FireClass FC700 series Panels

Product Application and Design Information

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Contents

1 Introduction

This guide provides detailed information when planning a fire alarm system using the FireClass FC700 series panels and repeaters.

1.1 About this Guide

1.1.1 Who this Guide is For

This guide is aimed at suitably qualified engineers who are experienced in the principles of fire detection and alarm system design, and who have also received training in FireClass based systems.

1.1.2 What this Guide Covers

This guide provides information to support the design of a fire detection system using one of the FireClass FC700 series range of Fire Alarm Control Panels, and associated devices (such as detectors, call points, sounders and ancillaries).

The guide includes, for example, guidance notes and unit dimensions.

The guidance notes include information on choosing the particular control panel from the FireClass FC700 series that suits the purpose.

1.1.3 What this Guide does not Cover

This guide does not provide:

- Principles of fire alarm and design of control system.
- Content covered by local regulations.

  The local regulations will typically cover cable specifications and panel siting restrictions, and it will be the responsibility of the designer to ensure these are followed.
- Information covered by other guides that are available for the FireClass FC700 series (For more details see Section 5.1 "Documentation").

1.2 System Overview

The system is based on multiple devices (including detectors, call points and sounders) connected to a common two wire loop.

Electrical signalling on the loop allows communication with individual devices, where each device has an unique address. This allows for sophisticated monitoring and alerting across the various areas of a building.

Central to the system will be one of the FireClass FC700 series of fire alarm control panels.

The number of possible loops, and the available number of loop addresses, varies between the various FireClass FC700 series panels in the range.

The systems can be expanded with additional facilities, such as interfaces to building management and environmental systems. The expansion capability is supported by a range of optional modules.

1.3 System Compatibility

The introduction of the FireClass FC700 series products saw a continuation of FireClass Technology, so all the pre-existing FireClass technology products can be used. This means for example:

- The panel can act as a replacement for an existing FireClass panel, connecting to the existing loops and their devices.
- The panel is compatible with existing expansion products such as ANN880 annunciators hosted via MPM800 boards (as shown in Section 4.5 "BUS Based Connections" on page 30).

In some cases an existing module will have been replaced with a new 'slot card' equivalent, which must be used. For example, the XLM800 board and its PLX800 slot card equivalent.

1.4 Key Functions and Features

Fire alarm systems based on FireClass FC700 series control panels incorporate the following key features:

- Simple two wire run (loop), supporting many devices in multiple areas:
  - The loop connection format helps with wiring fault tolerance (short and open circuit), and minimises voltage drop.
  - Device addressing scheme allows individual communication with multiple devices on the same two wires (such as detectors, call points and sounders).
  - Multiple loops. The number of loops supported varies between control panels.
- Fault monitoring and diagnostics:
  - The panel monitors itself for faults in the background. Faults are signalled and recorded as events. This covers all key components such as, power supplies, batteries, sounder and speaker circuits, addressable loops, detectors and addressable devices, monitored input circuits, remote and local communication links.
  - Maximum of 10,000 events can be stored. These can be viewed, selected and printed.
  - Smoke detectors are long term averaged. Dirty smoke detectors can be identified.
  - Extensive diagnostic facilities, such as interrogation of detector temperature levels.

  - Optional remote diagnostics over a telephone network.
- Comprehensive local (non-loop) input and output options:
  - Relay based (volt free) external signalling of alarm and fault conditions.
  - Optional interface to fire brigade alerting systems.
  - Terminals for receiving two state (external switch closed/open) input. Monitored for open and short circuit faults on external switch wiring. Also non-monitored versions.
  - Local sounder outputs (sounders can also be connected to the loop).
- Comprehensive operator interaction facilities:
  - Zone LED indicators (optional).
  - Functionality override options. These include temporarily disabling detectors (to prevent possible false alarms), and an investigation time delay in the fire brigade signalling.
  - Re-configuration options, such as changing zone descriptions.
  - Switchable detector modes and sensitivities according to changes in occupancy patterns (day mode) and variations in fire risk. (There is also an automatic switching option.)
  - Critical operator functions are protected with key-switch, logon and password. "Higher level" engineering functions requiring logon at higher access level.
  - Operator control pad (Graphical User Interface):

    8.4" touch panel with TFT LCD technology and VGA resolution (640 x 480 pixels).

    "Dedicated and "Soft" control icons with varying functions.

    Various mounting options (including 'black box' control panels), for flexible positioning within the system.

    Includes a USB socket and optional keyhole.
- Wireless proximity access RFID cards/tags which when offered up the panel allows automatic log in. The cards are configured at the panel by user with configuration access level.
- Flexible system configuration using dedicated Windows software.
  - Supplied templates for standards-compliant base configurations.
  - Efficient address and power utilisation – loops can be allocated only the addresses and power they need, to conserve these resources for other loops.
  - Allocation of devices to building zones.
  - Completely configurable system input to output response mapping ("cause and effect mapping"). For example choose whether a detector activation affects all zones or just the local zone.
  - Outputs can be synchronised, so all sounder patterns are in phase, for example.
  - Flexible options for configuration download to panel: serial link, USB thumb drive, over a panel network.
- Networking and ancillary support:
  - Peer to peer networking capability with other control panels.
  - Support for 1500 auxiliary inputs/outputs, 7 repeaters on Ethernet, and multiple remote printers and 15 repeaters on Rbus.
- Comprehensive system expansion and interfacing options, such as additional support and interfacing with conventional detectors.

1.5 Typical System Design Steps

The design process will vary between sites, but will typically involve these steps:

- Specifying the devices (detectors, ancillaries, call points, sounders, beacons) required in the various areas of the site.
- Specifying the number of loops required.
- Specifying any required repeaters and other network items, and peripherals such as printers.
- Planning for interfacing to any conventional loops.
- Specifying the signalling requirements - for example, weather fire brigade signalling is required.
- Specifying any interfaces to building services, such as the environmental control system and door control relays.
- Specifying the wiring routing throughout the building.
- Entering the system design parameters into FireClass Designer Pro (a computer aided system design application). The FireClass Designer Pro will then calculate requirements such as the minimum required for backup battery capacity.

  Note that various forms are available to act as checklists and help you record design information.

  At this stage, the FireClass Designer Pro can facilitate:
  - Establishing the feasibility of your choice of control panel, and if necessary choosing an alternative control panel from the FireClass FC700 series range. For example, you may find the battery capacity of your first choice is inadequate.
  - Producing a list of parts to be ordered.
- Producing a zone plan, specifying the division of the building into the various zones, and the allocation of devices to these zones.

- Producing a "cause and effect" plan showing the required system responses to various input conditions.
- Entering the system parameters into FireClass Express to produce a configuration to be downloaded to the control panel.
- Producing an order list of required components, including product codes.

1.6 Approval Information

1.6.1 Loop Failure Compliance

All systems will comply with BS EN 54-2:1997+A1:2006 clause 13.7, in that if there is a failure of a loop driving module (either a FC-FI or PLX800), a maximum of 500 devices (detectors or callpoints) will be inoperative, which is less that the stipulated 512 maximum.

The figure of 500 arises because this is the number of loop addresses on the driving module (hence the maximum number of devices (detectors and callpoints) supported). In the event of a failure in one FC-FI or PLX800, other loop driving modules can continue to support their loop devices.

1.6.2 Optional Functions

The EN54-2 Optional Functions implemented are as shown in Table 1.

Clause Title (BS EN 54-2:1997+A1:2006)	Supported
7.8 (Output to fire alarm devices)	Yes
7.9.1 (Output to fire alarm routing equipment)	Yes
7.9.2 (Input from fire alarm routing equipment)	Yes
7.10.1(Outputs to Type A fire protection equipment)	Yes
7.10.2(Outputs to Type A fire protection equipment)	Yes
7.10.3(Outputs to Type A fire protection equipment)	Yes
7.10.4(Fault monitoring of fire protection equipment)	Yes
7.11 (Delays to Outputs)	Yes
7.12.1 (Dependencies on more than one alarm signal Type A)	Yes
7.12.2 (Dependencies on more than one alarm signal Type B)	Yes
7.12.3 (Dependencies on more than one alarm signal Type C)	Yes, in conjunction with clause 7.11
7.13 (Alarm Counter)	Yes
8.3 (Fault Signal from points)	Yes
8.9 (Output to fault warning routing equipment)	Yes
9.5 (Disablement of addressable points)	Yes
10 (Test condition)	Yes
11 (Standardised Input/output Interface)	Yes

Table 1: Optional Functions

1.6.3 EN IEC 62368-1

EN IEC 62368-1 is the standard for the safety of audio, video, information and communication technology electrical and electronic equipment. The standard specifies that the FC-FI connections OUTPUT LOOP A, B, C, D, SDR 1, 2, +/- 24 V, +/-5 V are rated PS2 ES1. The standard also states that the Output +24V on the Display Board (FC1DS/GUI Zonal Display Interface) is rated PS1, ES1, and LPS.

1.7 Connected Devices

If a device covered by specific EN54 standards is connected to the FireClass FC700 series system, this must be connected and operated based on these standards.

2 Control Panels and Associated Housings

2.1 Panels

These are the control panels in the FireClass FC700 series range:

- FC708D - see Figure 1
- FC702S - see Figure 2
- FC702D - see Figure 3
- FC718D - see Figure 3

For comparative information on the panels see Section 2.2.1 “Panel Data – Quick Comparison” on page 12.

The control panel and doors are mild steel. The doors are hinged at the left edge and are lockable.

The main electronics for panels comprises the FC-FI board, known as the ‘Field Interface Board’, containing the main CPU. This provides, for example, the loop connections and connections for printers, and hosts the various communications buses (RBUS, IOBUS etc.). There are various connectors, terminals, jumpers and DIP style switches for configuring and connecting to the board. These are shown in Figure 19 on page 34. These are all labelled on the board itself. Using these will be covered in more detail by other more specific system guides.

You can install any optional expansion cards into a separate cage within the housing. There are slots for inserting slot cards, and other non-slot expansion modules can be fitted here.

There is a user control panel (known as the ‘GUI’, or Graphical User Interface) mounted to the front door – see Section 2.2.4 “Graphical User Interface” on page 12 (the GUI is not shown in Figures 1, 2, and 3 as these show the insides of the open doors).

2.2 FC700 series panels

The FireClass FC700 series range consists of the following panels:

- FC702S - Two loop FireClass panel
  This panel can have two standard power loops or one high power loop with a maximum of 250 addresses. It features a TFT touchscreen display with 16 zonal LEDs. The panel has a compact housing and 5A PSU for 17AH batteries. The FC702S is a networkable panel.

- FC702D - Two loop FireClass panel
  This panel can have two standard power loops or one high power loop with a maximum of 250 addresses. It features a TFT touchscreen display with 16 zonal LEDs. The panel has a designer housing and 5A PSU for 38AH batteries. The FC702D is a networkable panel.

- FC718D - Four to eight loop FireClass panel
  This panel can have four standard power loops or two high power loops expandable to eight standard power or four high power loops with a maximum of 1000 addresses. It features a TFT display with 16 zonal LEDs. The panel has a designer housing and 5A PSU for 38AH batteries. The FC718D is a networkable panel.

- FC708D - Four to eight loop FireClass panel
  This panel can have four standard power loops or two high power loops expandable to eight standard power or four high power loops with a maximum of 1000 addresses. It features a TFT display with 80 zonal LEDs. The panel has a designer housing and 5A PSU for 38AH batteries. The FC708D is a networkable panel.

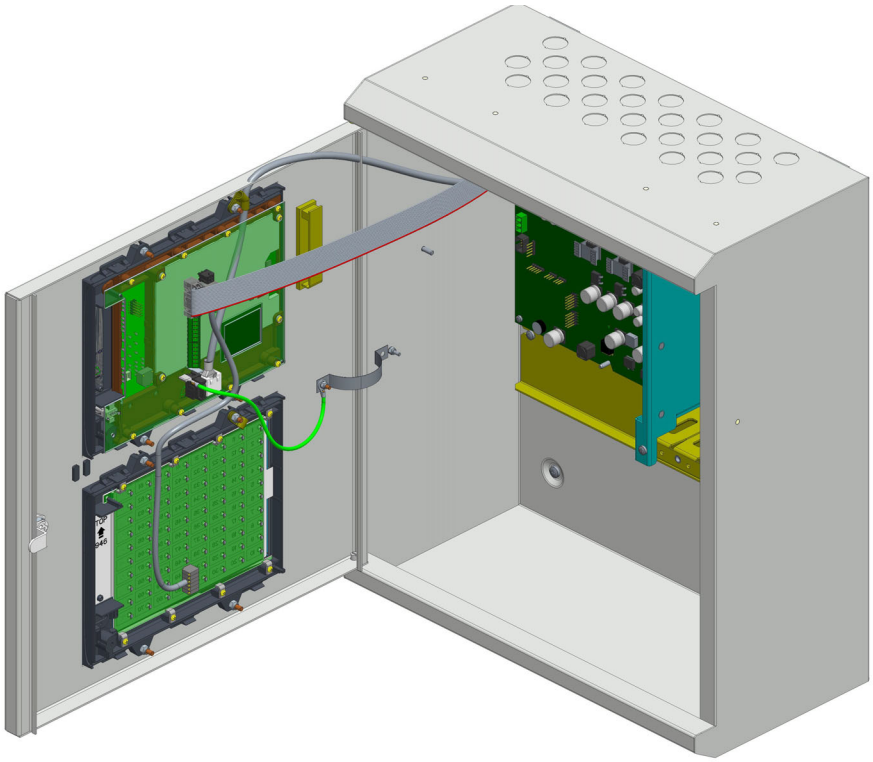

Fig. 1: FC708D

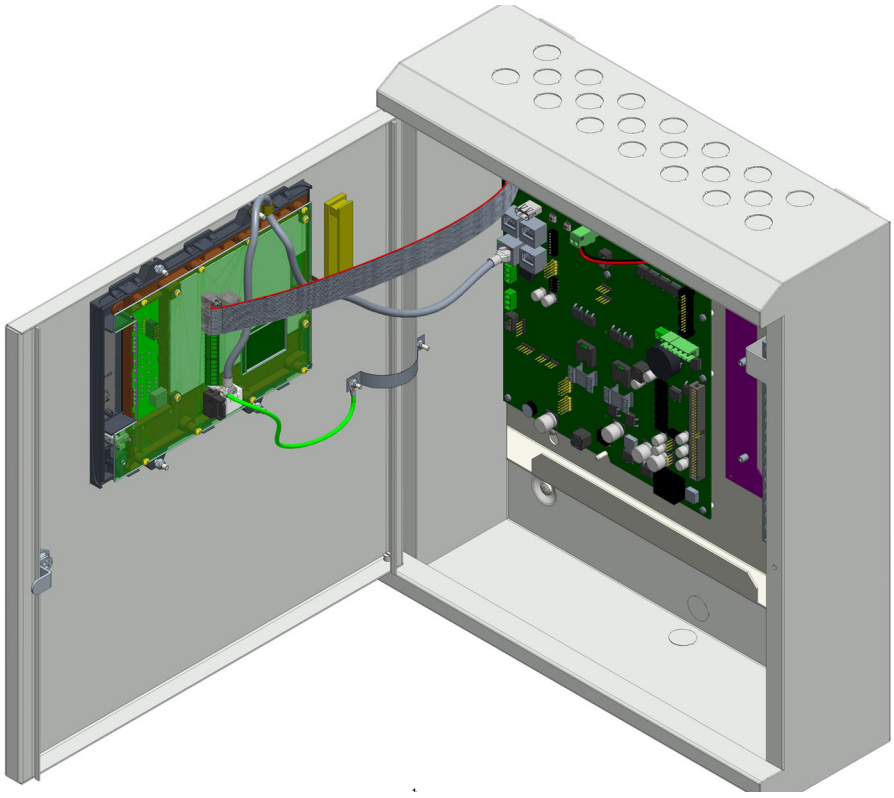

Fig. 2: FC702S

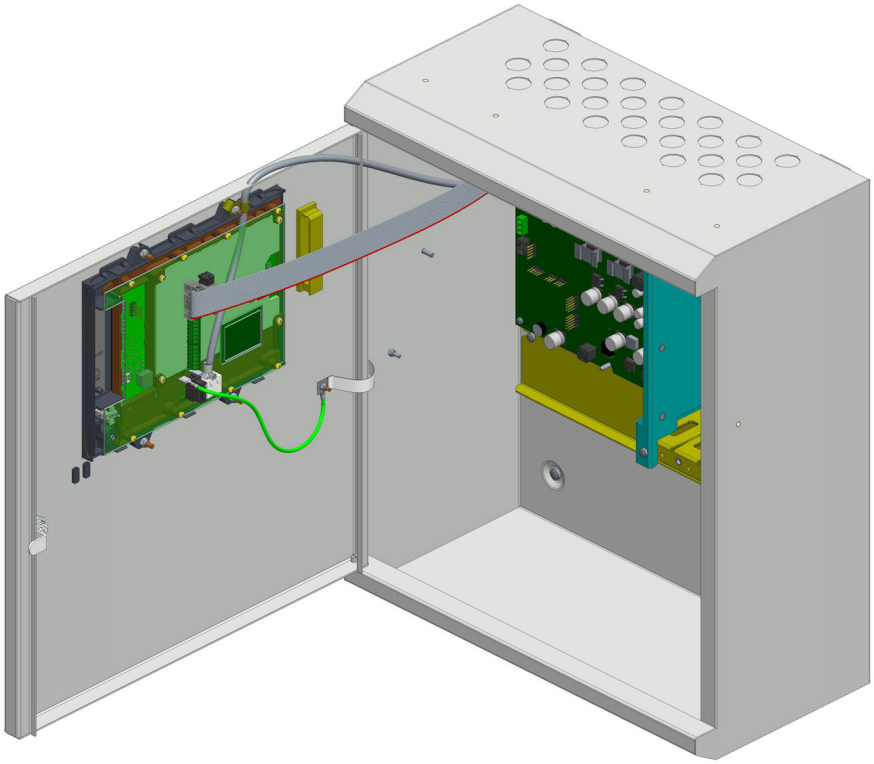

Fig. 3: FC702D and FC718D

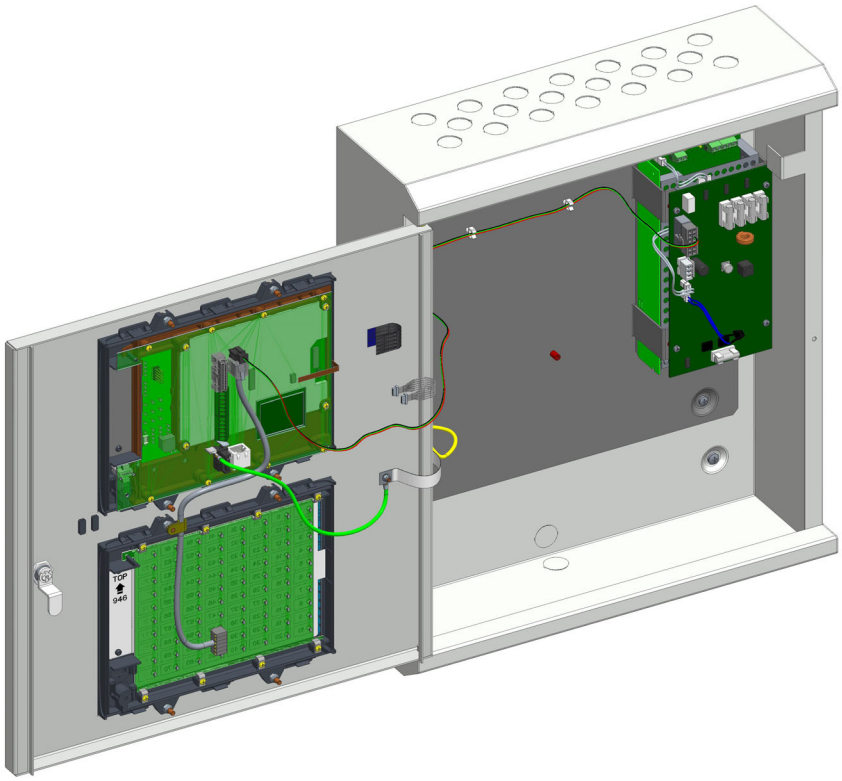

Fig. 4: FC8AS

2.2.1 Panel Data – Quick Comparison

Table 2 details the key data of the panels in the FireClass FC700 series range, helping to provide a quick comparison between them.

Item	FC702S	FC702D	FC718D	FC708D
Standard number of loops	2		4	
Maximum number of system loops (for details of adding more loops see Section 2.9.5 "PLX800 Loop Expansion Slot Card" on page 22)	2		8	
Maximum number of addresses on a loop*	250			
Maximum number of loop addresses * and **. (Note that some loop devices occupy more than one address)	250		1000	
Batteries (must be ordered separately)	17 Ah	38 Ah	38 Ah	38Ah
Standard number of card slots (see 'adding more card slots' on Page 24)	3	4		
Number of zones	240			
Dimensions	See Section 2.8.3 "Drawings"			

Table 2: Panel Comparison

NOTE: Only the specified battery capacity is specified for use.

** See Section 3.2 "Dividing Addresses Between Loop Pairings" on page 23*

***In the event of a failure, the loops will not all necessarily fail simultaneously - see Section 1.6.1 "Loop Failure Compliance" on page 8.*

2.2.2 RFID Card Logon

As mentioned in Section 2.2.4 "Graphical User Interface", users must log on before they can use most of the menu items (commands).

A quick method of logging on is to use RFID cards. These just need to be offered up to the antenna area, and the user will be automatically logged on. The antenna area is item 5 in Figure 5.

This facility needs to be configured using FireClass Express.

2.2.3 Mounting Frames

Each unit (panel, ancillary housing or repeater) is supplied with a frame for mounting it to a wall.

The mounting frame is first attached to the wall, then the unit is simply hung from the frame. This has the advantage that the unit can be left completely assembled – there is no need to remove boards for access to the housing rear wall for screw insertion.

2.2.4 Graphical User Interface

The Graphical User Interface (GUI) is fitted to the front door of panels and repeaters for user interaction with the system.

The GUI features an 8.4" TFT touch sensitive colour panel with VGA resolution.

The GUI signals events such as alarms and fault messages.

Users can issue commands using an icon based menu icon system. There are commands for interrogating system status, disabling devices and so on.

Each command has a different level of user access rights needed to use it. Some are 'open access'. Other commands require the user to log on, and each logon account has an assigned level of access rights. Some levels of access rights are reserved for engineers, needed for re-configuration commands for example.

Fig. 5: Graphical User Interface (GUI)
1– Command icon (menus) area
2– Quick Access Buttons
3– Status LEDs Area. Note that this area is also touch sensitive, even though it is not styled as a button.
4– USB Flap
5– RFID Antenna – see section 2.2.2 on page 12

2.2.5 RFID Tag Data

- RFID transponder conforming to ISO/IEC 15693
- RFID Frequency: 13.56 MHz
- Unique Serial Number
- Operating Temperature: -25 °C to 50 °C
- Dimensions: (W X H X D) 86 X 54 X 0.8 mm
- Weight: 5 g

2.3 Repeaters

The FireClass FC700 series range includes the repeaters shown in Table 3.

Repeaters provide secondary points at which you can control and monitor the fire alarm system. The FC1DS and FC8AS repeaters connect to the system by Ethernet. The FC1D2 repeater connects to the system by 2-wire serial cable. It requires a DC power supply from the panel.

The FC8AS uses the 'Pro x' housing that is common to the range – for dimensions see Section 2.8.3 "Drawings" on page 16.

Name	No. of expand -able zonal panels	Mains Power	Batteries	No. of Zone LEDs (sup- plied)
FC8AS	0	Yes	17 Ah	80*
FC1DS	3	No	No	16*
FC1D2	1	No	No	16*

Table 3: Repeaters Summary
NOTE: Only the specified battery capacity is specified for use.
** One red LED per zone*

2.3.1 FC1DS and FC1D2 DC Power

The FC1DS and the FC1D2 repeaters are powered from a 24 V DC output of the main control panel PSU, or from a separate standalone PSU.

If the repeater is powered from the main panel there is a limit on the distance between them, due to voltage drop considerations of the interconnecting power cable.

2.4 Additional Display Modules

- FCZ4x – see Figure 6.
  This features 40 numbered pairs of LEDs. Use each pair to signal a fault or alarm in the numbered zone, for example (dependent on the configuration).
- FCZ8x – see Figure 7.
  This features 80 numbered LEDs. Use each LED to signal an in the numbered zone, for example (dependent on the configuration).

These modules are mounted to the front of a panel or ancillary housing.

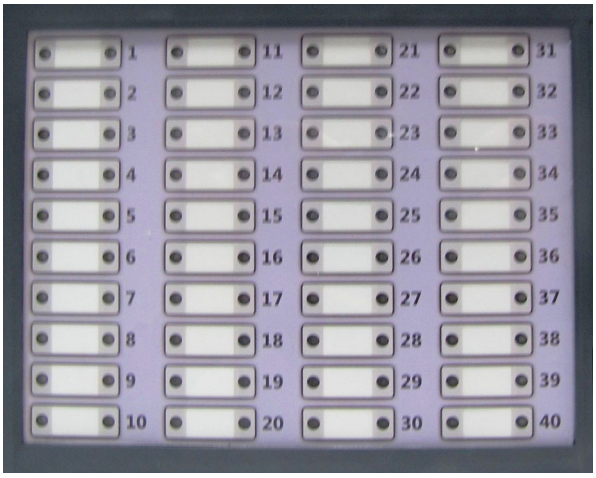

Fig. 6: FCZ4x

Fig. 7: FCZ8x

2.5 Country Specific Labelling

The labelling of the panel text has been customised to suit various languages.This is required for the following reasons:

- The number of functions, hence the number of labels varies between countries.
- The text on the screen are re-arranged between countries, so different functions are assigned to different positions.
- The labels need to be in the local language.

The labelling of the panel text is changed by switching the removable insert to the panel overlay (this insert carries the labels). For example: English, German, Dutch etc.

2.5.1 Configuration Template

Country-specific panel variants differ in their operator functions.

This country-specific functionality is achieved in FireClass Express, by basing the configuration on the specific template designed for that country.

2.6 Power Demand Considerations

The sections below detail the mains power and battery backup considerations.

2.6.1 Mains Power Requirement

All supplied mains power must be 230 V, 50/60 Hz.

The current consumption of a PSU will vary, with a maximum of 1.6 A.

The number of PSUs varies according to the type of panel.

2.6.2 Power Supply Loading

There will be a varying demand placed on the power supply, depending on the system design. The demand will depend on a number of factors, such as:

- The sounders fitted to the local sounder outputs.
- The number and types of devices fitted to the loops. Loop powered sounders for example represent a high potential power demand, compared to detectors. For more details see 3.8 "Loop Loading Calculation".
- The number of remote repeaters powered directly from the control panel.
- Using of ORing special Ethernet switches.
- Using of fibre optic interconnection between control panel and repeater(s).
- The number of ancillaries or extension modules powered by the 24 V outputs.

To help you stay within the acceptable power demand limits, use FireClass Designer Pro. This is a Windows PC application that is available for free download from the FireClass web site. One of the functions of FireClass Designer Pro is to show you the proportion of the available power you have used, as you add devices and load the power supply.

There is also a "Loop Loading and Battery Calculations" document for panels, that you can use instead of, or in conjunction with, FireClass Designer Pro.

2.7 Power Sources

All mains-derived power is supplied by system-standard BAQ140T24 PSUs or BAQ60T24 PSUs in the case of the FC8AS repeater. These are hosted in the control panel or repeaters (standard fitment).

All PSUs are equivalent on the system – a PSU does not have a specific area that it powers, they all contribute as a group to meeting the power demands.

You need to calculate how many PSUs you need, or use FireClass Designer Pro.

There is comprehensive battery management:

- Detection of high resistance within batteries or connections.
- Short circuit detection and protection.
- Charge voltage and current optimisation for battery longevity and maximum charge, including battery temperature compensation.
- Reverse polarity protection by 10 A slow blow fuse.
- Deep discharge protection.

Power management includes:

- Monitoring and failure indication of the AC supply.
- Earth fault and rail voltage monitoring.

The PSUs require no maintenance. The PSUs are not repairable and must be replaced as a complete unit if faulty.

2.7.1 Battery Backup

In the event of mains failure a battery backup system maintains the operation of the fire alarm control panel and associated system. Two batteries are connected in series to provide a nominal 24 V. For the battery capacity see Table 2.

The required size of the backup batteries depends on the system design and the specified time period for which the batteries need to maintain system function. You need to calculate the minimum size using FireClass Designer Pro or the loop loading document.

The batteries are charged from the common control panel PSU, and you need to factor the charging demands into the PSU requirement calculation within FireClass Designer Pro or the loop loading document.

The batteries can supply up to 5 A, so in a high demand alarm state they can provide power to, for example, sounders and beacons, door release mechanisms and interface relays and remote repeaters.

The batteries will continue to maintain system operation until their combined voltage drops to 21 V, due to discharge.

2.8 Siting Considerations

The control panel is designed for wall and rack mounting. Typically screws and rawl plugs in drilled holes will be used. The screw hole positions are shown in the dimensional drawings see Figs. 2.8.3 "Drawings".

For rack mounting, a special mounting kit is required. Refer to Fig. 9 and Fig. 10 Assess whether the wall fixings will be able to bear the weight of the units. The size of the batteries will have a large bearing on the weight of the units.

Panel's doors are hinged on the left.

2.8.1 Environmental Stipulations

The FC702S, FC702D, FC718D, and FC708D panels are IP30 compliant and meet the BS EN54-2 classification of IP30. The control panel is not weatherproof. Check that the location is indoors, dry and free from excessive dust. Also check that the location fulfils the temperature and humidity stipulations shown in Table 17.

2.8.2 Housing Clearances

Choose a location that will ensure adequate clearance for the cabling.

For leading cables into the housing there are various knockout options, as detailed in the panel drawings below. Choose the option appropriate to local regulations and practice.

2.8.3 Drawings

Dimensions and screw hole positions are shown in the following figures:

Unit	Figure
Repeater: FC1DS, FC1D2	8
Repeater: FC8AS	9
FC702S mounting frame	10
FC702D, FC718D, and FC708D mounting frame	11

Table 4: Drawing references

Table 4: Drawing references

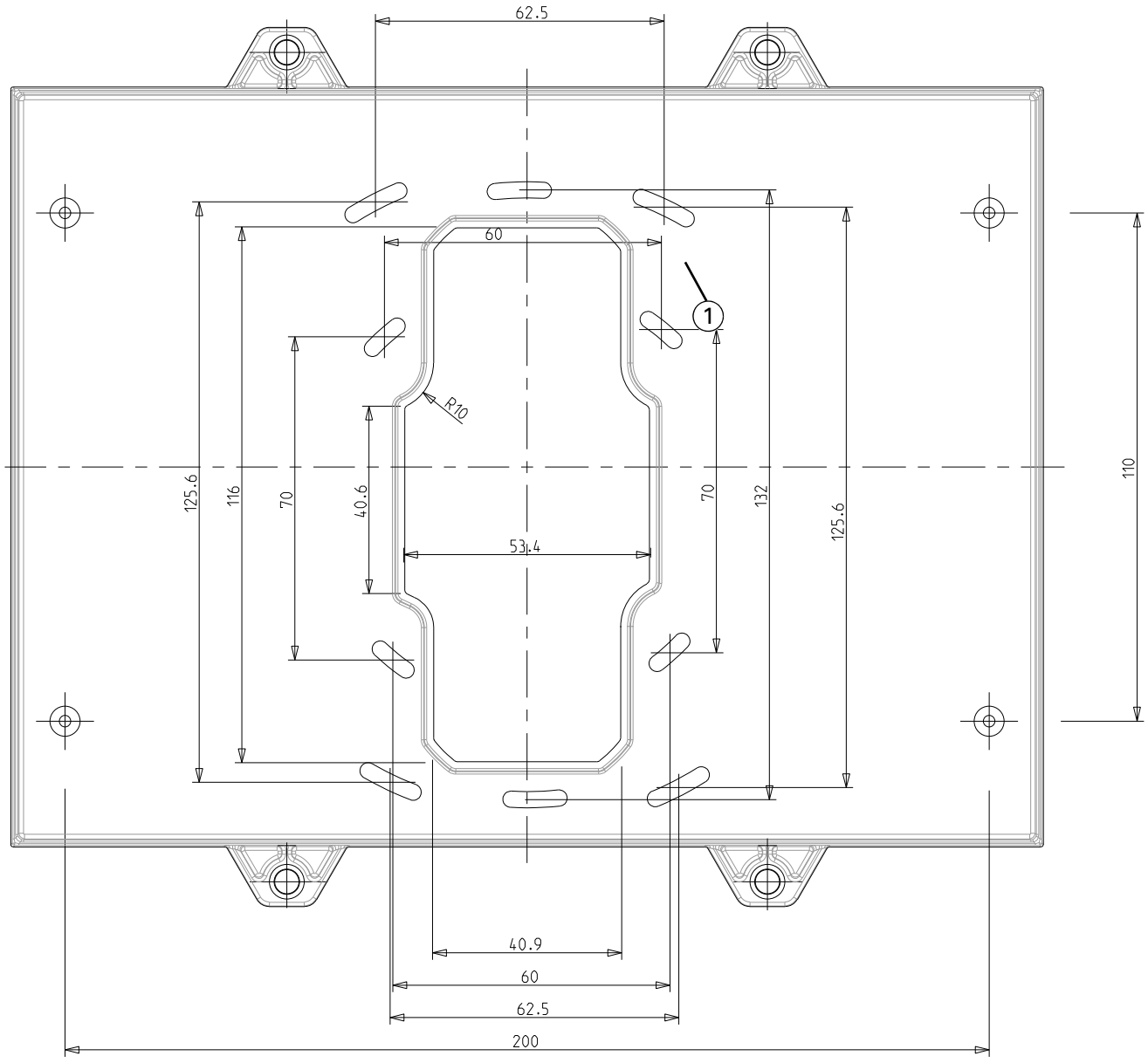

Fig. 8: FC1DS Fully Functional Repeater Shallow/FC1D2 FireClass FC700 series Display Only Repeater -Overall and Fixing Dimensions
1 – Slots

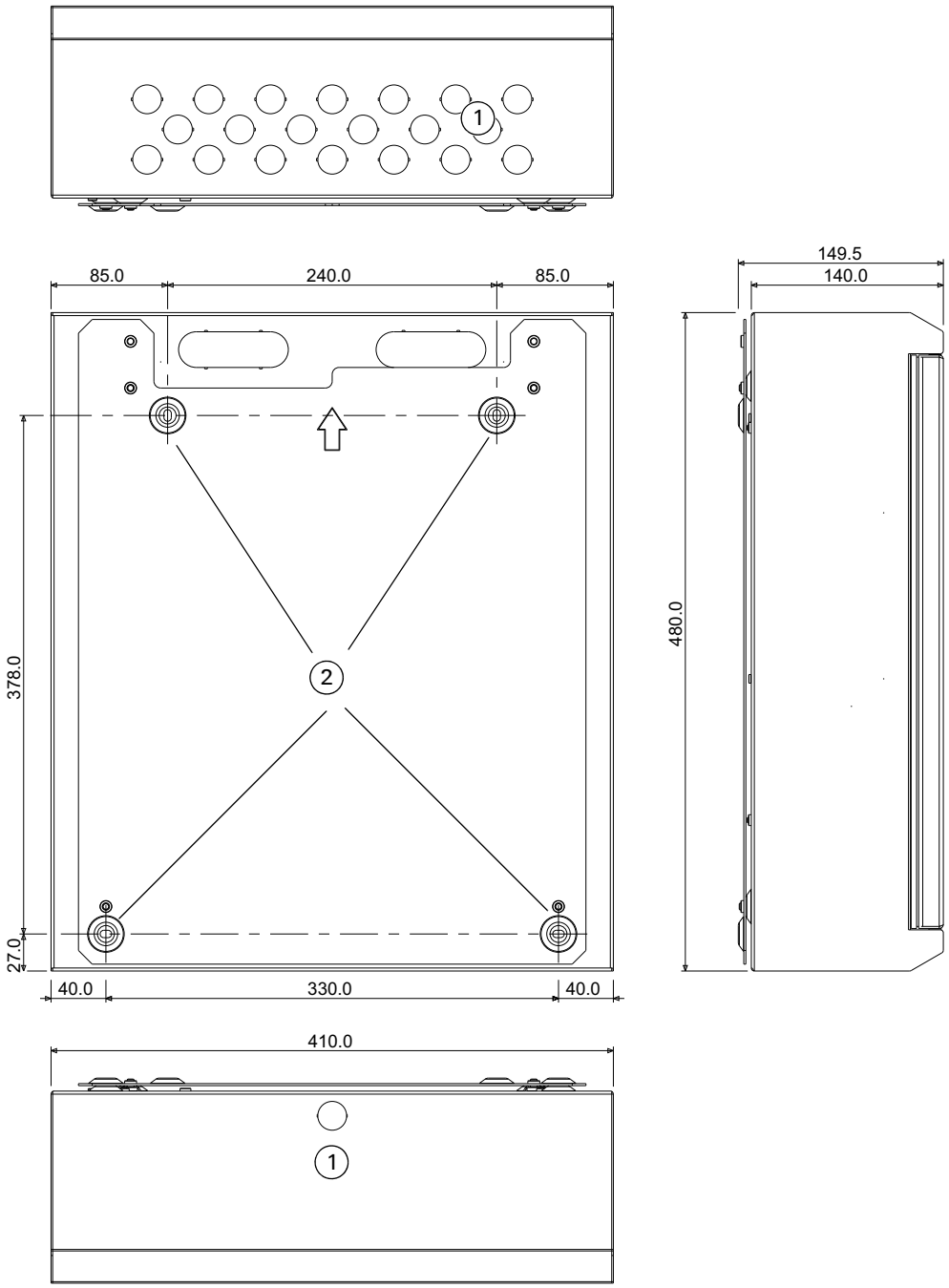

Fig. 9: Single Loop Panel Shallow and FC8AS FireClass FC700 series AC Repeater - Overall and Fixing Dimensions
1 – Knockouts Ø 20 mm (13x)
2 – Knockouts

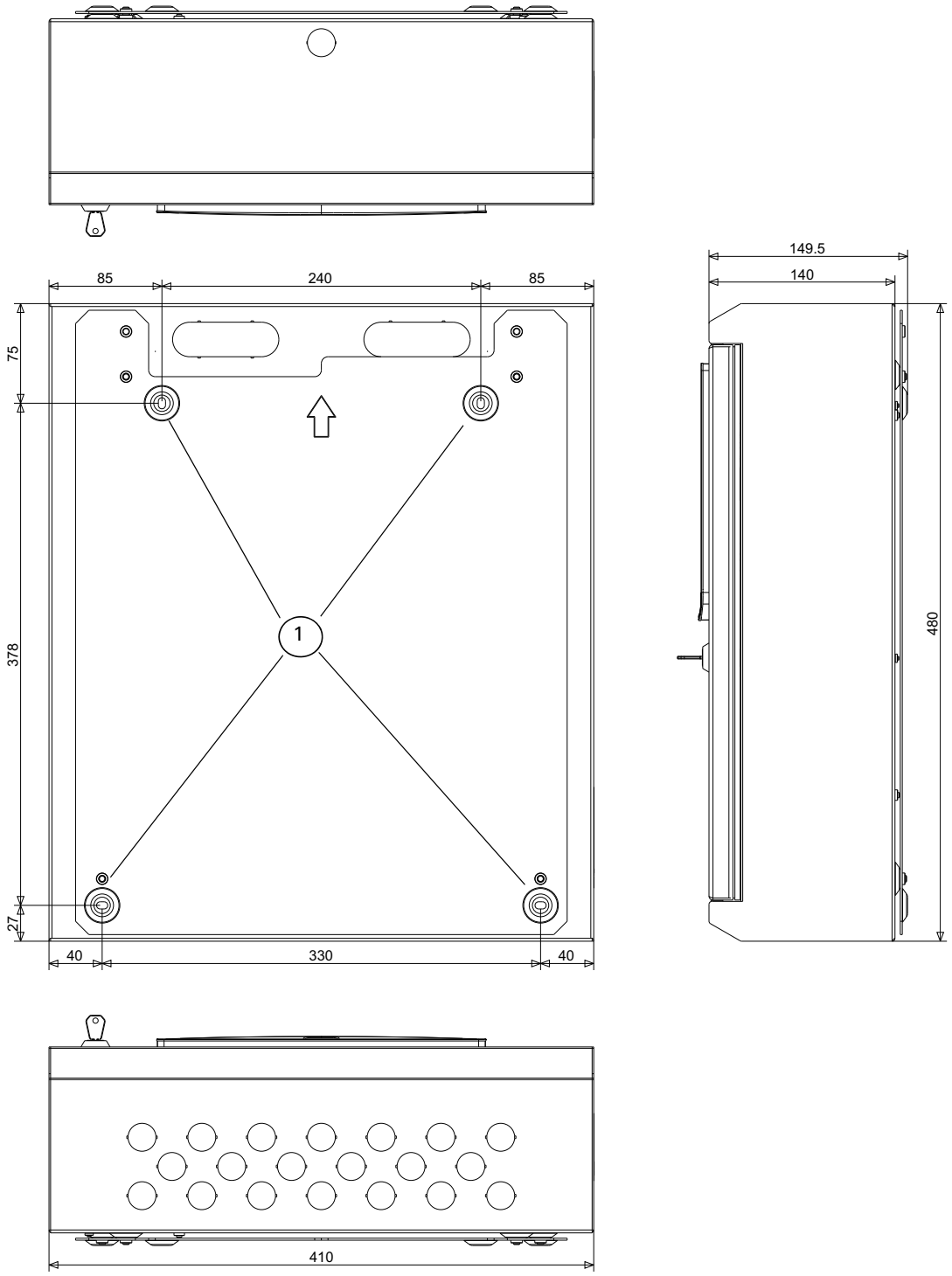

Fig. 10: FC702S- Mounting plate fixing and overall dimensions in mm
1– Mount-to-housing fixing screw holes

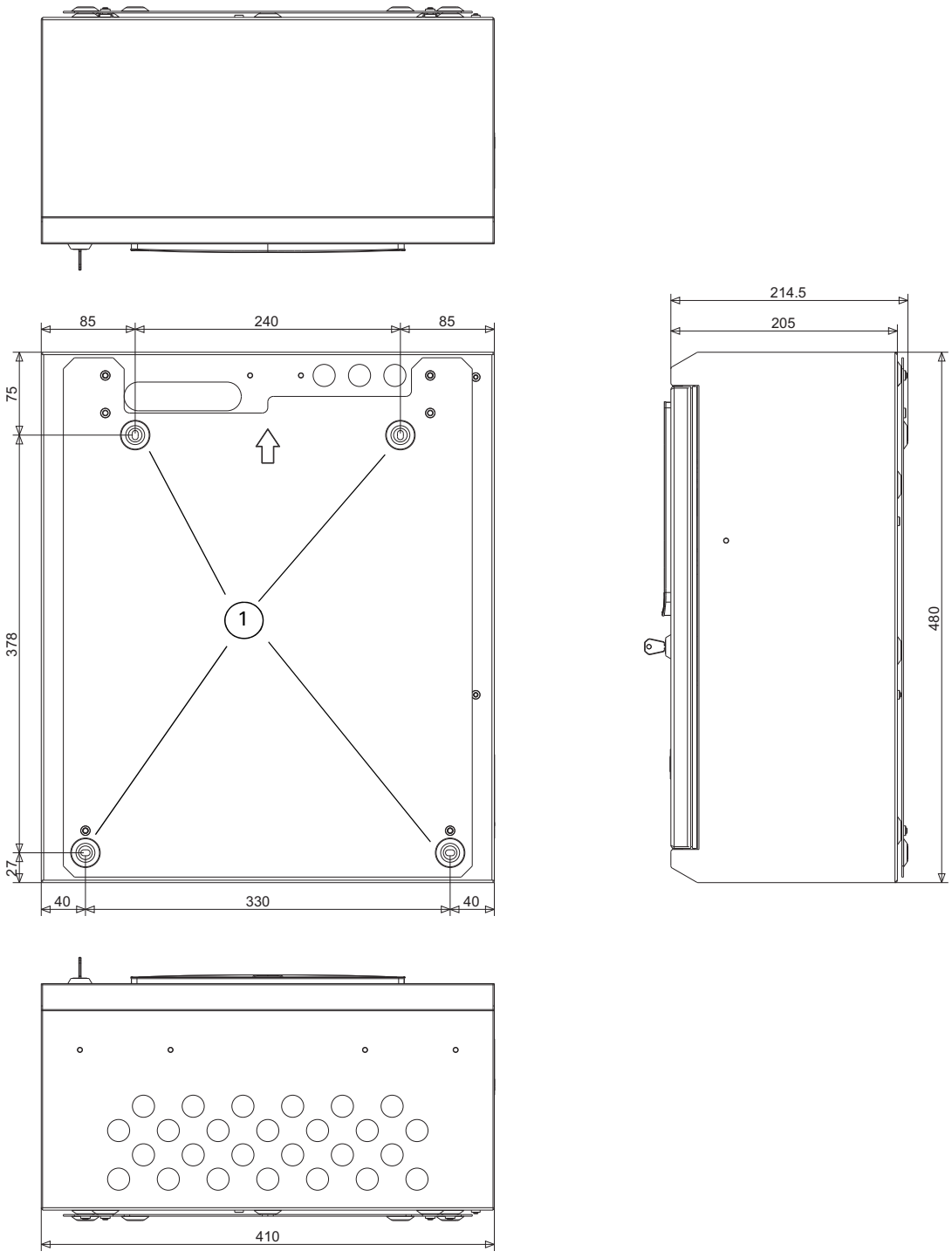

Fig. 11: FC702D, FC718D, and FC708D panel mounting plate fixing and overall dimensions
1 – Mount-to-housing fixing screw holes

2.9 Slot Cards and Slot Card Cage Hosted Boards

A variety of modules are available as slot cards, that can be installed by simply inserting them into a slot card cage. This applies only to panels with a slot card cage. Legacy (older style) cards can be housed within the slot card cage, but without being plugged into the slot card backplane. In the case of the FC702S panel, cards can be mounted using stand-offs.

Table 5 summarises the available cards, with links to further information.

Card	Function	More details on page
POS800	Ethernet Switch Fibre Optic	21
PCS800	Ethernet Switch Copper	21
PNI800	Network Interface	22
FB800*	Fuse board	22
PLX800	Loop Expansion	22
IOB800*	Input/Output Expansion (old style)	22

Table 5: Slot Cards summary

** See Section 2.9.7 "Legacy Boards in the Slot Card Cage" on page 22.*

For order codes see section 7.2 "Ordering Codes" on page 41.

A typical slot card installation involves some or all of the following steps:

- Checking the slot card has been programmed into the panel configuration.
- Setting the addressing DIP switch to match the configured address.
- Inserting the card into a slot.
- Attaching the securing metal bracket.
- Connecting additional wiring (such as loop wiring).

2.9.1 POS800 Ethernet Switch Fibre Optic Slot Card

This module provides Ethernet interfacing capability. It can be used to interface with some repeaters, particularly when the repeater is placed a long distance from a panel or when a cable runs through a harsh environment.

Fig. 12: POS800 Slot Card

2.9.2 PCS800 Ethernet Switch Copper Slot Card

This module provides Ethernet interfacing capability. It can be used to interface with some repeaters, particularly when the repeater is placed a long distance from a panel or when a cable runs through a harsh environment.

This card supersedes the previous RDS800 card.

Fig. 13: PCS800 Slot Card

2.9.3 PNI800 Network Interface Card

Fig. 14: PNI800 Slot Card

Use this to connect units together to form a network, such as two control panels. This supersedes the TLI800 (/EN) board

2.9.4 FB800 Fuse board

This is an example of where the slot card cage can host an older type board – see Section 2.9.7 "Legacy Boards in the Slot Card Cage" on page 22.

For protection, when adding an additional unit that must be powered from the panel, route the power through an FB800.

2.9.5 PLX800 Loop Expansion Slot Card

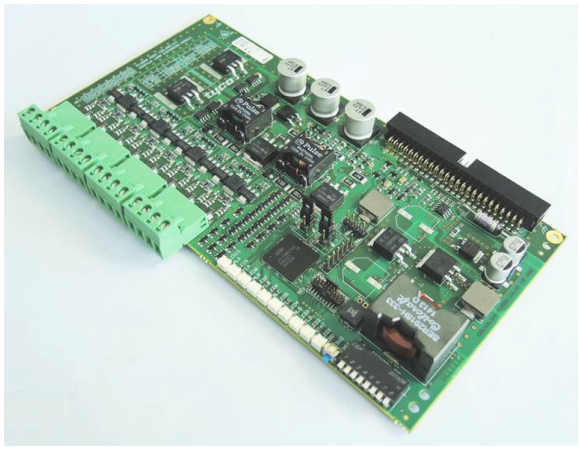

Fig. 15: PLX800 Slot Card

Adding one of these to the system adds four loop connections to the system. How (and whether) these are used depends on the system configuration (see Section 3.2 "Dividing Addresses Between Loop Pairings" on page 23). This card supersedes the XLM800 board.

The maximum number of PLX800 cards you can add depends on the panel.

2.9.6 IOB800 Input/Output Expansion

This is a 'legacy board' – see Section 2.9.7 "Legacy Boards in the Slot Card Cage" on page 22.

Use an IOB800 to obtain eight isolated relay outputs (first eight addresses) and monitor eight 24V optically isolated inputs (last eight addresses).

For information on positioning the card within the cage see Section on page 46.

2.9.7 Legacy Boards in the Slot Card Cage

Legacy (older style) boards can be hosted in the slot card cage, using a supplied adapter bracket. These boards do not electrically connect with the cage backplane – the cage only acts as a physical mounting location.

Legacy boards can be stacked using spacers (as they could in previous panel model ranges). You will need to arrange the cards and boards in the cage to allow sufficient room.

The legacy boards are indicated in Table 5 on page 21.

3 Addressable Loop

A 'loop' comprises a pair of conductors with devices (detectors, callpoints, etc.) connected in parallel between them.

The term 'loop' arises because the conductors are connected at both ends, to provide a level of protection against failure such as short or open circuits in the loop.

For cable types recommended for the loop conductors, see Section 6.1 "Cable Types" on page 39.

3.1 Loop Naming

A loop has a name to identify it in the following situations: when configuring the panel; when using the panel; and when connecting the loop. These names might be different.

To illustrate, the loops are physically labelled 'A', 'B' 'C' and 'D' on both the main FC-FI board (as shown in Figure 19 on page 34) and on a PLX800 loop expansion slot card that might be fitted. In this case, when configuring, the loop on the PLX800 'A' connector might be identified as loop 'E', for example.

Also, within the configuration a loop can be given a name that users will see when operating the panel, which can be more meaningful.

3.2 Dividing Addresses Between Loop Pairings

Not all loops will require the same number of addresses, so loops are in pairs and you can divide the total 250 addresses between them in whatever ratio you require.

You can even allocate all the addresses to one loop of the pair, and leave the other loop of the pair unconnected. For example you could allocate 250 addresses to loop 'A' and leave loop 'B' (the other loop of the pair) unconnected.

Note though that the two 'halves' of the pair are not totally independent. The loop loading constraints apply to the whole loop, so high current devices on one half of the loop might mean you need to limit the number of devices on the other half (see Section 3.8 "Loop Loading Calculation" on page 25).

After determining your ideal loop configuration, you implement this by making settings in FireClass Express.

3.3 Cabling Considerations

General

Select all cables in accordance with local standards.

For the Loop circuit wiring, refer to the latest version of the publication FireClass Loop Loading and Battery Calculations.

FireClass Loops are resilient to noise and approved for use without screened cables, however, screened cables may provide further resilience in harsher environments.

If using screened cables, the screen or metal sheath must not be connected to the addressable loop conductors and must be floating relative to earth. It is not necessary to interconnect the screen or sheath between devices.

All other cables must be of a sufficient size not to cause an excessive voltage drop (maximum 1 V for a 24 V circuit for the current required).

Note

It is a local regulation that fire alarm cables be segregated from all other (non-fire alarm) cables.

To comply with EMC directives, for the loops use the type of cabling specified in the latest version of the publication FC-D-LOOP 'FireClass Loop Loading and Battery Calculations'.

3.4 Wiring Configurations

The term "loop" is commonly used for the addressable circuit. This is because the usual configuration is for both ends of the circuit wires to be connected at the control panel to the "Left" and "Right" connectors.

The Loop configuration is favoured because it can help with the fault tolerance of the system (see "Isolators" below), and also helps limit voltage drops.

This is not the only configuration however. A "spur" is a section of addressable circuit only connected at one end.

There may be a mixture of loops and spurs. For example you can interface the addressable circuit to a conventional detector circuit using a FC410DIM, and this conventional circuit could be wired as a spur.

3.5 Short Circuit Protection

The following sections provide details of the control panel's internal short circuit protection, and the measures you can take to protect against short circuits in the loop.

3.5.1 In-built Panel Protection

To protect the control panel from short circuit damage, the Left and Right connectors of the control panel are shut down on the detection of a short circuit.

With no isolator bases fitted, this would shut down the whole loop and prevent it from functioning.

3.5.2 Isolators

Isolators or "line isolators" to be more specific divide the loop into sections, that can be individually shut down in the event of a short circuit.

Isolators are inserted into the loop. They normally allow continuity, but on detecting a short, they open and disconnect the shorted section of the loop. There is now a non-functioning section to one side of the isolator, and a functioning section on the other side (that includes the isolator itself).

Isolators are bi-directional, so they can shut down the loop to the left or to the right of themselves.

By using two isolators you can limit the non-functioning section to the section between the isolators (so the non functioning section is only between the two nearest isolators either side of the short).

A number of devices include the functionality to act as isolators. This includes the following devices, for example:

- Dedicated isolators such as the FC410LIM.
- Isolator bases, such as the "4BI" (here the "I" designates the isolator version of the "4B" base)
- TSM800 Door Control Modules
- FC410DDM universal fire and gas detector modules.
- LP Symphoni sounders.
- FC410LPAV Symphoni sounders.
- FC410LPAV sounder-beacons.
- FC430LPSB sounder-beacons.
- FC440AVB/FC441AVB addressable base sounder beacon VAD
- FC440AVW/FC440AVR/FC445AVR addressable wall sounder beacon VAD
- FC440SB addressable base sounder
- FC440AIB addressable base sounder beacon VID
- FC440SW/FC440SR/FC445SR addressable wall sounder
- FC440AIW/FC440AIR/FC445AIR addressable wall sounder beacon VID
- FC440CAVB addressable base sounder beacon VAD BC
- FC445CAV addressable wall sounder beacon VAD BC
- FC440DSB detector base sounder
- Quad Modules

3.5.3 Isolator Loading

Each device positioned between isolators places a load on the isolators. This load is measured in "IB Units". The IB Units of devices varies between the device types. There is a total IB unit loading that must not be exceeded.

There is also a loading that the isolators themselves place on the loop.

You need to allow for these factors when designing the loop – see Section 3.8 "Loop Loading Calculation".

For a full HP loop, no more than 128 isolators can be fitted, but see also Section 3.2 "Dividing Addresses Between Loop Pairings" on page 23.

3.6 Protocol

The protocol that is used for communications between the control panel and devices on the addressable loop is termed as the 'FireClass Digital Protocol'.

This protocol is very robust and reliable and uses a Frequency Shift Keying (FSK) technique.

3.6.1 Loop Addresses

There is a maximum of 250 addresses on each loop (the actual number varies – see Section 3.2 "Dividing Addresses Between Loop Pairings" on page 23).

To use the addresses, you populate them with devices. Any possible combination of addresses can be used – you do not need to use a contiguous block of addresses for example.

Note that there may not be enough power available to fully populate the loops with devices - refer to the latest version of the publication FC-D-LOOP 'FireClass Loop Loading and Battery Calculations'.

Generally each device occupies one address. There are exceptions, for example:

- A FC410MIO which may use seven addresses.
- A FC410DDM which may use four addresses.
- A FC410QIO which may use eight addresses.
- A FC410QMO which may use two or four addresses.
- A FC410QRM which may use two or four addresses.

3.6.2 Detector Address Programming

Each device is programmed with the loop address that it is going to occupy (this is a separate step, the device can be programmed 'offline' using a programming tool, for example).

Because the loop address is allocated to a zone (such as 'Boiler Room'), this associates the device with that zone. So now, if a detector or call point device activates, we know where in the building the alarm has originated.

DANGER

Possible death, serious injuries or damage to property.

The zone allocation is within the detector, not the detector base. This means that if you remove a detector and re-install it in another zone, in an alarm the zone indication at the panel will be incorrect.

If you do move a detector, check the system configuration, and change this if necessary.

3.7 Intrinsically Safe Design

A range of devices and modules are also available as an intrinsically safe version, for use in special hazards areas. For additional information on intrinsically safe detectors, refer to the FireClass website and Section 5.1 "Documentation".

DANGER

Incorrectly designed intrinsically safe systems may lead to possible death, serious injuries or damage to property.

The design of such systems must be in accordance with local regulations.

The regulations will typically stipulate the following: the designer of the system is suitably qualified; the system design is correctly documented; the nature of the hazard is obtained from the customer; a survey is carried out to determine the proximity of the safe area to establish cable runs.

3.8 Loop Loading Calculation

Each device placed on a loop imposes various loads on the loop, such as a current draw and associated voltage drop.

You need to stay within the maximum loadings for loops, and to help with this use the latest issue of FC-D-LOOP 'FireClass Loop Loading and Battery Calculations'.

You can also use the PC application 'FireClass Designer Pro', available for free download.

Note that loop loadings apply to both halves of a loop pairing taken together, so the devices you can fit to one half of the pair may be constrained by the devices you have fitted to the other half of the pair.

3.9 End Of Line Termination

There may be a need for EOL (End Of Line) termination, for example at the end of a section of conventional devices interfaced to the main loop using a FC410DIM.

This is for implementing fault detection, where an EOL resistor creates a known standing current value, and large departures from this are signalled as open or short circuit faults.

Examples requiring EOLs are as follows:

- On conventional detector circuits, interfaced using a FC410DDM.
- On monitored circuits, interfaced using a FC410CIM.
- On sounder circuits interfaced using an FC410SNM or SNB520.

Terminating resistors are supplied with their units.

3.10 Device Compatibility

To quickly determine the compatible devices, use FireClass Express, which is a Windows PC software application (for more details see 5.2 "Software" on page 38).

In this application you start by specifying the type of your panel – you would choose one of the FireClass FC700 series range. You then move on to populating the loop addresses with devices, by selecting the device type at each address from a list. This list will only include the compatible device types.

To obtain the device product code, you can then refer to Section 7 "Ordering Information" on page 41. Alternatively, search for the type of device in the FireClass website (see Section 5 "Web Based Resources" on page 38).

3.11 Detectors and Other Loop Devices

For information on detectors and other loop devices refer to their specific documentation. For example there is a product application and design information guide to the FC460 FireClass detectors as a whole.

4 Connections

There are various connection types involved in the system, from simple two wire relay based connections to expansion buses requiring additional interfacing boards and panel network connections. Any interfacing boards, as with other devices, will need to be configured into the system using FireClass Express.

4.1 System Diagram

Figure 1 6 summarizes the various connections to the main FC-FI board.

Further details of some of these connections are provided in the following sections.

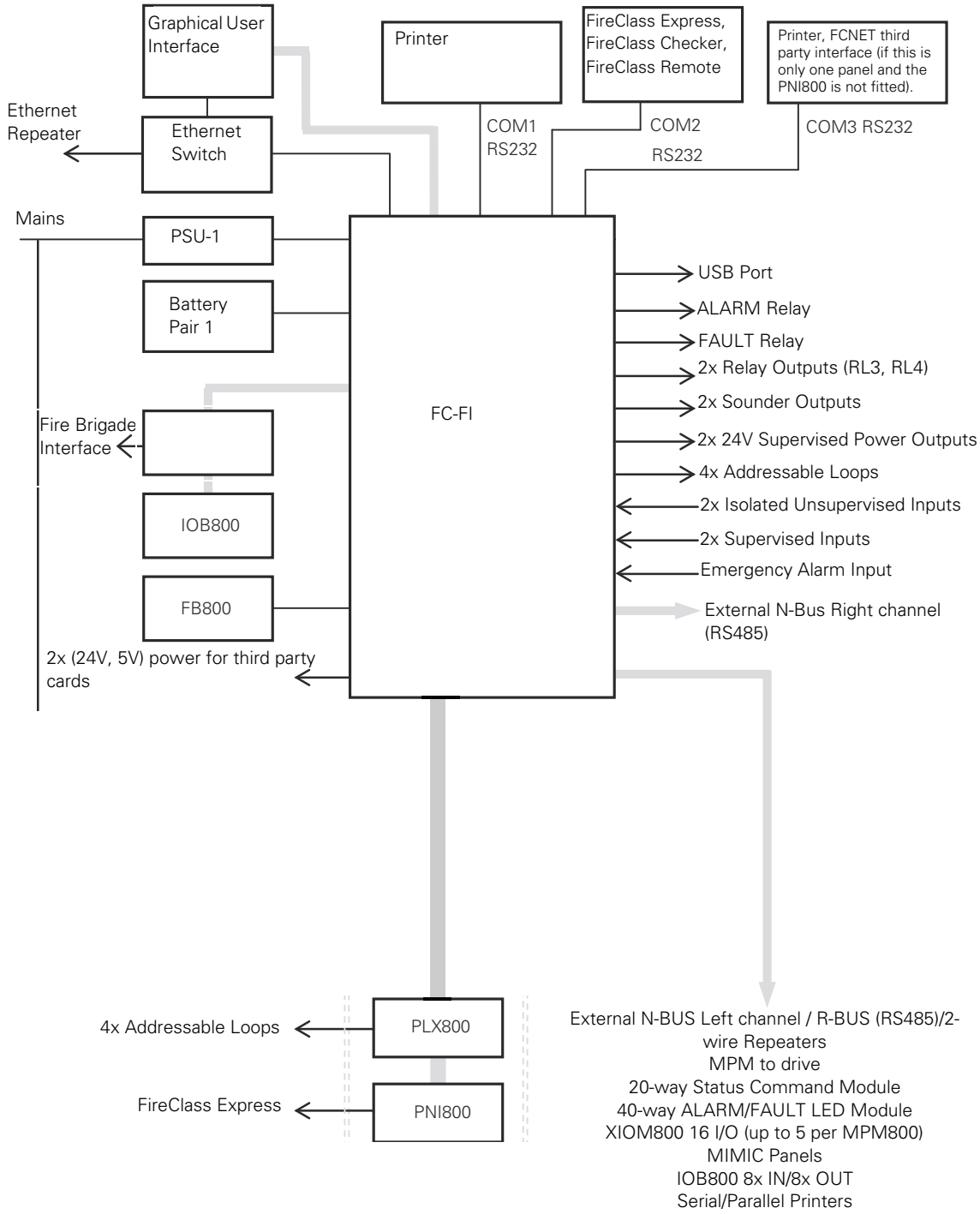

Fig. 16: System diagram – standard and optional components.

4.2 FCNET

Several control panels can be networked together using FCNET. Any panel can be used as a remote control and monitoring point for the system.

The networked panels are not all strictly equivalent, as one panel must be designated as the 'Date and Time' panel, for example.

To network a panel a PNI800 slot card must be fitted. Instead of using a PNI800 and a TLI800, you may use

COM3 to network a single panel and third party network interface at maximum distances up to 25m.

4.3 Printers

Printers can be used, for example, to output details from event logs, such as fault events.

The printer output is in the form of ASCII text, so a standard line printer would be compatible, for example.

As a desktop printer, the Minerva printer LQ-300 can be ordered.

Printers can be connected to the "COM1" serial port of the control panel.

Alternatively, for more distant locations from the panel, the printer can be driven using an intermediate MPM800 Multi Purpose Interface Module.

Note that when using an MPM800 to drive a mains-connected printer, a serial isolation module should be used to eliminate potential earth fault indications.

4.4 Loops

There are four left/right pairs of loop connectors on the FC-FI, each with positive and negative pins. There is a connector block labelled "XT3" with further "LOOP A, L+ and L-" and ""LOOP C, L+ and L-" labelling. Similarly there is an "XT4" connector block for "LOOP B and "LOOP D".

The loop wires are connected using screw terminals into a plug, which is then inserted into the board sockets.

There is short circuit protection on the loop interface (see section 3.5 "Short Circuit Protection" on page 23).

4.5 BUS Based Connections

Figure 17 shows the two BUS based expansion options.
Further details are supplied in the following paragraphs.

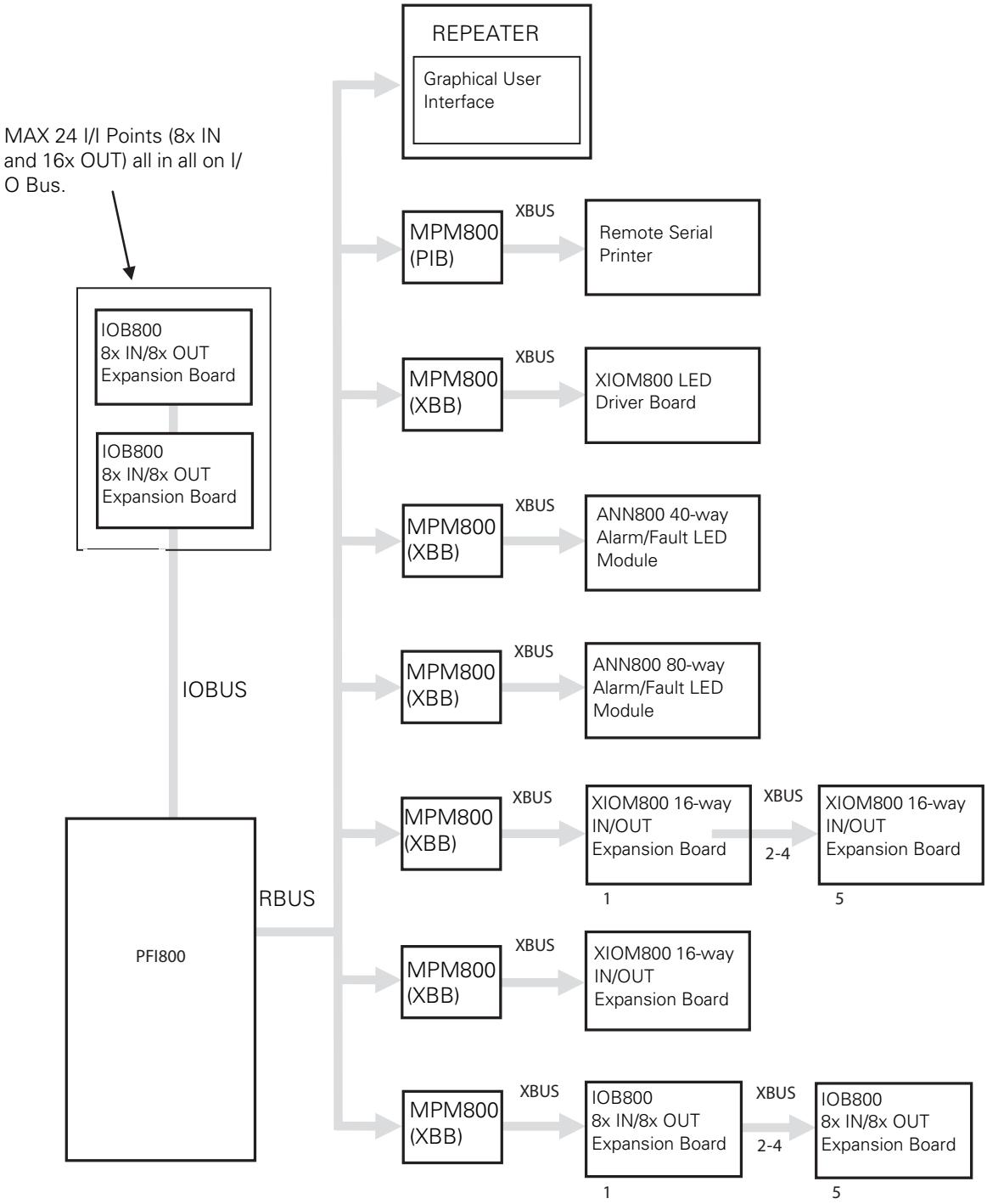

Fig. 17: Bus Connections

4.5.1 RBUS

The RBUS is used for interfacing with repeaters and proprietary system expansion modules, such as an ANN820 annunciator (as opposed to the IOBUS which you can use to interface with your own custom circuitry).

The RBUS connector is labelled "XT1 - LEB/RBUS" on the PCB. The RBUS is an RS485 asynchronous bus using a differential wire pair and running at up to 19.2kb. The maximum length is 1200 m.

The RBUS has 16 available node addresses. These are set, for example, using DIP switches on an MPM800. Note however that the maximum number of RBUS devices that can be supported is also affected by other factors, such as MPM "personality".

The bus must be terminated with a 120 Ohm resistor beyond the last device on the bus.

Earth loops are likely on a large site where mains powered repeaters are used, powered from a distant point on the building mains wiring. This is especially true if the repeaters are on a different phase of a three phase supply. Please ensure that AC repeaters are on the same phase and the installation earthing is properly made. If issues persist, use the fibre optical switch in the panel and the AC repeater housing.

4.5.2 IOBUS

The IOBUS is used for communicating with your own devices. Typically these will be door or air conditioning control relays. The IOBUS is labelled "XP3 - IOBUS" on the PCB.

Your devices are driven via an intermediate IOB800 (8 input, 8 output board, with 8 inputs and 8 outputs.

The IOBUS has 24 addresses – it supports up to 16 outputs (for controlling LEDs or relays for example), and can read up to 8 inputs.

The IOBUS can drive one or two IOB800 boards. If two IOB800 boards are driven, not all the available input/output ports can be used.

You can also interface by connecting the IOB800 board to the RBUS, this has the advantage of allowing the IOB800 to be positioned further away from the panel, for example.

4.6 Simple State-Switching FC-FI Connection Details

Fig. 18 shows the FC-FI simple state-switching connections (that is the connections that are not for complex communication with, for example, printers and expansion modules).

All terminals accept solid/stranded conductors from 0.5 to 2.5 mm^2.

For the technical specifications (such as the relay ratings), see Table 21 on page 44, in the "Collected Specifications" section.

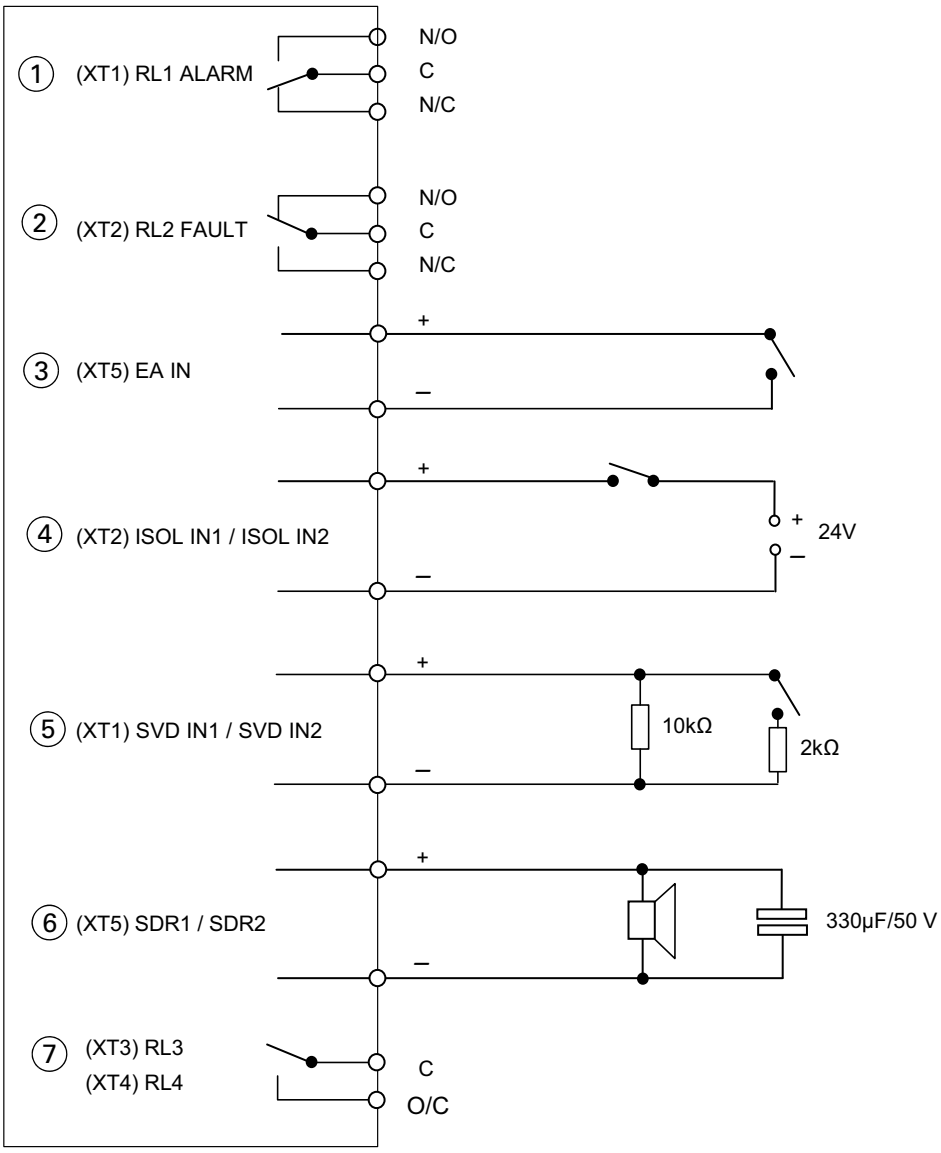

Fig. 18: FC-FI board connections (the labels match those printed on the FC-FI board – the '(XT..)' part is the connector block, followed by the pin labels)
1– Alarm relay. Shown in the "normal" position (no alarm). See Section 4.6.1 "Alarm and Fault Signalling Relays" on page 33.
2– Fault relay. Shown in the "normal" position (no fault). See Section 4.6.1 "Alarm and Fault Signalling Relays" on page 33.
3– Emergency Alarm Input. See Section 4.6.2 "Emergency Alarm Input" on page 33.
4– Isolated Unsupervised Input – see Section 4.6.3 "Isolated Inputs" on page 33.
5– Supervised Inputs – see Section 4.6.4 "Supervised Inputs" on page 33.
6– Sounder Outputs – see Section 4.6.5 "Sounder Outputs" on page 33.
7– General Purpose Relay Outputs - see Section 4.6.6 "RL3 and RL4 Outputs" on page 33.

4.6.1 Alarm and Fault Signalling Relays

These are outputs from the board. The relays change over to indicate fault or alarm conditions.

The Alarm relay, for example, can be used to interface with public signalling systems, such as the British Telecom system (BT Redcare).

The relays change over as shown in Figure. 18.

The Fault relay is energised when there are no faults, and the switch position is as shown in the figure. When there is a fault the relay coil is de-energised and the switch changes over. With no power to the board to energise the coil, the relay is in its "fault" position. The Fault relay coil is not monitored.

The Alarm relay is coil is de-energised when there is no alarm. When there is an alarm the coil is energised and the switch changes over. With no power to the board to energise the coil, the Alarm relay is in its "no alarm" position. The Alarm relay coil is monitored, so a faulty coil results in a fault event.

NOTICE

Danger of equipment damage.

Do not use the Alarm and Fault relays to switch mains voltages.

4.6.2 Emergency Alarm Input

Use this as an external alarm input.

Emergency alarm signal is a part of signals distributed using the internal N-BUS.

4.6.3 Isolated Inputs

Optionally use this for your own custom purposes. Apply a voltage to this connector to signal an input to the control panel. Change the panel configuration to make use of this input.

4.6.4 Supervised Inputs

There are two supervised inputs on the FC-FI board.

These are for receiving a two state signal, applied by an external circuit.

For signalling, the circuit needs to change resistance between high and low (so it could be a simple switch for example). This is for general use, as defined in the configuration.

The external circuit must include the resistors shown in Figure. 18. These resistors allow short and open circuit monitoring of the wiring.

4.6.5 Sounder Outputs

There are two local sounder outputs from the FC-FI. These cannot be loop connected.

A number of sounders can be connected in parallel to the outputs. Beyond the last sounder there must be an 'End Of Line' capacitor connected, as shown in Figure. 18. This is for short and open circuit monitoring. Non-polarized (bipolar) electrolytic capacitors must be used in this application (see Section 9.1 "Sounder End of Line Capacitor Polarity" on page 46). Suitable capacitors are supplied in the accessory kit.

If a short circuit is detected in one output this is shut down, but the other output can still operate.

The sounder outputs may be required to drive devices with 'peaky' loads, such as electromechanical bells, strobes and xenons. This must be allowed for in the current calculations.

4.6.6 RL3 and RL4 Outputs

Optionally use these volt-free relay contacts for your own custom purposes.

Use FireClass Express to change the system configuration to make use of these contacts.

4.6.7 24 V Outputs

The two 24 V outputs are for powering auxiliary devices such as a FC1DS fully functional repeater.

4.6.8 Serial Ports

There are three RS232 serial ports, which are used for communicating with the following:

- COM1 - Printer
- COM2 - FireClass Express, FireClass Checker, FireClass Remote
- COM3 - *Reserved*

4.7 Loop Based Inputs and Outputs

Note that there are also many options for making input and output connections using devices on the addressable loops, for example:

- The FC410RIM output relay device. This closes contacts when commanded by the control panel. You could use this to control door release mechanisms for example.
- The FC410CIM input relay devices. This monitors normally open or normally closed switches.
- The MPM800 multi-way input/output module.

4.8 FC-FI Main Board Details

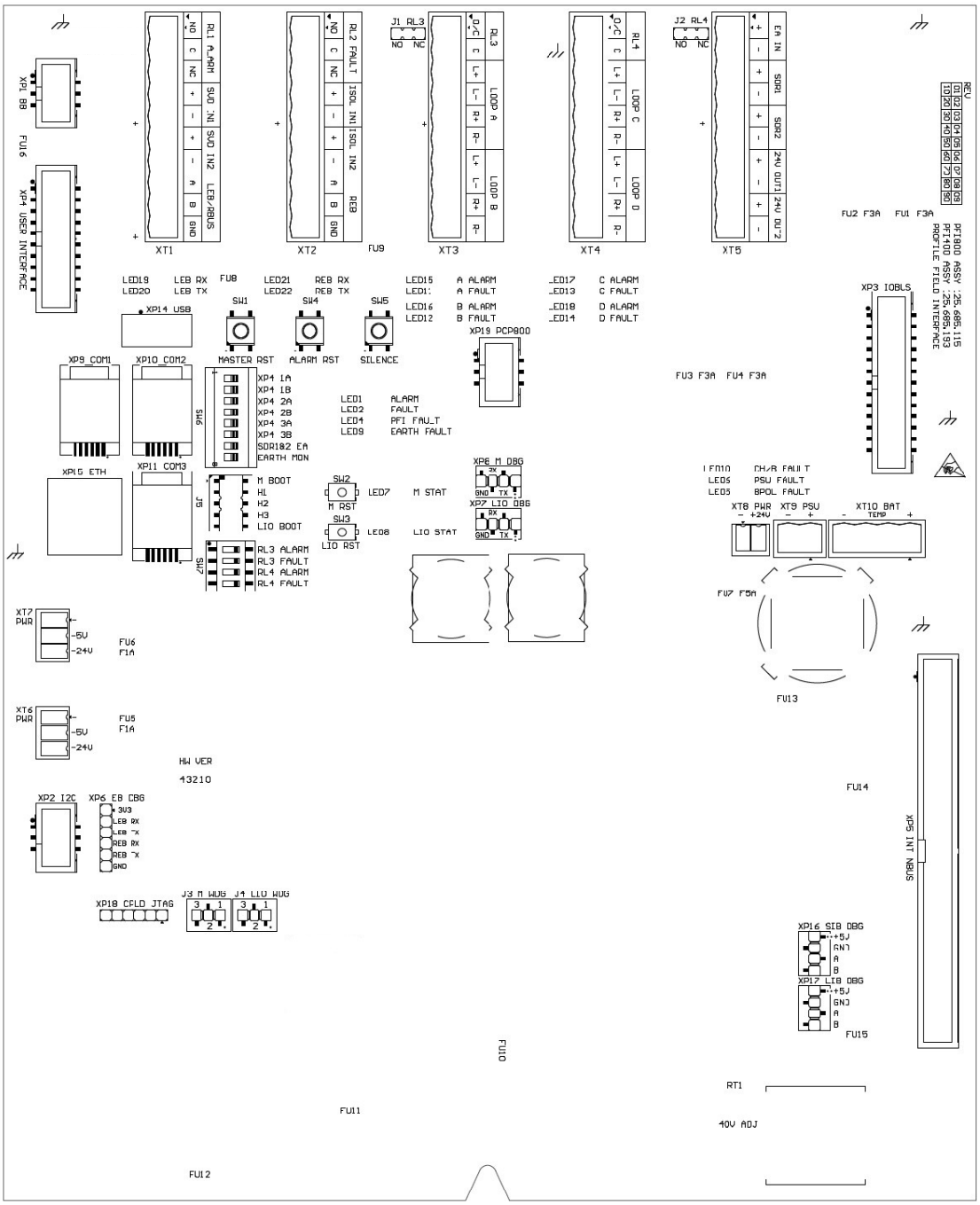

Fig. 19: FC-FI - Connector, switch and jumper positions. These are the labels as printed on the PCB itself.

PCB Label	Function
SW1	Master RESET button
SW2	MCPU RESET button
SW3	LIOMCU RESET button
SW4	Alarm RESET Button
SW5	Silence Button
SW6	Dip switch
SW7	Dip switch
J1	Jumper (Relay_3 contact options)
J2	Jumper (Relay_4 contact options)
J3	Jumper (MCPU Watchdog options)
J4	Jumper (LIOMCU Watchdog options)
J5	Jumpers (Headers H1 H2 H3, MCPU and LIOMCU Boot modes)
XT1	Terminals (Alarm Relay_1, Supervised Inp_1 Inp_2, Left Ext. N-Bus / R-Bus RS485)
XT2	Terminals (Fault Relay_2, Isolated Inp_1 Inp_2, Right Ext. N-Bus RS485)
XT3	Terminals (Relay_3, Loop A, Loop B)
XT4	Terminals (Relay_4, Loop C, Loop D)
XT5	Terminals (EA Input, Sounder Outp_1 Outp_2, 24V Power Outp_1 Outp_2)
XT6	Terminals (24V and 5V Power for Third Party Cards)
XT7	Terminals (24V and 5V Power for Third Party Cards)
XT8	Terminals (24V Power for FB800 Fuse Board)
XT9	Terminals (PSU connection)

Table 6: FC-FI DIP Switches and Connector Functions

PCB Label	Function
XT10	Terminals (Battery and Battery Thermistor connection)
XP1	Connector (Black Box front panel LEDs: Alarm, Fault, System Fault)
XP2	Connector (I2C interface, +5V Power)
XP3	Connector (IO-Bus interface for connection of IOB800 cards)
XP4	Connector (Interface for connection of internal GUI)
XP6	Connector (External N-Bus signals for debugging purpose only)
XP7	Connector (LIOMCU Debug port RS232)
XP8	Connector (MCPU Debug port RS232)
XP9	Connector (COM1 Printer)
XP10	Connector (COM2 FCExpress, FCChecker)
XP11	Connector (COM3 Printer and FCNET third party interfaces)
XP14	Connector (USB interface)
XP15	Connector (ETHERNET interface)
XP16	Connector (Internal N-Bus Service Channel signals for debugging purpose only)
XP17	Connector (Internal N-Bus Loop Channel signals for debugging purpose only)
XP18	Connector (Auxiliary JTAG for CPLD)
XP19	Connector (interconnection of external N-Bus interface with Redundant MCPU slot card)

Table 6: FC-FI DIP Switches and Connector Functions

FC-FI Optical Indicators		
LED	**State**	**Description**
LED 1 Alarm	ON OFF	Panel is in alarm state No alarm
LED 2 Fault	ON OFF	Panel in fault condition Panel in fault tree condition
LED 3 Ethernet Link (integrated into XP15 Ethernet connector)	ON OFF	Ethernet link established No link

Table 7: FC-FI optical indicators

FC-FI Optical Indicators		
LED 4 PFI Fault	ON	Possible reasons for FC-FI in fault condition: ■ Sounder 1 fuse blown ■ Sounder 2 fuse blown ■ Power 1 fuse blown ■ Power 2 fuse blown ■ Converter 24V to 5V fuse blown ■ Converter 24V to 40V fuse blown ■ FB800 fuse blown ■ MCPU dead ■ LIO card fault ■ 3.3 V failed ■ Invalid or missing configuration file
	OFF	FC-FI in fault free condition
LED 5 BPOL Fault	ON OFF	Battery polarity incorrect Battery polarity correct if fitted
LED 6 PSU Fault	ON OFF	PSU Fault No PSU Fault
LED 7 M STAT	ON BLINK OFF	Main CPU Fault/Power up (<15s) 0.5s ON / 0.5s OFF Normal function 5V/3.3V Missing
LED 8 LIO STAT	ON	LIO CPU Fault
	BLINK	0.5s ON / 0.5s OFF Normal function 0.1s ON / 0.9s OFF Firmware update mode
	OFF	5V/3.3V Missing
LED 9 EARTH Fault	ON OFF	Current leakage to earth detected No fault
LED 10 CH/B Fault	ON OFF	Charger or Battery Fault No Fault
LED 11 A Fault	ON OFF	Loop A fault Loop A fault free
LED 12 B Fault	ON OFF	Loop B fault Loop B fault free
LED 13 C Fault	ON OFF	Loop C fault Loop C fault free
LED 14 D Fault	ON OFF	Loop D fault Loop D fault free
LED 15 A Alarm	ON OFF	Loop A in alarm condition Loop A quiescent
LED 16 B Alarm	ON OFF	Loop B in alarm condition Loop B quiescent
LED 17 C Alarm	ON OFF	Loop C in alarm condition Loop C quiescent
LED 18 D Alarm	ON OFF	Loop D in alarm condition Loop D quiescent

Table 7: FC-FI optical indicators

FC-FI Optical Indicators
LED 19 LEB RX
Left External N-BUS (RBUS) RX Activity indicator
LED 20 LEB TX
Left External N-BUS (RBUS)TX Activity indicator
LED 21 REB RX
Right External N-BUS RX Activity indicator
LED 22 REB TX
Right External N-BUS TX Activity indicator

Table 7: FC-FI optical indicators

5 Web Based Resources

5.1 Documentation

All the documentation related to FireClass FC700 series fire alarm systems can be downloaded from the FireClass web site, in PDF format. This documentation may help in the design process.

There are alternative ways you can navigate to this documentation – from a link on the FireClass FC700 series control panels page, or from a link to an archive of published documentation.

The documentation includes the control panel installation and user guides, as well as documentation on the detectors and ancillaries. More details are provided in sections below.

There is also a "FireClass brochure" which lists the products available, along with their product codes, and brief specifications and application information. This is potentially more up to date than the information in this product application and design guide.

5.1.1 Documentation Set

At the time of writing, the following guides are provided for the FireClass FC700 series control panels:

- Installation Guide
- Commissioning Instructions

  This covers providing a supplied kit of parts delivered to the building, and handing over to the site personnel as a tested and operational fire alarm control system.
- User Guide

  This covers the day to day operation of the control panel. It includes, for example, details on what to do if faults are indicated, and how to isolate devices to prevent false alarms.
- Product Application and Design Guide

  This guide.

5.2 Software

Also available for download on the FireClass web site are various supporting PC software applications, as detailed in this section.

(There are also references to these applications as appropriate throughout the rest of the manual.)

For more details on using the applications, use the online help file, as accessed from the **Help** menu.

5.2.1 FireClass Designer Pro

This is an application that helps in the design of systems based on FireClass FC700 series fire alarm control panels. There is also a FC-D-LOOP 'FireClass Loop Loading and Battery Calculations' document for panels, that you can use instead of FireClass Designer Pro, or in conjunction with FireClass Designer Pro.

This application is referenced as appropriate in other sections of this manual.

One function FireClass Designer Pro is to calculate the required backup battery size, based on your entered system parameters. These parameters include the type of device at each address, for example.

Another function helps you keep to the maximum number of devices between isolator bases.

FireClass Designer Pro can be freely downloaded and used.

5.2.2 FireClass Express

This is the Windows PC application into which you enter the configuration of your system.

The panel needs to be configured with details such as the type of detector at each address, the cause and effect mappings between input and output states, and networking details.

You start with some pre-made settings from a standards-compliant "template". You then tailor these with the details of your individual system (you are warned if you change to non-compliant settings).

You then transfer the configuration to the control panel using a USB flash drive.

To be compatible with the latest FireClass FC700 series range of panels, use the latest version of FireClass Express.

6 Cabling Considerations

6.1 Cable Types

Table 8 shows the cable types that should be used to comply with EMC requirements.

CAUTION
No other cables should be run with the Mains Cable.

Application	Cable Type
Addressable loops	Refer to the latest version of the publication FC-D-LOOP 'FireClass Loop Loading and Battery Calculations'.
Mains	Mains cable installation must follow local requirements. Generally, MICC, SWA (using a suitable termination gland) or 'foil and drain wire type' fire resistant cable (terminated with an SHV or CXT type gland) can be used. However, it is necessary to maintain the minimum diametre of wires with respect to panel input current.
Remote BUS	'Foil and drain wire type' fire resistant cable (terminated with an SHV or CXT type gland). MICC, SWA (using a suitable termination gland).
Serial Outputs	To connect serial outputs, FCC68 cable is recommended.
Network	Refer to the PNI800 Fixing Instructions document for the recommended cable based on speed, distance and EN54-13 compatibility.

Table 8: Compliant Cable Types

6.2 Remote BUS Cabling

Higher baud rates require lower capacitance network cabling.

Table 9 shows the maximum capacitance for each baud rate (with the cable terminated with an SHV or CXT type gland) The resistance of the cabling, between conductors, is assumed to be no more than 75 Ω.

Baud Rate	Maximum Capacitance
38,400	0.3 µF
19,200	0.6 µF
9,600	1.2 µF

Table 9: Cable Capacitance

6.3 Foil and Drain Types

The following 'foil and drain wire type' fire resistant cables are suitable:

Wire Type	Cable Type
Dätwyler	Lifeline
DELTA	Firetuff
FABRICA CAVICEL	Firecell
HUBER+SUHNER	Radox FR
PIRELLI	FP range
DRAKA CALFLEX	Calflam
RAYDEX	FG950
GEC AEI	Firetec
TRATOS CAVI	Firesafe
ALCATEL	Pyrolyon

Table 10: Foil & Drain wire type fire resistant cables

The following 'foil and drain wire type' cables are suitable:

Cable type	Line resistance	Line capacity
J-Y(ST)Y n x 2 x 0.8	73.2 Ohm/km	100 nF/km
J-Y(ST)Y n x 2 x 0.6	130 Ohm/km	100 nF/km

Table 11: Cable parameters

6.4 Cable Routing

Plan cable routing to minimise coupling effects.

In particular, avoid running power and signal cables in the same conduit or trunking.

If it is unavoidable to run power and signal cables together, keep to the minimum cable separations in Table 12.

Voltage	Separation (m)	Current	Separation (m)
115 V	0.30	5 A	0.30
240 V	0.45	15 A	0.35

Table 12: Power Cable Separation Distances

Voltage	Separation (m)	Current	Separation (m)
415 V	0.58	50 A	0.50
3.3 kV	1.1	100 A	0.60
6.6 kV	1.25	300 A	0.85
11 kV	1.4	600 A	1.05

Table 12: Power Cable Separation Distances

Note
If grommets or bushings are used to secure cabling to the panel, they must have a flammability rating of Class HB or better.

The Mains Supply to the panel must be separated from other field wiring. The Mains Supply must enter through a different knockout.

6.5 Earthing

All exposed metalwork and cabling conduits must be returned to earth via a suitable copper conductor back to the panel. System 0 V MUST NOT be connected to earth.

The earthing stud in the top left hand corner of the panel MUST BE connected to earth.

The control panel must be connected to a low resistance protective earth. If provided, the earth of the incoming AC Mains Supply can be used as the protective earth of the panel. The recommended thickness for normal installations is at least 1.25 mm^2.

The protective earth is required for:

- Safety; if the housing becomes live.
- For correct functionality of the EMC filters inside the panel.

Particularly in harsh environments, an additional low resistance earth conductor connected to the solid earth bar in the closest distribution unit may be necessary (stranded wire > 2 mm^2). Note that earthing via the mains distribution may not provide the best path for HF currents.

Note
Earthing should be to IET Regulations and conform to local standards.

6.6 Cable Glands

Cables are led through a suitable knockout in the control panel housing wall. Fit the knocked out holes with suitable cable glands. To maintain IP30 pass test status, use a M20 cable gland with a locknut.

7 Ordering Information

7.1 Ordering Codes in FireClass Designer

The FireClass Designer PC application indicates product codes. To discover the product code of an item, select the item in the Tree view, and look up the code in the "Quick Properties" window.

For example, in the Tree click on the "+" of Loop A to expand the loop and see its devices, then click on a detector to select it, then switch to the Quick Properties window to see the code.

7.2 Ordering Codes

Product Code	Item
557.200.954	FC1DS FireClass Fully Functional Repeater
557.200.955	FC1D2 Display Only Repeater
557.200.956	FC8AS FC 80 Zone AC Repeater
557.200.957	FCZ4DS FireClass 40 Zone Display
557.200.958	FCZ8DS FireClass 80 Zone Display
557.200.959	FC-PRT Printer Module in Housing
557.200.949	FC702S:1 -2 Loop FireClass Panel
557.200.950	FC702D:1 -2 Loop FireClass Panel
557.200.952	FC718D:4-8 Loop FireClass Panel
557.200.951	FC708D: 4-8 Loop FireClass Panel
557.200.960	FC-ANC Ancillary Housing
557.200.961	FC-FI: FireClass Panel Main Board (Replacement Unit)
557.200.962	FireClass RFID Cards, 5 Units
557.200.963	FC-ANC-E Empty Ancillary Housing
557.202.842	PLX800: FireClass Loop Expansion Slot Card
557.202.844	PNI800: FireClass Network Interface Slot Card*
557.202.859	POS800-S: Fibre Optic Switch Single Mode
557.202.862	POS800-M: Fibre Optic Switch Multi-Mode
557.202.860	PCS800: FireClass Ethernet Switch

Table 13: Order Codes - Control Panels, housing, and accessories
** Must be ordered with one P-EXP panel expansion kit (557.202.807) for each FC702S panel.*

Product Code	Item
557.202.804	Rack Mount Kit for GUI Repeater and Zonal Repeater
557.201.513	Document Holder Attachment Fitting Kit
557.202.006	IOB800 (8in/8out) Expansion Board
557.202.100	FB800 Fuse Board 15 Way*
557.202.805	P-KEY FireClass Enable Key Kit
557.202.801	P-WSH FireClass Display Wall Mount Shallow
557.202.802	P-WDP FireClass Display Wall Mount Deep Backbox
557.202.871	Flush Mount Kit Repeater
557.301.014	Spare Paper Roll (Pack of 5)
557.180.244	External Printer EPSON LQ350 Dot Matrix Printer
557.180.220	LQ 300+ Printer Ribbon Spare
557.202.117	Serial Printer Cable for MPM800 or FIM800
557.200.757	Semi Flush Fire Alarm Panel Steel Bezel Painted 480 mm x 410mm
557.200.752	Semi Flush Fire Alarm Panel Bezel Stainless Steel 480 mm x 410mm
557.202.806	CWJB Cavity Wall Double Gang Junction Box

Table 13: Order Codes - Control Panels, housing, and accessories
(cont.) Must be ordered with one P-EXP panel expansion kit (557.202.807) for each FC702S panel.*

7.3 Ordering Codes – Mechanical Parts

Product Code	Item
557.201.511	Rack Mount Kit for 480 mm x 410 mm x 140 mm Panel
557.201.512	Rack Mount Kit for 480 mm x 410 mm x 205 mm Panel
557.202.807	P-EXP Panel Expansion Kit
PS-12170	17 Ah Battery
PS-12260	26 Ah Battery
PS-12380	38 Ah Battery

Table 14: Order Codes - Mechanical Parts

7.4 Ordering Codes - GUI/Zonal Display Inserts

Product Code	Item
557.200.965	FC Language Inserts - Dutch (4 Pieces)
557.200.966	FC Language Inserts - Turkish (4 Pieces)
557.200.967	FC Inserts with Icons (4 Pieces)
557.200.971	FireClass Zonal Display Inserts

Table 15: Order Codes - GUI/Zonal display inserts

8 Collected Specifications

8.1 Panel Overall

8.1.1 Shock and Vibration

The shock and vibration resistance meets EN54-2.

8.1.2 Dimensions and Weights

Panel	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)
FC702S	480	410	140	9.7
FC702D	480	410	205	12.5
FC718D	480	410	205	12.5
FC708D	480	410	205	13
FC8AS	480	410	145	9.7
FC1DS	195	248	33	0.8
17 Ah batteries	167	181	76	6.1 each
26 Ah batteries	125	166.5	176	7.8 each
38 Ah batteries	170	197	165	13.8 each

Table 16: Dimensions and Weights

8.1.3 EMC

Product family standard EN50130-4 in respect of Conducted Disturbances, Radiated Immunity, Electrostatic Discharge, Fast Transients and Slow High Energy

EN 61000-6-3 for Emissions.

8.1.4 Environmental

Parameter	Value
Operating Temperature	-5 to + 40 °C
Storage Temperature	-20 to +70 °C
Operating and storage maximum Relative Humidity	95% RH non-condensing

Table 17: Temperature and Humidity Stipulations

8.1.5 Loop and Zone Details

Panel	Loops	Zone LEDs
FC702S	1 full loop/1-2 split loops	16
FC702D	1 full loop/1-2 split loops	16
FC718D	2-4 full loops / 4 - 8 split loops	16
FC708D	2-4 full loops / 4 - 8 split loops	80

Table 18: Loop and Zone Details

8.1.6 Battery Details

Refer to the latest version of the publication FC-D-LOOP 'FireClass Loop Loading and Battery Calculations' for Battery and Alarm Power Supply calculation".

The backup batteries are serial pairs of12 V SLA (sealed lead acid) from Power Sonic.

The batteries can maintain system operation until their combined voltage drops to 21 V, due to discharge.

Panel	38 Ah	26 Ah	17 Ah
FC8AS	No	No	Yes
FC702S	No	No	Yes
FC702D	Yes	No	No
FC718D	Yes	No	No
FC708D	Yes	No	No

Table 19: Battery Capacity
** This battery is incompatible with the battery retaining clip.*
***Limited by size constraints*

The maximum internal resistance of the battery and its associated circuitry is 0.2 Ω.

Panel	Imaxa: Ipse	Imaxb: Ipse	Imin: Ipse
FC8AS	1.9 A	2.5 A	0 A
FC708D	1.8 A	5 A	0 A
FC718D	1.8 A	5 A	0 A
FC702S	1.8 A	5 A	0 A
FC702D	1.8 A	5 A	0 A

Table 20: Maximum PSE Loads

8.1.7 Mains Power Requirement

All supplied mains power must be 230 V, 50/60 Hz. The maximum current demand of any PSU is 1.6 A.

The number of PSUs varies according to the type of panel or repeater and the system design.

The FC8AS repeater has a maximum current demand of 0.9 A.

Expanding the number of PSUs is not possible with the FC702S, FC702D, FC718D, and FC708D panels.

8.2 FC-FI Main Board

All terminals accept solid/stranded conductors from 0.5 to 2.5 mm^2.

Item	Details
Dimensions: Height x Width x Depth	22 x 240 x 270 All in mm
Input Voltage nominal from the PSU	27 V
Input Voltage range from batteries	21 V to 28.6 V
Loop support	Connectors for 4 loops.
Sounder	Two outputs of between 21V and 28.6 V. Rated at 2A continuous. Short and open circuit failure is monitored by means of a 330uF end of line capacitor. The maximum permitted cabling resistance is 6.5 Ω.
Alarm relay, Fault relay, RL3 and RL4	Changeover contacts rated at 2 A @30 VDC. Do not use below 100uA at 3 VDC. Not suitable for AC switching applications.
Supervised input	Contact input (prebiased by 5 V@10 kΩ). Capable of operating in normal and active states using the end of line (10 kΩ) and contact active (2 kΩ) resistors. Open and short circuit faults are detected at values of greater than 12 kΩ and less than 8.2 kΩ. The maximum permitted cabling resistance is 300 Ω.
Isolated input (Unsupervised)	This is a two state input. In the normal state (that is the state that also corresponds to the input not being in use), 0 V is expected on this input. The state switches when a voltage between +8V to +30V is detected (typically 24 V).
24 V Outputs	Two outputs of between 21V and 28.6 V. Rated at 2 A continuous.
Emergency Input	A short circuit between the two pins of this connectors is interpreted as an alarm.
Addressable loop	Frequency Shift Keying and communications circuit. Maximum of 250 device addresses available. 37.5 V DC maximum. The maximum supported current demand is 1 A. The loop cabling resistance must be within a limit that depends on the projected loop current demand, as calculated using FireClass Designer. The absolute maximum is 146 Ω. Similarly there is a capacitance limit that you can calculate with FireClass Designer. The absolute maximum is 450 nF.
Remote Bus	Conforming to RS485 electrical specifications. Half duplex, multi-drop, 19200 baud.
Printer/Configuration PC/Network ports	Conforming to RS232 electrical specifications. Full duplex, 9600 to 115200 baud.
IOBUS	1-bit bi-directional BUS capable of addressing up to 24 I/O devices.

Table 2 1: FC-FI Specifications

Table 2 1: FC-FI Specifications

8.3 PLX800 Loop Expansion Slot Card

Item	Details
Height	29.5 mm
Width	247.8 mm
Depth	104 mm
Input voltage	21 V to 28.6 V (27 V nominal)
Loop support	Connectors for 4 loops

Table 22: PLX800 Slot Card Specifications

8.4 PNI800 Network Interface Slot Card

Item	Value
Height	29.5 mm
Width	247.8 mm
Depth	104 mm
Input Voltage	21 to 28.6 (24 nominal)

Table 23: PNI800 Specifications

8.5 IOB800 Input/Output Expansion Board

Item	Value
Height	15 mm
Width	164 mm
Depth	80 mm
Input Quiescent Minimum	0 V DC
Input Quiescent Maximum	3 V DC
Input Active Minimum	4 V DC
Input Active Maximum	30 V DC
Outputs (Relays)	2 A@30 V DC

Table 24: IOB800 Specifications

8.6 FB800 Fuse Board

The FB800 Fuse Board is used to supply up to 15 fuse protected auxiliary voltages.

Item	Value
Height	14 mm
Width	164 mm
Depth	92 mm
Output minimum	21 V DC
Output nominal	27 V DC 0.5A
Output maximum	28.6 V DC
Fuse rating	500 mA/250 V

Table 25: FB800 Specifications

8.7 Jumper and DIP Switch Settings

Designator	FC-FI	PFI400
X3001	2-3	Not used
X3002	2-3	Not used
X11001 (one jumper link on one pin)	2 4 6 8 10	2 4 6 8 10

Table 26: Jumper link configurations

Position	FC-FI	PFI400
A	OFF	OFF
B	OFF	OFF
C	ON	ON
D	ON	ON
E	OFF	ON
F	OFF	ON
G	ON	ON
H	ON	ON

Table 27: DIP switch SW3790 configuration

Position	FC-FI	PFI400
A	OFF	Not used
B	OFF	Not used
C	OFF	Not used
D	OFF	Not used

Table 28: DIP switch SW3000 configuration

9 Installation Notes

These installation notes are meant to complement the FireClass FC700 series Installation Guide.

9.1 Sounder End of Line Capacitor Polarity

Panels are supplied with capacitors to be fitted to the ends of local sounder spurs. These are non-polarized (bipolar) and normal polarized electrolytic capacitors cannot be used in this application.

As the capacitors are non-polarised the positive and negative leads are equivalent and interchangeable, even if they have positive and negative identification.

Fig. 20: Sounder End of Line Capacitor

9.2 FC-FI Board Connections Behind the Batteries

Some of connections of the main FC-FI are behind the batteries, such as the connectors for powering third party cards - see XT6 and XT7, towards the right edge of the FC-FI board, shown in Fig. 19 on page 34. All the connections to the FC-FI should be made before the batteries are fitted.

9.3 IOB00 Board Positioning

The IOB800 card is an older type of board that is mounted in the slot card cage, using a special bracket, but without using the backplane connections (as described in 2.8.7 on page 24).

The preferred position of the IOB800 is in the left hand slot (or at least to the left of any other fitted slot cards). This is because of the difficulty in leading its connecting ribbon cable behind other slot cards.

If the IOB800 is hosting another board (mounted on stand-offs), such as an FB800, then move the IOB800 one slot to the right, and feed the ribbon cable behind the hosted board – see Fig. 21.

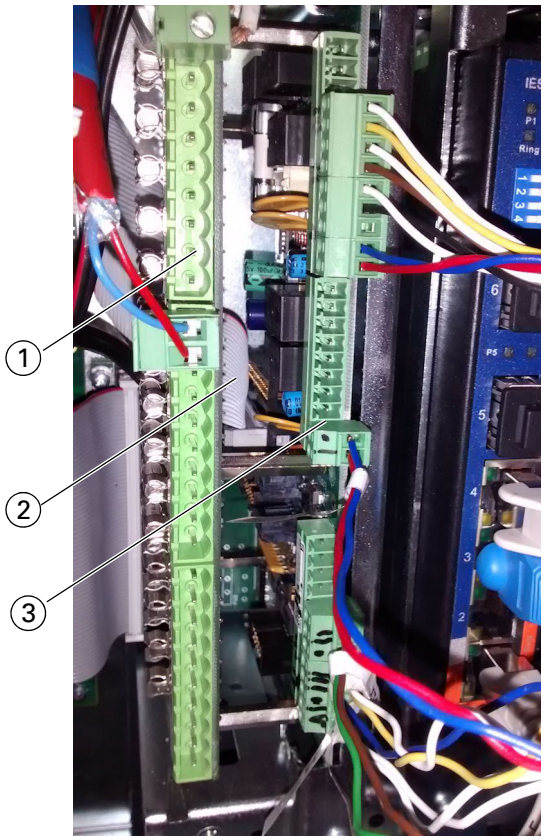

Fig. 21: IOB800 Positioning
1– Hosted board (FB800 in this case)
2– Ribbon cable
3– IOB800

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