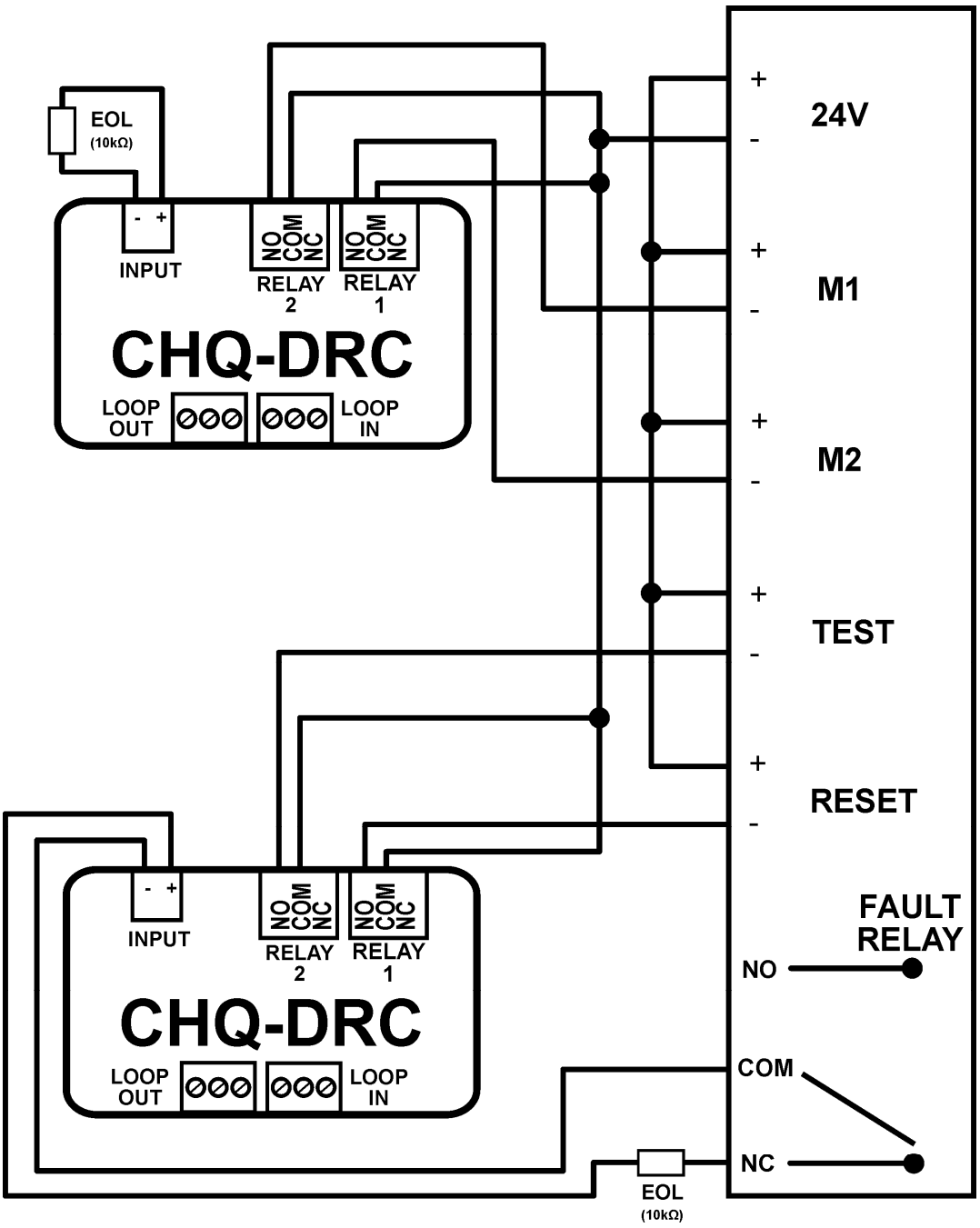
It should be noted that BS5839-8 requires all controlling inputs to be latched and all links to be monitored. Depending on the facilities available at the controlling equipment, this is not always possible. In such cases it is acceptable to have unmonitored links provided they are very close and at least IP30 protected. One way to do this is to mount the control equipment next to FIREvac so there is no gap between them.

10.1 The Conventional Interface

The conventional interface has four polarized inputs, Evacuate (M1), Alert (M2), Test (M3) and Reset (RES) plus a fault relay output. All four inputs are optically isolated and designed to be active when supplied with +24 V. For compliance with BS5839-8, all four conventional inputs are set to latch by default (i.e. Link 3 of the PLK4 option links is supplied fitted).

When a steady voltage of +24 V is applied to an input, the relevant message plays until a higher priority message is asserted (note that pulsing inputs are not compatible with FIREvac). When the trigger voltage is removed, the selected message will continue to play. Only when the FIREvac's Reset input is asserted will the system return to normal.

When the Reset stimulus is released no message will play unless other inputs are asserted. Note, the Reset input should be set to activate when the fire detection system is SILENCED or RESET, not just when reset.



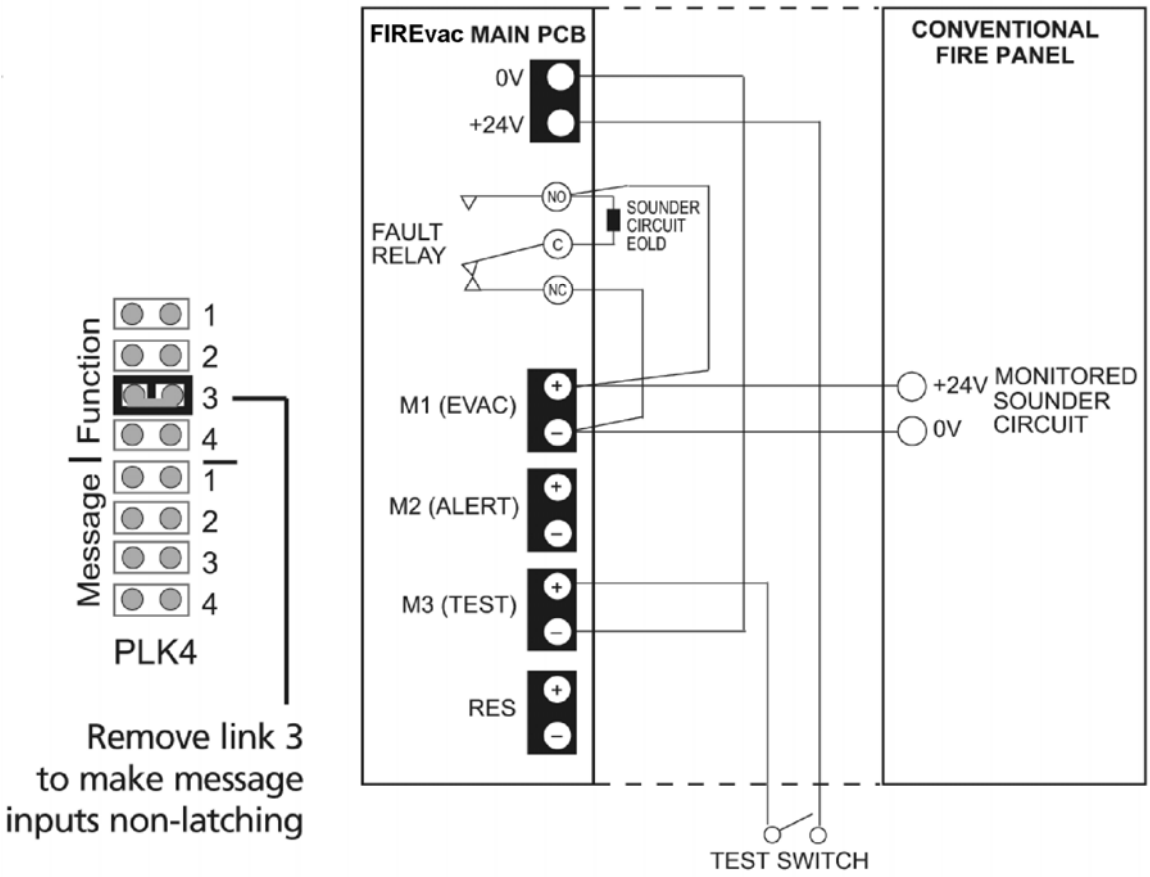
NB: Model CHQ-R can also be used in the above wiring configuration.

When interfacing an ESP analogue addressable fire alarm system to the conventional interface, the M1, M2, M3 and RES inputs are usually triggered via two CHQ-DRC (or CHQ-R) Modules as shown above. The Modules should be programmed via the fire panel's own programming software to operate as appropriate.

NOTE: To meet BS 5839-8, the Modules should be mounted adjacent to the Master FIREvac(s) such that they can be considered to be one cabinet.

When interfacing a conventional fire alarm panel to the conventional interface, the M1 (Evacuate) input is normally triggered via a monitored sounder circuit or relay. The M2 (Alert) input is normally not used in this scenario as pulsing inputs are not compatible with FIREvac. As most conventional panels do not have a monitored silence output that is capable of driving FIREvac's reset input, removing Function Link 3 on FIREvac's PLK4 option links will set all message inputs to non-latching.

For this arrangement to meet the spirit of BS5839-8, the control panel must be mounted adjacent to the Master FIREvac(s) such that they can be considered to be one cabinet.



Interfacing a conventional fire system to FIREvac's conventional interface

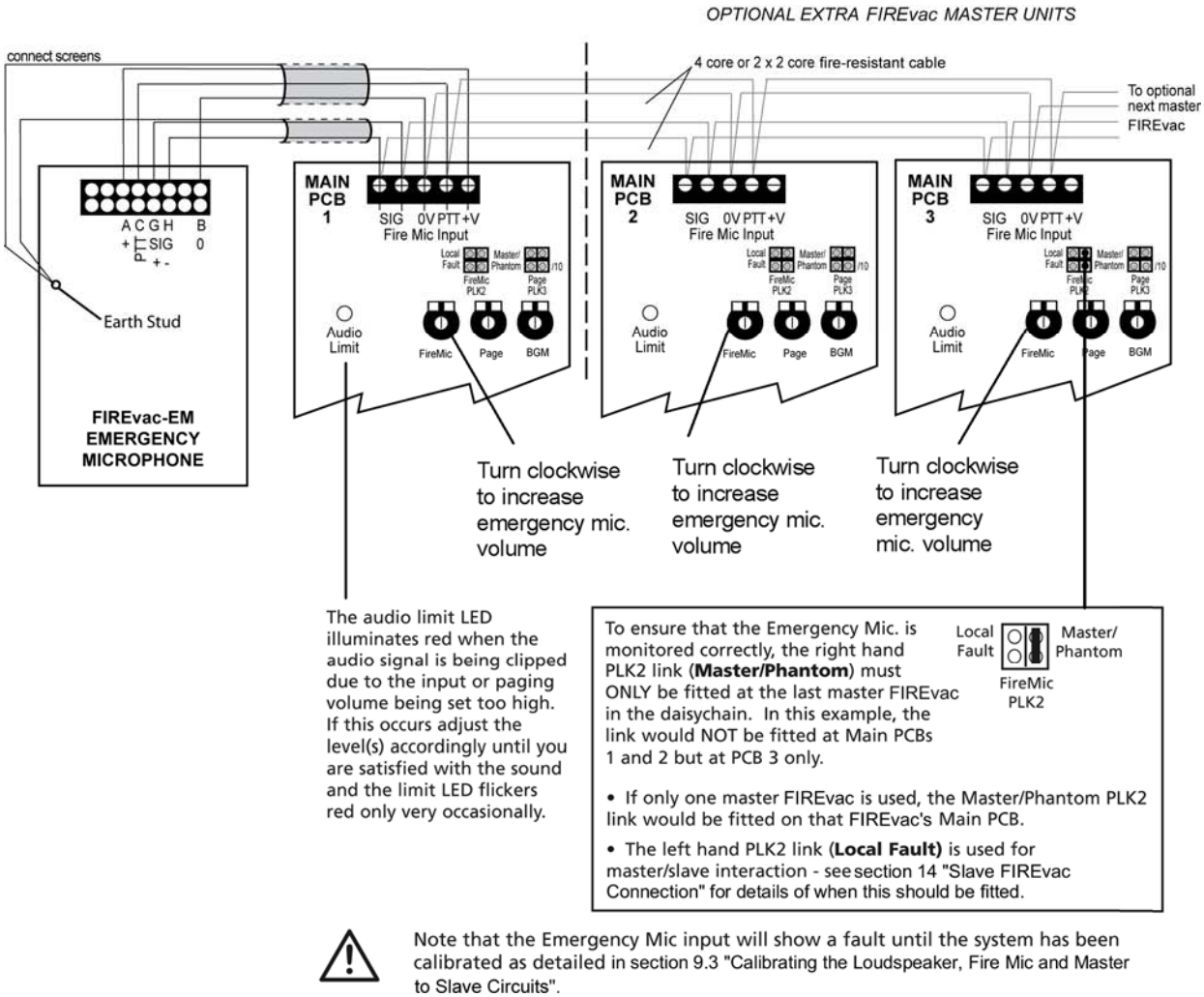
11 Emergency (Fire) Microphone Connection

If an emergency microphone is required, you must use a FIREvac-EM microphone. Only one FIREvac-EM should be used per system. This can be daisy chained to up to ten FIREvac masters as illustrated below. Pressing the FIREvac-EM's push to talk button will override all other audio signals on the system, including Evacuate and Alert messages, allowing live announcements to be made.

If an emergency microphone is NOT required and to prevent a fault condition occurring you must fit the 6K8 0.25W resistor (supplied in the accessory pack) across the PTT and 0V terminals at the Fire Mic input.

If required, the volume of the microphone can be adjusted using the Fire Mic level control on the Main PCB. Please note, should its volume be set too high, the audio limit LED on the main PCB will illuminate red to indicate that the audio signal is being clipped. If this happens, re-adjust the Fire Mic level control until you are satisfied with the sound quality and the limit LED flickers red only very occasionally. Failure to do so could lead to poor sound quality.

If the microphone is too loud, too quiet or too distorted, the master output level of the FIREvac-EM may need to be adjusted. Refer to the FIREvac-EM instructions for details. Please note, to ensure the microphone is monitored correctly, the right hand PLK2 link (Master/Phantom) must only be fitted at the last master FIREvac in the daisy-chain - see below for details.



Emergency microphone connection

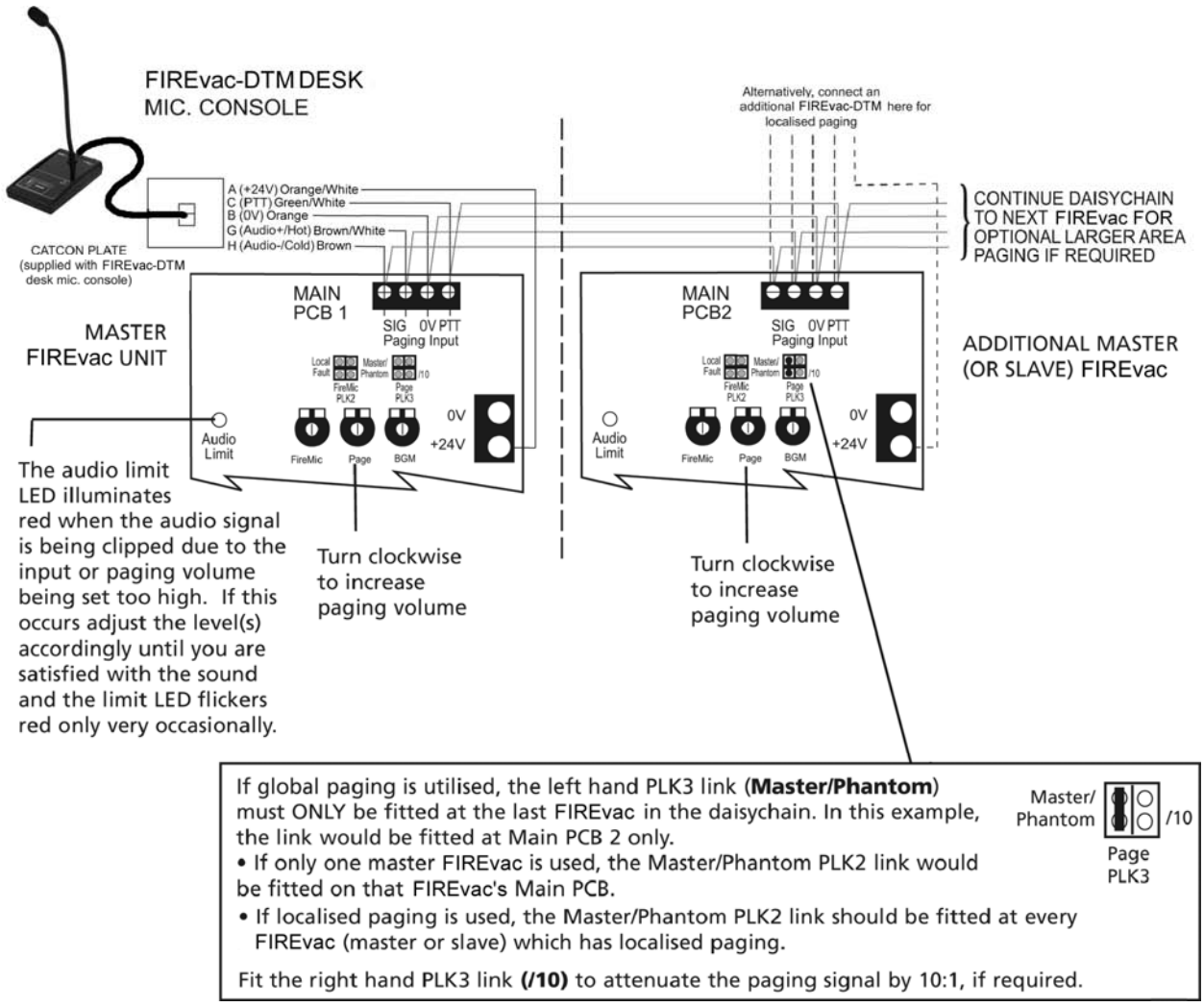
12 Public Address Paging Connection

If required, a FIREvac-DTM desk microphone console can be connected to the paging input for non-life safety public address announcements. Note that other balanced line level equipment, such as the output from a telephone system, may be connected instead. If in doubt, please contact your distributor for details.

The paging input is designed to accept balanced line level signals of between 300 mV and 1.5 V rms. If you wish to connect a higher line level signal, fitting the right hand PLK3 link (/10) on the Main PCB will attenuate the input signal by a ratio of approximately 10:1.

The volume of the paging signal can be adjusted using the Page level control on the Main PCB. Please note, should the volume be set too high, the audio limit LED on the main PCB will illuminate red to indicate that the audio signal is being clipped. If this happens, re-adjust the Page level control until you are satisfied with the sound quality and the limit LED flickers red only very occasionally. Failure to do so could lead to audio distortion.

For global paging, simply daisy chain the paging input to all relevant FIREvac master and slave units. Note that if global paging is utilised, the left hand PLK3 link (master/phantom) must be fitted at the last FIREvac in the daisy chain only. If local paging is used, then the left hand PLK3 link should be fitted at every FIREvac (master or slave) which has paging equipment connected directly to it). Pressing the paging equipment's PTT (push to talk) button will override all relevant background music signals but have no effect on higher priority triggers (such as Alert messages, Evacuate messages or Emergency Mic broadcasts).



Typical public address paging (FIREvac-DTM desk microphone console) connection

13 Background Music (BGM) Connection

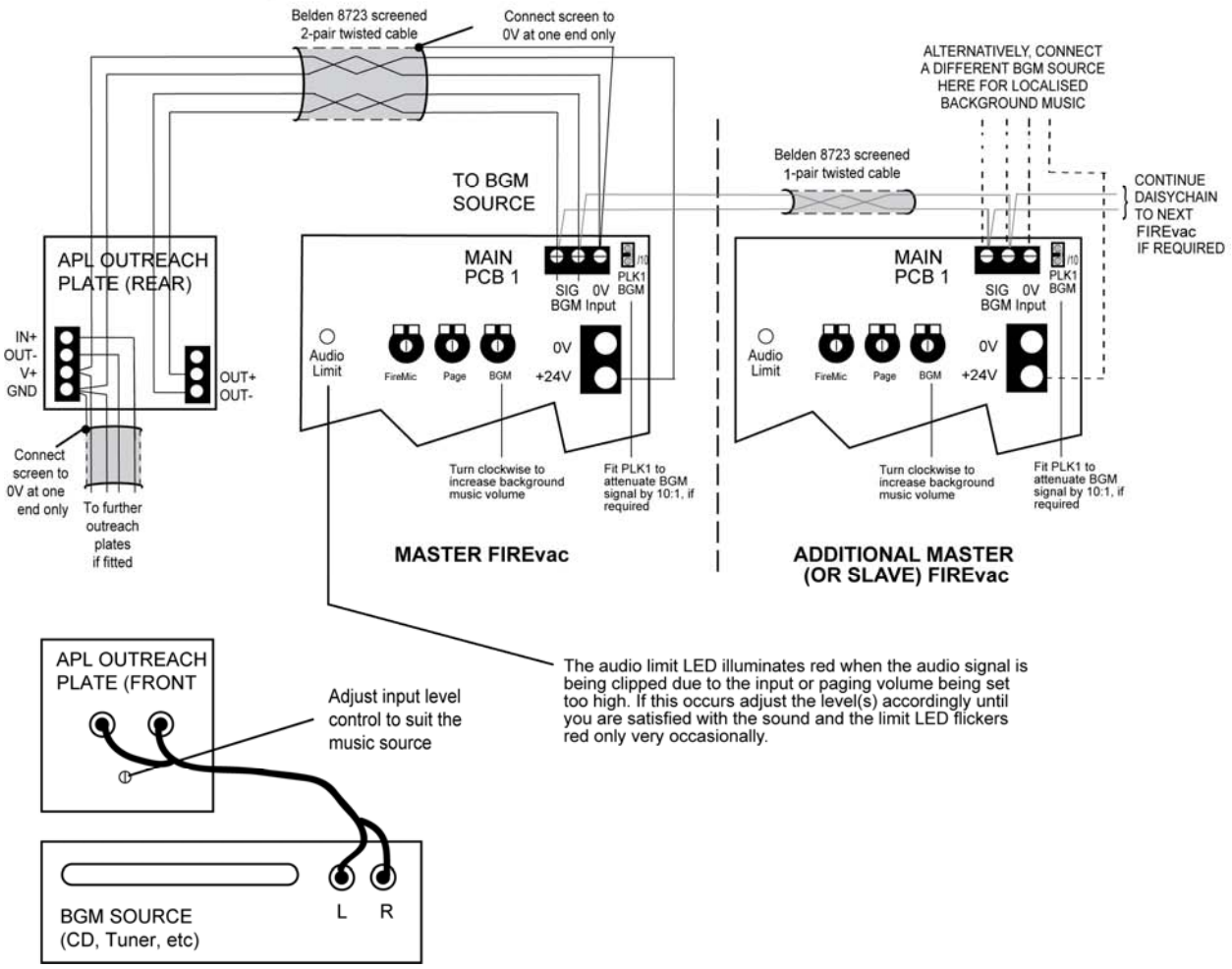
Any background music source with a balanced line level output (CD player, radio tuner, etc.) can be connected to the FIREvac. Background music is FIREvac's lowest priority input and it will play continuously unless there are other audio inputs active on the system.

The BGM input, like the paging input, is designed to accept balanced line level signals of between 300 mV and 1.5 V rms. If you wish to connect a larger line level signal, fitting link PLK1 on the Main PCB will attenuate the input signal by a ratio of approximately 10:1.

The volume of the background music signal can be adjusted using the BGM level control on the Main PCB. Please note, should the volume be set too high, the audio limit LED on the main PCB will illuminate red to indicate that the audio signal is being clipped. If this happens, re-adjust the BGM level control until you are satisfied with the sound quality and the limit LED flickers red only very occasionally. Failure to do so could lead to poor sound quality.

For global background music, simply daisy chain the paging input to all relevant FIREvac master and slave units. If multiple FIREvacs and/or slave amplifiers are used, different background music sources can be connected to play in different areas, i.e. local radio in warehouses, piped music (or silence) in offices, etc.

The simplest way to connect a background music source is via an APL double phono line level outreach plate which can be wall mounted in a location convenient for the user to change CDs, etc.



Typical background music connection

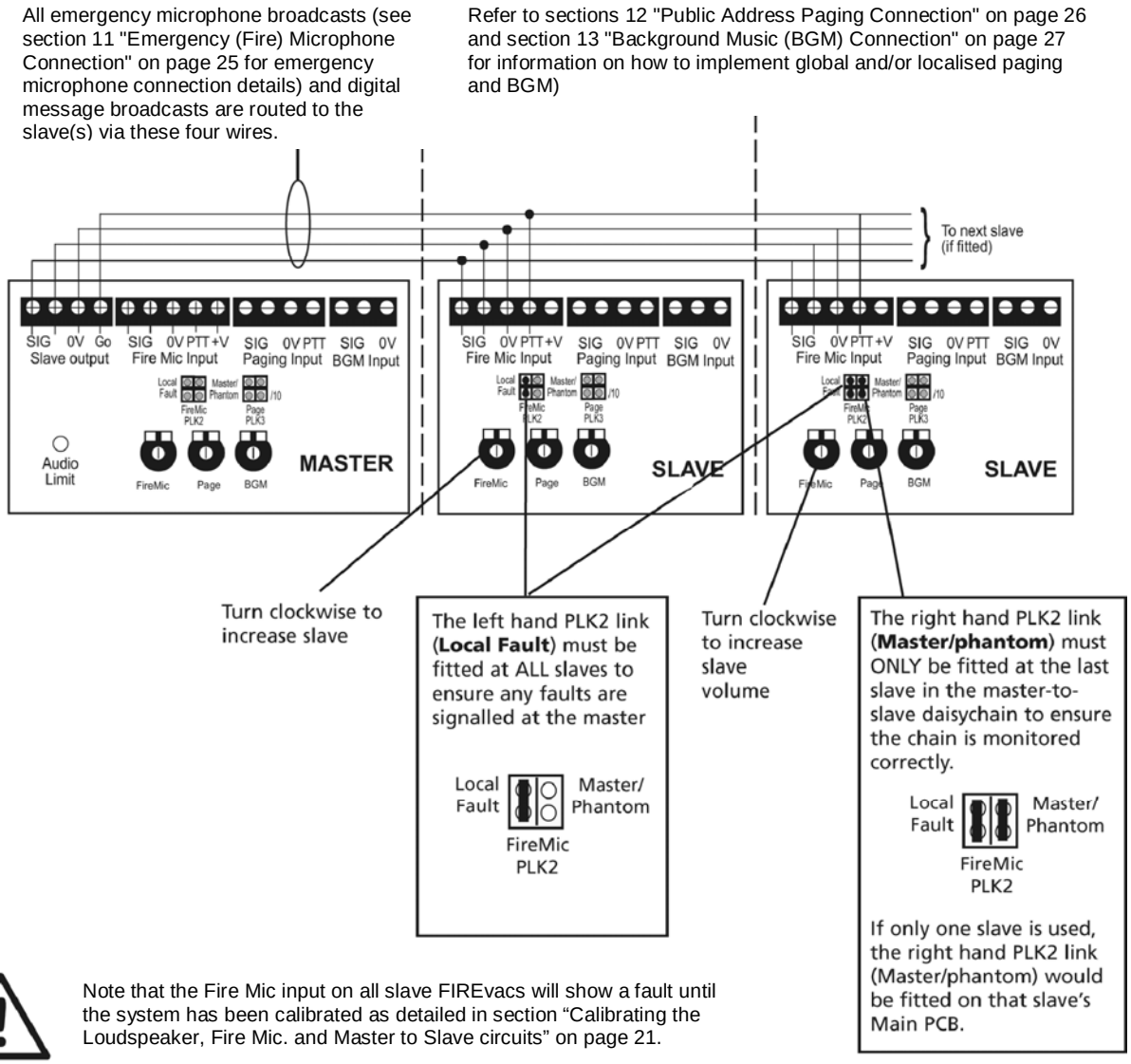
14 Slave FIREvac Connection

To increase audio coverage in large areas such as warehouses, shopping centres, etc, up to 10 slaves can be connected to one master.

For compliance with BS 5939-8, all critical life safety broadcasts made at the FIREvac master (i.e. emergency microphone announcements, Evacuate, Alert and Test messages) are automatically passed to the relevant slave(s) for output.

To allow greater paging and background music flexibility, each slave has its own paging and BGM inputs. Alternatively, for global paging and background music, the audio source(s) at the master can be daisy chained to the slave's inputs as explained in "Public Address Paging Connection" on page 26 and "Background Music (BGM) Connection" on page 27.

Slaves connect to masters as shown below. Please note, to ensure slave FIREvacs are monitored correctly, the right hand PLK2 link (Master/Phantom) MUST only be fitted at the LAST slave in the daisy chain. The left hand PLK2 link (Local Fault) should be fitted at ALL slaves.



Note that the Fire Mic input on all slave FIREvacs will show a fault until the system has been calibrated as detailed in section "Calibrating the Loudspeaker, Fire Mic. and Master to Slave circuits" on page 21.

Typical slave FIREvac connection

15 Digital Message Selection

The digital message store PCB is located on the main PCB. It comprises a non-volatile solid state memory (on which the Evacuate, Alert and Test messages are stored in MP3 format), an MP3 player and a volume control.

15.1 Message Content

The general characteristics of the Evacuate and Alert digital messages meet BS 5839-8 (1998) and consist of a siren sound to attract attention, brief silence, the body of the message followed by another brief period of silence before the message is repeated.

The PLK4 option links on the Main PCB can be used to select different message arrangements to suit various applications. For example, in single storey buildings, fitting Message Link 1 will remove the statement "Do not use a lift" from all Evacuate messages whilst fitting Message Link 2 will report

Evacuate or Alert conditions as 'situations' rather than fires. If the Test message facility is used, fitting Function Link 4 will prompt the system to broadcast "The fire alarm test is now complete" when the test trigger is removed. A full breakdown of the messages available can be found later in this section.

Important:

To silence the Evacuate, Alert and/or Test Message:

- When the Conventional Interface is set to latching (PLK4 link 3 fitted) : **Operate the reset input**
- When the Conventional Interface is set to non-latching (PLK4 link 3 not fitted) : **Remove the Evacuate, Alert and/or Test input stimulus.**

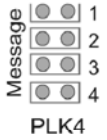
NOTE: Non-latching triggers are not fully compliant with BS 5839-8. However, if the triggers (for example, loop driven I/O units) are mounted adjacent to the FIREvac so that they form, in effect, one cabinet, this is normally considered to be acceptable

15.2 Evacuate Message Selection

Listed below are the four Evacuate messages currently available for the FIREvac together with details of the PLK4 option links you need to fit (or remove) to select them.

Evacuate message 1

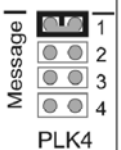
Siren (three seconds silence),
Attention please, attention please.
Fire has been reported in the building.
Please leave the building immediately by the nearest available exit.
Do not use a lift.
(three seconds silence then repeat)



Message links 1, 2, 3 & 4 not fitted

Evacuate message 2

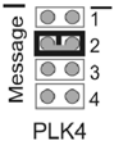
Siren (three seconds silence)
Attention please, attention please.
Fire has been reported in the building.
Please leave the building immediately by the nearest available exit.
(three seconds silence then repeat)



Message link 1 fitted

Evacuate message 3

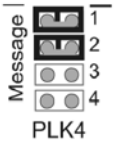
Siren (three seconds silence)
Attention please, attention please.
A situation has arisen where we need to clear the building.
Please leave the building immediately by the nearest available exit.
Do not use a lift.
(three seconds silence then repeat)



Message link 2 fitted

Evacuate message 4

Siren (three seconds silence)
Attention please, attention please.
A situation has arisen where we need to clear the building.
Please leave the building immediately by the nearest available exit.
(three seconds silence then repeat)



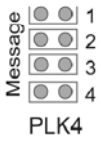
Message links 1 & 2 fitted

15.3 Alert Message Selection

Two Alert messages are available. The actual message played will depend on the position of Message Link 2 as shown in the diagrams below. Note altering the position of Message Link 2 will also affect the content of the Evacuate message (described previously).

Alert message 1

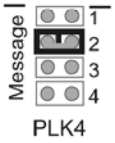
Siren (three seconds silence)
May I have your attention please, may I have your attention please
Fire has been reported in the building.
please listen for further instructions.
(10 seconds silence) ***Ding dong.***
You are reminded to remain at your workplace whilst the fire alert exists
(repeat last two segments every 22 seconds).



Message link 2 not fitted

Alert message 2

Siren (three seconds silence)
Attention please, attention please
A situation has arisen in the building, please listen for further instructions.
(10 seconds silence) ***Ding dong***.
You are reminded to remain at your workplace whilst the fire alert exists
(repeat last two segments every 22 seconds).



Message lnk 2 fitted

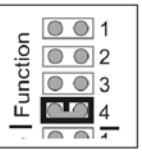
15.4 Test Message Selection

One test message is available, as detailed below:

Siren (three seconds silence)
A fire alarm system is about to be tested.
Please take no further action.

However, if Function (not Message) Link 4 of the PLK4 option links is fitted, FIREvac will also broadcast a "test complete" message when the system is returned to normal, as detailed below:

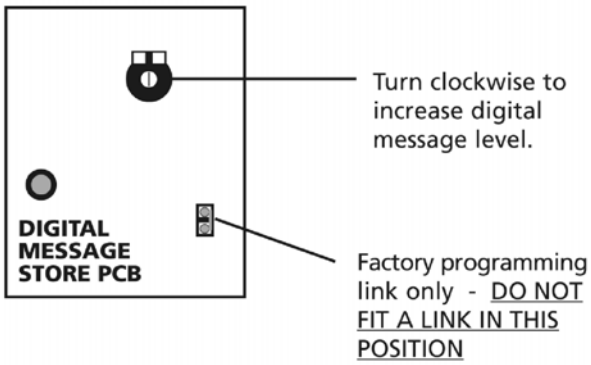
Ding dong
The fire alarm test is now complete.
Thank you for your cooperation.



Function link 4 fitted

15.5 Adjusting the MP3 Player Level

The level of the digital messages can be globally adjusted using the MP3 player's volume control which is located on the digital message store PCB, as shown below:



Test message:

A fire alarm system is about to be tested, please take no further action.

The fire alarm test is now complete.

15.6 Custom Messages

Custom messages can be provided at extra cost but may have to be recorded to suit the job. Please advise us of your requirements (prices on application).

16 Fault Indication

When a fault occurs, an intermittent fault buzzer sounds at FIREvac and the relevant fault indicator illuminates. The fault relay also activates to report the fault to the fire detection system where, depending on the wiring configuration used, it is usually reported as a sounder fault.

Pressing the Silence Internal Sounder button on the front of FIREvac will mute the fault buzzer. However, as all faults are also reported to the host fire detection system, removing link PLK5 (located below the buzzer on the Main PCB) will permanently disable the fault buzzer. Be sure to check with the approving authority that disablement of the internal sounder is acceptable before removing this link.

All faults should be recorded in the fire detection system's log book and appropriate action should be taken to correct them. An explanation of what each indicator means and the steps that can be taken to correct the faults they relate to can be found below. Note that all faults (except system faults and amplifier faults) are non-latching so when the fault is cleared, provided no other faults are present, the fault buzzer and all relevant fault indicators will clear.

PSU fault
Illuminates when one or more of the following has occurred:
1) The battery fuse has blown.
2) The battery supply voltage is too low.
3) The battery charging circuitry is faulty.
4) The switch mode power supply is faulty.
5) The 24V output on the main PCB is shorted or overloaded.
See also section 16.1on page 33.

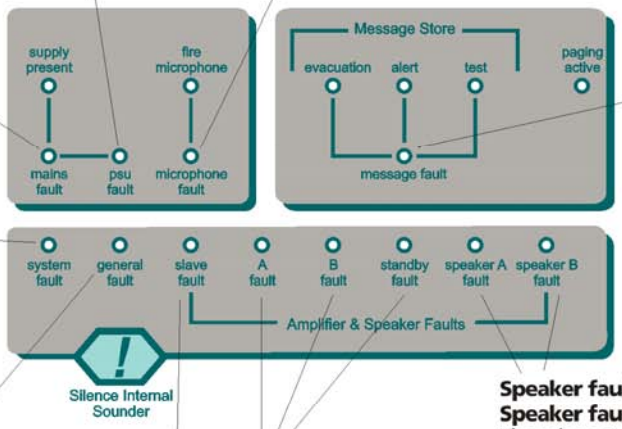
Mains fault
Illuminates when the mains has failed or the primary mains fuse has blown. Note that when this light is lit the system will only operate for the standby period dictated by the size of the backup batteries fitted and to conserve battery life, BGM and public address paging is suppressed.

System fault
Illuminates when one or more of the following has occurred:
1) The microprocessor has reset.
2) The main PCB is faulty.
These types of fault can only be cleared by pressing the Reset button (SW2) on the indicator PCB inside the panel.
If the fault reoccurs the Main PCB may be faulty. **See also section 16.2 on page 34**

General fault
Flashes when there is a fault on any part of the voice alarm system. This light is always lit in tandem with at least one other fault light which will convey more precise information on the type of fault detected.

Microphone fault (on master *FIREvacs*)
Illuminates when one or more of the following has occurred:
1) The emergency microphone is faulty
2) There is an open or short circuit fault on the fire mic. wiring
3) The master fire mic. link (PLK2) is not fitted at the last FIREvac to which it is connected.

Master fault (on slave *FIREvacs*)
Illuminates when one or more of the following has occurred:
1) The master FIREvac is faulty.
2) There is an open or short circuit fault on the master to slave wiring
3) The master fire mic. link (PLK2) is not fitted at the last slave FIREvac in the master to slave chain.



Message fault
(this indicator does not appear on slave *FIREvacs*)
Illuminates when there is a problem with the digital message store. Check that the Digital Message Store PCB is plugged in correctly. If it is and the fault message reoccurs the PCB may be faulty.

Slave fault
(this indicator does not appear on slave *FIREvacs*)
Illuminates when one or more of the following has occurred:
1) There is a fault on any (optional) slave(s) that are connected to the master - refer to the slave(s) for more precise details of the fault.
2) There is an open or short circuit fault on the slave wiring.

A fault, B fault and/or standby fault
The relevant amplifier fault indicator illuminates if there is a problem with any of the amplifiers (A, B or standby). Note that the standby amplifier is optional. If any of these indicators are lit, try pressing the Reset button (SW2) on the indicator PCB inside the panel to see if the fault clears. If the fault does not or if the fault comes back soon after **See also section 16.3 on page 35**

Speaker fault A
Speaker fault B
The relevant speaker fault indicator illuminates when one or more of the following has occurred:
1) There is an open or short circuit fault on a speaker circuit.
2) The speaker circuit's end of line device is missing.
3) There is a speaker earth fault.
To ascertain if there is an earth fault, open the ***FIREvac* and check to** see if either of the speaker earth fault lights on the Main PCB inside the panel are lit. If they are not, the fault is an open or short circuit.

Have you calibrated the speaker circuits (see page 19)?

Failure to do so could also lead to speaker circuit faults. Refer also to section 16.3 on page 35.

16.1 Power Supply / Mains Faults

A power supply/mains fault is indicative of one or more of the following faults.

16.1.1 The mains supply is too low or has failed completely.

Symptoms: FIREvac runs on batteries, but not on mains. The red 'Hazardous Voltages Present' light on the Power Supply PCB may be lit (if Mains has failed the LED will be off).

Suggested action:

(a) Isolate the mains supply and probe the live and neutral connections with a multimeter.

(b) Taking all due precautions, reapply the mains and measure the voltage.

(c) Isolate the mains supply again.

If the reading was incorrect (see Technical Specifications at the back of this manual) repair the mains supply. If the reading was correct, check to see if the primary mains fuse (F1) is ruptured. If the fuse is intact and the red hazardous voltages present light on the Power Supply PCB is lit, then the PSU is faulty and should be replaced.

16.1.2 The primary mains fuse (F1) is ruptured.

Symptoms: FIREvac runs on batteries, but not on mains. The red 'Hazardous Voltages Present' light on the Power Supply PCB is off.

Suggested action:

(a) Isolate the mains supply and check the PSU's primary mains fuse (F1) for continuity.

(b) If the fuse is ruptured it will be due to an excessive mains surge or a PSU fault. Check the components on the PSU for damage. If none is found replace the fuse with the correct type and reconnect the mains supply. If the red 'Hazardous Voltages Present' light does not come on then the PSU is faulty and should be replaced.

16.1.3 The battery fuse (F2) is ruptured.

Symptoms: FIREvac runs on mains, but not on batteries.

Suggested action:

(a) Isolate the mains supply and disconnect the batteries.

(b) Check the Battery Fuse (F2) on the Power Supply PCB for continuity.

(c) If the fuse is ruptured check the Power Supply PCB and Main Control PCB for signs of damage. If none is found, replace the fuse with the correct type, ensuring that the fuse clip is not damaged when re-inserting the fuse.

(d) Refit the Main PCB and reconnect the batteries.

If the green 'Supply Present' light is lit, reconnect the mains supply and check that the power supply fault has cleared. If the 'Supply Present' light is not lit, either the Power Supply PCB or the Main PCB is faulty and should be replaced.

(e) If the Battery Fuse (F2) is intact, proceed to check the battery voltage (see below).

16.1.4 The battery voltage is too low.

Symptoms: FIREvac runs on mains, but may or may not run on batteries.

If the mains supply has failed and the battery supply has been discharged to the point where the voltage is too low (i.e less than 21 V), FIREvac will automatically turn off to avoid damaging the batteries by allowing them to deep discharge. FIREvac will not restart unless fresh, fully charged batteries are connected, or the mains supply is restored.

If the mains supply has not failed, but the total battery voltage is less than 21 V, the PSU will not charge the batteries to avoid damage to the charging circuit. If the battery terminal voltage is greater than 21 V, the batteries can be charged but FIREvac will continue to show a power supply fault until they have sufficient charge, at which point the power supply fault will automatically be cleared. Depending on battery size and the depth of discharge, this may take several hours. If the batteries are in poor condition they must be replaced.

Please note that the charging circuit is set up during manufacturing, and is temperature compensated. There is no need to adjust the voltage.

If the batteries are in good condition and all the other checks have been performed and no faults found, the Power Supply PCB is faulty and should be replaced.

NOTE: Batteries that are not connected, connected in reverse or with opposite polarities will also cause a power supply fault condition.

16.1.5 Supply Present light not lit

If the 'Supply Present' light is not lit one of the following faults has occurred:

- Both the mains supply and the standby batteries have failed. This could be because the mains supply has failed and the batteries have been exhausted.

Suggested action:

Restore the mains supply and the 'Supply Present' light should come back on. However, if the batteries are discharged this will be recognised as a fault and indicated as such. See "Battery voltage too low" above.

- The Power Supply PCB, the Main PCB and/or the cable that connects them is faulty.

Suggested action:

If the mains supply is present (indicated by the red hazardous voltages light being lit on the Power Supply PCB), check that the connector cable between the Power Supply PCB and the Main Control PCB is fully inserted at both ends. If so, either the Power Supply PCB and/or the Main Control PCB and/or the connector cable are faulty and should be replaced.

16.2 System Faults

System faults are unique in that they do not automatically clear when rectified.

Suggested action:

Press the Reset button on the indicator PCB (located inside the panel). This should clear the fault. If the fault persists, the Main PCB is faulty and must be replaced.

16.3 Amplifier/Loudspeaker Faults

The FIREvac shows a loudspeaker/amplifier fault after calibration or

Adding or removing an End of Line Device (EOLD) is not detected.

Suggested action:

NOTE: Before starting these tests please ensure that you have a record of the number, type, location and tapping of each loudspeaker on each circuit. The form in section 17 “Appendix 1” on page 39 can be photocopied and used for this purpose.

Check whether the fault is with the FIREvac, EOLD(s) or in the wiring. Remove the loudspeaker wiring and connect the EOLD(s) at the FIREvac. Press calibrate. If the fault does not clear, check whether the fault is with the EOLDs or the FIREvac by swapping the EOLDs and recalibrating. If it is an EOLD or the FIREvac, contact your supplier for assistance.

If the fault lies with the external wiring there may be several causes. First refit the EOLDs at the end of line

16.3.1 The Loudspeaker circuit may be overloaded

The absolute maximum loading for each amplifier module is 60 watts (167 ohms) at 1 KHz. If this is exceeded, the amplifier will shut down as announcements are made or audio is played. As the signal varies in loudness, the amplifier may operate intermittently.

The most common installation error is to leave loudspeakers tapped as supplied, which is normally the maximum load setting.

For example, a typical office environment may require 6 W ceiling loudspeakers to be tapped at 1.5 W each. A maximum of 40 x 1.5 W loudspeakers can be connected to one 60 W amplifier circuit (although we recommend you allow 20% spare capacity on each loudspeaker circuit). If the speakers are tapped at 6 W, the load would be 240 W and the amplifier will shut down and may fail.

To identify this problem, use an impedance meter to measure the line impedance; which should be no less than 167 ohms at 1 kHz or use an audio load meter to measure the load directly; it must not be more than 60 watts. See section 9.2 on page 20 for instructions on how to calculate power from impedance.

If it is more than 60 watts (167 ohms or less), the load must be reduced by removing loudspeakers or lowering the tappings of some loudspeakers.

16.3.2 If the fault is intermittent or the loudspeakers cut out intermittently

One or more input sources may be set too high. If this problem only occurs very rarely, it is likely to be related to an audio source that is seldom used. Try each of the sources in turn to see if the problem occurs.

Unplug all input sources. Press the reset button. If the fault clears, this indicates that one of the inputs is overdriving the unit. Re-attach the inputs one at a time and set the audio working. If the fault recurs, lower the level on that input.

The remaining faults can be difficult to find so at this point it is best to check which loudspeakers are working and whether you think they are tapped correctly.

Connect a pink noise (hiss) generator such as a PNGN across the audio + and – pins of the BGM (background music) input. Adjust the BGM input level so that it can be heard but is not annoying. If it is too loud, the amplifier will cut off intermittently. Walk the circuit listening to each loudspeaker in turn and assessing whether it is working and if it is set to the correct level.

16.3.3 There may be one or more bad connections on the loudspeaker circuit.

A loudspeaker may be off, intermittent or crackly. A loose contact/wire adds impendence to the circuit causing the EOL to be less effective.

16.3.4 One or more loudspeakers may be mis-connected

A loudspeaker may appear to be connected but it doesn't work

100 volt loudspeakers have transformers with tappings and it is possible to connect them incorrectly. When the circuit is tested with an impedance meter, the reading can be more than 167 ohms, which appears to be acceptable, but the load monitoring system will still detect the problem.

16.3.5 Applying the rule of halves.

Remove the end of line, split the circuit at the middle, connect the EOLD and attempt to recalibrate. If it does not recalibrate, split the line in half again and repeat. If it does recalibrate reconnect the line and split again at the three-quarter point. Continue until the misconnected loudspeaker is identified.

16.3.6 One or more of the loudspeakers may be damaged or faulty

As per section 16.3.4, look for uninsulated cores, water damage and physical damage.

16.4 Earth Faults

Earth fault indications only apply to loudspeaker circuits and are indicated on the front of the FIREvac as speaker faults. (Note that the Speaker Fault A and Speaker Fault B indicators will also illuminate for open and/or short circuit faults). To ascertain if there is an earth fault, open the FIREvac and check to see if the Speaker Earth Fault A or B indicators on the main PCB are lit.

16.4.1 Amplifier faults occur on the system but when reset they do not reoccur for some considerable time

An audio input, which is not currently running, may be set incorrectly, intermittently overdriving the amplifiers. See section 16.3.2 above.

If paging is installed has there been any feedback? Check for loudspeakers near telephones or microphones and move the equipment further apart. The load may be changing due to bad connections, see section 16.3.2 above.

16.4.2 The emergency mic shows a fault.

The last Master FIREvac panel connected to the emergency microphone should have its Master/Phantom PLK2 link fitted. Check that no Local Fault links are fitted on any Master FIREvacs.

The emergency mic that has been used is not compatible – you must use the FIREvac-EM.

There is no emergency mic fitted and the EOL resistor has been omitted, see Emergency (Fire) Microphone Connection on page 25.

16.4.3 Connecting some input sources causes noise

Use volt free switch contacts on the paging input.

Avoid multiple screen and multiple 0 V connections as large circulating currents and excessive noise could result. If a source is unbalanced and connected to signal + or - and 0 V try connecting across signal + and Signal - inputs.

16.5 Master to Slave Faults

Are all FIREvac masters and slaves Rev 4? If not, contact your distributor/technical support for advice.

Ensure all PLK2 Local Fault links are removed from Slave FIREvacs before calibration takes place and that the links are refitted AFTER calibration.

Is the PLK2 Master/Phantom link fitted at the last slave FIREvac?

17 Appendix 1 – Loudspeaker Record Sheet

This form is provided for you to record the number, type, location and tapping of each loudspeaker on the FIREvac's circuits. On heavily populated systems you may wish to make multiple photocopies of this page before using it.

SPEAKER TYPE	LOUDSPEAKER LOCATION	SPEAKER TAPPING	FIREvac LOCATION	FIREvac CIRCUIT	ADDITIONAL COMMENTS

18 Appendix 2 – FIREvac Master/Slave Record Sheet

A FIREvac master / slave record sheet (AP101) is provided in the accessory pack supplied. We strongly recommend the relevant side of this sheet (master or slave) is completed by the engineer for future reference. Should you experience any technical problems with FIREvac our technical department will require information from this sheet in order to assist you.

19 Technical Specification

Power Supply and charger	
AC input	230 V a.c +/- 10% 50/60 Hz
Internal power supply	27 V d.c. Nominal
Max continuous output current limited to	5A @ 230 V a.c. (derate by 500 mA if batteries are charging)
Pulse peak output current limited to	7A @ 230 V a.c.
Supply & battery charger monitored for failure	YES (battery charger is also temperature compensated)
Batteries monitored for disconnection and failure	YES
Batteries protected against deep discharge	YES (Deep discharge cut off approx. 21 Volts)
Battery size and type	2 x 12 V 7 AHr VRLA connected in series
Mains fuse	240 V 1 A HRC ceramic 20 mm - compliant with IEC (EN60127 Pt2)
Battery fuse	5 A F 20 mm - compliant with IEC (EN60127 Pt2)
Max Battery Charge current	0.5 A
Inputs **Input level for 100 V RMS (1 kHz tone) with gain adjust set to Max. sensitivity**	
BGM	230 mV RMS
BGM with link	2.3 V RMS
Page	230 mV RMS
Page with link	2.3 V RMS
Fire Mic input	230 mV RMS
Page PTT Volt Free contacts non triggered state	Open circuit
Page PTT Volt Free contacts triggered state	Close circuit
Fire Mic PTT non triggered state	6K8
Fire Mic PTT triggered state	1K in parallel with 6K8
Manual inputs M1,M2,M3,RES	12 V 1mA to 25 V 2.5 mA (optically isolated)
Outputs	
Max Output AUX 24 V (Master only)	100 mA
Max Output Fire Mic 24 V	100 mA
Max Speaker Output	100 V 0.6 A RMS (60 W) x 2
Output power	2 x 60 W continuous average power
Frequency response at 30 W load / line driven from the Fire Mic	152 Hz to 12 kHz
Fault output relay single pole changeover	1A 30 V
Battery Calculations	
Average standby current at full load	97 mA
Average alarm current at full load (audio on Fire Mic)	1.2 A
NOTE: AUX and Fire Mics will add to the current drain requirements	
Loudspeaker Monitoring Tone	20 kHz
Frequency response	220hz to 6.2kHz on Page and BGM

