VIGILANT

MX1 FIRE ALARM SYSTEM
System Design Manual

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MX1 is manufactured by:

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The *MX1* Fire Indicator Panel provides a configuration programming facility which may be accessed via a programming terminal using a password. Because this programming facility allows the user to define in detail the operation of the *MX1* System being customised, changes may be made by the user that prevent this installation from meeting statutory requirements.

Johnson Controls does not accept responsibility for the suitability of the functions programmed by the user.

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Amendment Log

1.0	24th January 2005	Original Issue
1.01	17th May 2005	Update to Mini-Gen Wiring Details Figure 8.3
1.20	31st July 2006	Added Keypad Alarm/Fault Buzzer sub-point details. Added Intrinsically Safe device information / Revised Section 7.4 / Added Section 9.11 Removed details specifically for V1.00 *MX1* software (refer Issue 1.01 manual) Updated throughout for V1.20 panel software and SmartConfig V1.6
1.21	14 April 2009	Added AZM800 design information in Chapter 9, and related updates to Chapter 8. Sundry small updates throughout manual.
1.30	25 February 2010	Added detail for V1.34 Firmware. 801PC, 801F, 801FEx, S271f+ devices. New keypad/controller points.
1.40	1 November 2011	Revised for 15U Panel, V1.40 firmware, multiple Loop Cards, RFBP.
1.50	11 November 2013	Revised for V1.50 firmware, networking, Gen 6 detectors.
1.60	20 February 2015	Revised for V1.60 firmware, AS1668 Controls, DDM800, Quad IO modules.
1.61	6 May 2015	Figure 10.13 corrected to show only 192 zones of LEDs, not 320. Add FP1084 to S3.1 and 9.2. Correct Supply Air Alarm in Fig 10.16 and text.
1.62	5 Oct. 2016	Minor additions to S3.3, 6.6.3, 8.2.2, Table 7.1, 11.3 and change to Figure 8.2a.
1.70	8 August 2017	Re-branded to Johnson Controls. Revised for V1.70 Firmware.
1.71	6 Dec. 2017	Updates for T-Gen2
1.72	24 Oct. 2018	Support for T-Gen2 Grade 2, Sections 8, 10, 13
1.73	6 March 2019	Add FV421i information. Obsolete TPI & V-Modem.
1.80	12 May 2020	Added MCP821/831, 80DSB. V1.80 firmware.
1.81	31 May 2022	Added FV421i to DDM800, QE20, VADs. NZS 4512:2021 mention.
1.82	20 Sept. 2022	Section 6.10.2 – added FV421i and 801FEx approved to AS 7240.10:2018.

Table of Contents

1 Scope

1.1 Scope

This manual provides information for personnel responsible for planning, ordering, installing and configuring an *MX1* Fire Alarm System. It is assumed that such staff have been trained to plan/install fire alarm equipment and are familiar with the relevant standards.

The manual is divided into the following chapters:

- Chapter 2 gives a general overview of the system, with a description of hardware devices and basic operation procedures. Equipment Standards are also specified.
- Chapter 3 contains detailed specifications for *MX1*.
- Chapter 4 provides an introduction to the concepts and features of the *MX1* system.
- Chapter 5 gives procedures for planning and designing a system, configuring the panel, and selecting appropriate alarm devices and other hardware.
- Chapter 6 lists and describes a wide variety of *MX* Loop devices. Installation and wiring are discussed.
- Chapter 7 considers the design of the *MX* Loop itself.
- Chapter 8 gives wiring and configuration data for a variety of alarm devices, including Mini-Gen Mk2.
- Chapter 9 describes in detail how to use the AZM800 Apartment Module with *MX1*.
- Chapter 10 gives various options for configuring *MX1* for the requirements of specific installations.
- Chapter 11 covers the calculation of battery requirements.
- Chapter 12 covers the installation and configuration of zone display modules.
- Chapter 13 details the use of various types of Remote Display Unit (RDU), LED-RZDU, IO-NET and RFBP remote displays and mimics.
- Chapter 14 covers the various brigade signalling options, including the GP SGD (PA0862), GP Brigade Relay Interface (PA0861) and the Brigade Relays.
- Chapter 15 considers various methods of remote access including V-Modem, PSTN modem, direct serial connection and network connection via Ethernet.
- Chapter 16 describes networking of *MX1* panels and connection to other compatible Panel-Link devices.

Appendices are provided for:

- *MX1* Equipment Point Descriptions
- Associated Standards Documentation
- Glossary of Terminology
- Glossary of Abbreviations
- Associated Product Documentation

2 System Overview

2.1 General Description

The VIGILANT *MX1* is a compact, self-contained, analogue addressable Fire Alarm System.

It is capable of controlling up to 250 *MX* addressable devices on its in-built *MX* Loop, with up to 1A available to power devices on the loop. Up to 7 additional *MX* loops can be added by fitting *MX* Loop Cards.

Networking of *MX1* panels together allows diverse systems to be created, or for connections to other compatible Panel-Link devices to be achieved.

MX1 is programmed offline using SmartConfig PC software. Two configuration databases are held in the *MX1*, and in the event that one datafile is corrupted, the system will default to the second datafile.

2.1.1 Equipment Standards

MX1 complies with the following standards:

NZS 4512:2010	Fire Detection and Alarm Systems in Buildings. Unless specified otherwise all references to NZS 4512 in this manual are to the 2010 version.
AS/NZS 60950:2000	Approval and Test Specification for Safety of Information Technology Equipment including electrical business equipment
AS/NZS CISPR22	Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment – Class A.
AS 7240:2004	Fire Detection and Fire Alarm Systems, Part 2 (Control And Indicating Equipment), Part 4 (Power Supply Equipment). Parts 5, 7, and 15 relate to Detectors and have requirements for software controlled devices.

2.1.2 Detectors and Devices

MX1 contains a built-in analogue addressable detection and control loop using the *MX* series of detectors, input and output modules. Additional loops can be added by fitting the *MX* Loop Card. Each loop supports up to 250 devices.

2.1.3 Displays

The primary display of the *MX1* is a 4 line by 40 character backlit LCD on which the status messages and prompts are shown. The *MX1* supports up to 999 zones.

Individual zone LED indicators can be added, in blocks of 16, up to a total of 191, depending on the system configuration.

LED indication for 15 zones is fitted as standard for NZ versions, and can be used in front- or rear-service format.

2.1.4 Outputs

MX1 has a range of relay outputs for controlling alarm devices and ancillary equipment. Many of these outputs can be configured for fault supervision from a range of supervision modes to suit the application. Addressable relay modules can be used to supplement these outputs or to reduce wiring costs between the *MX1* unit and the ancillary equipment.

MX1 has internal mounting options for several alternative tone/speech generators to drive 100V loudspeaker networks.

MX1 supports Fire Fan controls for AS/NZS 1668.1 applications. These have been assessed to the functional requirements of AS 4428.7-1999 Air-handling fire mode control panel.

2.1.5 Power Supply

MX1 operates primarily from the standard mains supply, with a battery supply and integral charger to maintain operation in the event of mains power failure.

The standard 5A charger has sufficient capacity to suit most installations.

See Chapter 11 for battery Standards requirements and configuration procedures.

2.1.6 Remote Displays

The *MX1* supports a single Remote Fire Brigade Panel (RFBP), which may be used for fire brigade use or for non-brigade use such as a building manager or maintenance engineer.

MX1 includes an RZDU port which can be used to power and communicate with up to 8 Remote Display Units. As well as these, other RZDU-compatible equipment such as LED-RZDU, IO-NET, QE20 and QE90 EWIS may also be connected to this port.

2.1.7 Logging Printer

A serial printer may be connected to the *MX1* to provide a log of events and operator actions.

Refer to Section 10.10 (Application – Event Logging Printer) for selection and installation details.

2.1.8 Remote Access

Remote access to the *MX1* panel can be arranged by using a V-Modem, PSTN Modem, or Ethernet connection via a PIB or Ethernet-to-Serial adaptor. PanelX software is run on the PC and simulates the user interface (LCD and Keyboard) of the *MX1*. A Telepager Interface (TPI) can also be connected to *MX1* to send event messages to alphanumeric pagers or text-capable cellphones.

2.1.9 Networking

With the addition of suitable network interface equipment the *MX1* may be combined with up to 250 other *MX1* panels into one large network to share alarm, display and control information. The network may include certain other Panel-Link compatible devices.

2.1.10 Fire Fan Control Panels and Distributed Switch System

With the addition of Fire Fan Control hardware the *MX1* can support up to 126 Fire Fans per panel. Fire Fans can be duplicated across a Panel-link network, with multiple Fire Fan Control Panels able to view the status of and control the operation of fans on different *MX1* panels.

The Fire Fans are based on the Distributed Switch System (DSS). The DSS is able to provide general purpose switches and indication functions for plant isolation, drain valve activation etc. The DSS controls are able to be duplicated over the Panel-link network.

3 System Specifications

3.1 General Specifications

3.1.1 Ordering Codes

FP0893 *MX1* SLIMLINE PANEL NZ
This is supplied complete with:
- 16 Zone display (15 zones + common indications)
- Rear service index (FA2416), Installation Guide (LT0360), Operator's Manual (LT0344)
- Sheet of 5 blank zone labels (LB0600), set of battery leads
- EOLRs for inputs and ancillary output supervision
- Screws for extra zone display and front service index mounting
- Pre-made loom for connection to T-Gen2 or T-GEN 50 (LM0319), SGD (LM0084)

FP1010 *MX1* NZ 15U 19" RACK PANEL
Suitable for wall mounting, does not have brigade index. This is supplied complete with:
- 16 Zone display (15 zones + common indications),
- Installation Guide (LT0360), Operator's Manual (LT0344),
- 2 blank zone labels (LB0600), Set of battery leads, screws for extra zone display.
- EOLRs for inputs and ancillary output supervision.
- Pre-made looms for connection to T-Gen2 or T-GEN 50 (LM0319) and SGD (LM0084).

Note: "Services Restore" Bulgin switch (SW0117) is not included.

FP0944 *MX1* EMPTY SLIMLINE CABINET BLANK DOOR
May be used to house equipment that cannot be installed in the *MX1* cabinet, for example
- Batteries where there is insufficient room in the primary cabinet.
- As an abutted cabinet for display boards in situations where these cannot otherwise be installed in a suitable viewing position.

FP1030 FP, EMPTY 15U CABINET, WINDOW DOOR
Empty 15U cabinet with windowed door the same as FP1010, but MCP blanked off.

FP1031 FP, EMPTY 15U CABINET, BLANK DOOR
Empty 15U cabinet with blank door.

FP1084 FP, EMPTY MX1 15U CABINET, FULL WINDOW DOOR
Empty 15U cabinet with full window door allowing all 15U of rack space to be used.

FP0950 *MX* LOOP CARD KIT
MX Loop Card on bracket, with power and FRC looms.

FP1002 *MX1* 16 ZONE DISPLAY EXTENDER (includes board, loom, mounting hardware)

FP1056 *MX1* 3U 12 X AS1668 FAN CONTROL DOOR
(includes 2 control board, loom, and mounting hardware)
- For Fire Fan Control or general switch / indication functions. Up to 126 controls.

FP1057 *MX1* 2 X AS1668 FAN CONTROL BOARD (includes looms and mounting hardware)

FP1009 *MX1*-NZ REMOTE FBP C/W RS485 BRD FOR *MX1*
This is a Remote FBP in an *MX1* Slimline cabinet (same as FP0893) with 16 Zones of LED displays, rear and front service mounting (requires FA2417 F/S index) supplied with:
- RS485 Board, looms for mounting in *MX1*.
- Operator Manual (LT0344), Installation Manual (LT0545).
- Domex label, wall hanging bracket.

FA2417 FAB 1982-23 *MX1* INDEX NZ FRONT SERVICE
(mounting screws supplied with Slimline panel)

3.1.2 Cabinets

Finish Powdercoated

Style	Slimline Cabinet	15U Rack Cabinet
	Dulux Cream Ripple 288 57289	Dulux Titania Ripple 288 1235Z
Dimensions	H590mm W480mm D140mm	H750mm W550mm D210mm
Construction	1.2mm welded steel	1.2mm and 1.6mm welded steel
Weight	15kg packaged 11kg unpackaged	24kg packaged 20kg unpackaged
Mounting Format	Suitable for surface or inset wall mounting, or window mounting for NZ rear service installation. An index (FA2417) is required for front service use in NZ. Easy-hang bracket for wall mounting. There is no external door covering the keyboard and display.	Suitable for surface or inset wall mounting. Includes outer door with clear acrylic window covering the keyboard and display.
Capacity	Up to 31 zone LED indicators	Up to 191 zone LED indicators
	Internal space for a pair of 12V 17Ah batteries	Internal space for a pair of 12V batteries up to 40Ah

3.2 Environmental Operating Conditions

Temperature -5°C to 45°C ambient

Humidity up to 95% relative humidity at 40°C (non-condensing)

The system complies with the environmental test requirements of NZS 4512:2010.

3.3 Electrical Supply Requirements

Mains Supply Requirements	**Voltage**	230VAC 50Hz (+10%, -15%)
	Current	1.2A rms maximum
	Frequency	50-60Hz
	Termination	Switched mains outlet block mounted inside cabinet. Power supply connects via standard 3 pin mains plug.
Battery Charger/	**Charger Voltage**	27.3VDC (nominal at 20° C)

Power Supply	**Temperature Compensation**	-31mV per C° (nominal)
	Non-Battery-backed Output Voltage	27.3V (nominal)
	Charger Voltage During Battery Test	20-22V (nominal)
	Output Current	5.0A DC charging, 5.5A DC current limit 4.0A DC continuous, long term Slimline model (FP0893) only 5.0A DC continuous, long term all other models.
	Fused Outputs from Controller	Battery-backed: VBF1, VBF2, VBF3, VRZDU. Each fused at 3A, individually supervised. Non-battery-backed; VBNF, fused at 3A, supervised.
	Fuse Types	All 5 x 20mm, glass cartridge type, 3A slow blow.
Current Consumption	**Controller**	150mA nominal at 24V supply (system normal, LCD backlight off, no zone indicators lit, excludes *MX* Loop, Loop Cards and other connected loads). 60mA per *MX* Loop Card
	Zone Indicator	5mA nominal at 24V per active indicator.
	AS1668 Fan Control	8.5mA nominal per Fan Control Module

3.4 Inputs

Battery Input	Two pairs of +ve and -ve screw terminals with capacity for 4.0mm ^{2} conductors. Battery cutout closes before 19.2V on rising voltage, and opens before 15V on falling voltage. LED status indicator shows connection status.
General Purpose Inputs	Two independent, protected inputs for connection to clean contacts or open collector outputs of ancillary devices, with optional open and short circuit supervision. Input characteristic is 1.2kΩ pull-up to 5V. Voltage bands are configurable. Default thresholds are 0.35V, 2.5V, 3.85V. These inputs share a common 0V terminal. All terminals have a capacity for 2.5mm^2 conductors.
Door Switch and Integral MCP	Two unprotected inputs are used to sense the state of the cabinet door switch and MCP (not NZ). If not required for an MCP, the MCP input can be used to sense another clean contact within the cabinet.

Relay Supervision

Each ancillary relay has an associated input for supervision. If not required for relay supervision, these can be used as supervised inputs for clean contacts.
Input characteristic is 33kΩ, pull up to +VBF (ANC1, ANC2) or 10kΩ pull-down to –5V (ANC3). Input thresholds depend on supervision mode (see 3.5 Outputs, below).
ANC1 and ANC2 inputs can be driven by open collector outputs or contacts; ANC3 can only be driven by a clean contact.
The operation of these inputs is set by the configuration.
Each supervision terminal has a capacity for a $2.5mm^2$ conductor.

LCD/Keyboard Switch Inputs

16 unprotected inputs suitable for unsupervised clean contacts.
These inputs are available on a 26-way header suitable for connection to a protected input board (PA0479), unprotected termination board (PA0483), or AS1668 4-way + common Fan Control Module (ME0472).

3.5 Outputs

ANC1, ANC2

Single pole, voltage free changeover contacts.
Rated at 30VDC 1A inductive, 2A resistive.
Screw terminal, $2.5mm^2$ conductor capacity.
ANC1 connector is demountable, and can be replaced with a pre-made loom (LM0319) connection to a T-Gen2 or a T-GEN 50.
Supervision modes: load mode 400Ω-15kΩ or one diode drop, door-holder mode (45-75% of VBF), contact mode (normal is closed to 0V), or none, set by configuration.
Operation mode: set by configuration.

ANC3

Single pole, voltage free changeover contacts. Rated at 30VDC, 5A resistive, 3A inductive. Screw terminals, $2.5mm^2$ conductor capacity.
Supervision modes: ANC3 (negative bias, up to three branches, 9kΩ EOLR), contact mode (normal is closed to 0V, clean contact only), or none, set by configuration.
Operation mode: set by configuration.

General Purpose Outputs

Two independent, protected, open collector outputs capable of driving loads up to 500mA from the 24V supply, plus common +VBF supply terminal.
Supervision modes: load mode (240Ω-10kΩ load), or none, set by configuration.
Operation mode: set by configuration.
Screw terminals with $2.5mm^2$ conductor capacity.

Alarm Routing/ Brigade Signalling

Relays - Alarm, Fault, Disabled, each with a single pole, voltage free changeover contact rated at 30VDC, 1A inductive, 2A resistive.
The Fault relay is normally energised; Alarm and Disabled relays are normally not energised.
Screw terminals with $2.5mm^2$ conductor capacity.

ASE Output	Isolated, protected output suitable for direct connection to the FAS inputs of a Centaur ASE. Signals Alarm, Fault, and Disable. Not used in New Zealand. Screw terminals 4.00mm^2 conductor capacity.
SGD Interface	Non-isolated unprotected output for direct connection to an adjacent General Purpose SGD (PA0862) or GP Brigade Relay interface (PA0861). 10 way FRC header.
LCD/Keyboard Outputs	16 unprotected open-collector outputs, suitable for driving LED indicators or relays from the *MX1* 24V supply. Individual loads must be less than 100mA. These are available on a 26-way header suitable for use with a protected output board (PA0480), unprotected termination board (PA0483), 24V relay board (PA0470) or AS 1668 Fan Control Module.
LCD/Keyboard Display Bus Output	Suitable for driving up to 12 zone display boards (either small format FP1002 or large format FP0475, or a mixture).

3.6 Communication Ports

***MX* Loop (Controller & Loop Card)**	Feed Voltage 37-40V depending on load Current capacity 1.0A continuous, overload trips at 1.1A typical. Cable limit =2000m of typical TPS types (including spurs). Four screw terminals, AL+, AL-, AR+, AR- with 4.0mm^2 conductor capacity. *MX1* can be operated in only Loop Mode. Protocol: *MX* DIGITAL Supports up to 250 of *MX VIRTUAL* analogue addressable detectors or modules.
Serial Communications	
RS232 ports	Two DB9 male connectors, each configured as RS232 level DTE. Diag/Prog is used for loading configuration data and using Service Diagnostic functions. This can be connected to a modem for remote access to *MX1*. Data rate is set at 19200 bps. Serial Port 1 can be used for a logging printer. The data rate is set by configuration.
Other Serial Ports	Five 10-way headers configured as logic level (0-5V) DTE. Display Port is dedicated to the LCD/Keyboard connection. Data rate is fixed at 19200 bps, 8 bits, no parity. Serial Port 0, 2, 3 and 4 can be configured to connect to the Remote FBP, *MX* Loop Cards or AS 1668 fan controls. Note, if Serial Port 0 is used the RZDU port is disabled.
RZDU Port	Four 2.5mm^2 terminals providing +VRZDU, TX, RX and 0V signals to Remote Display Units (up to eight) or other RZDU compatible devices. Protocol: Vigilant, RZDU LCD-A Data rate:1200bps

Cable Limits: 150Ω to furthest device, 100nF total line capacitance, including all wiring branches. Typically, these limits are met by 1km of TPS.

Network Port The serial port programmed for networking can connect to a PIB, I-HUB network interface or a single Panel-Link device using the point to point protocol.

3.7 External Controls

External Keypad Polyester keypad type, 29 keys.

Fire Brigade Panel NEXT, SILENCE BUZZER, SILENCE ALARM DEVICES, RESET, DISABLE keys as per AS 4428.3.
Four soft keys beside alphanumeric display, AIF key, 0-9 numeric keys, MENU, OK, CANCEL.

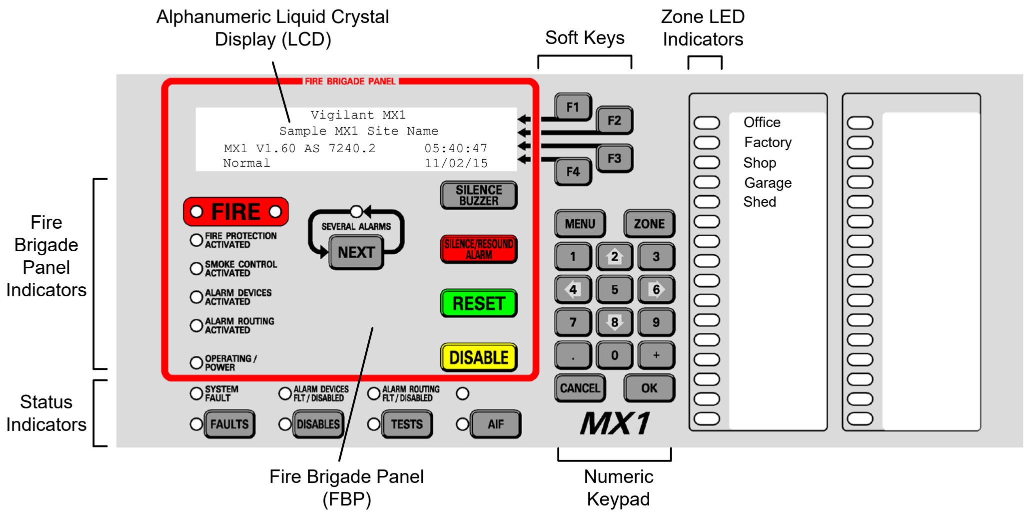

Figure 3.1 – *MX1* Keypad

Cabinet Lock Keyed 003, to secure cabinet. Also operates internal switch to enable higher level keypad functions

Brigade Keyswitch (NZ Option) Three Bulgin keyswitches labelled “SILENCE ALARMS”, “SERVICE RESTORE”, and “TRIAL EVACUATION”.

3.8 Internal Controls

Mains On/Off	Switches the AC mains supply to the *MX1* power supply/battery charger
Reset	"Reset" on Controller restarts the system immediately. "Reset" on LCD/Keyboard restarts the LCD/Keyboard.
Write-enable Links	Enable changes to the system configuration (DATABASE) or updates to the system firmware (FIRMWARE).
Battery Connection Link	Force the battery cutout to operate and connect the battery to the charger.
LCD Contrast	A control on the LCD/Keyboard to adjust readability of the LCD.

3.9 Displays

Alphanumeric Display LCD with 4 lines of 40 characters. Font height is 4.8mm, black text on a green/yellow backlight. Backlight operates while the keypad is in use or when an alarm occurs.

Status Indicators FIRE – steady red when an Alarm is present.

SEVERAL ALARMS – lit steady red when more alarms are present than can be simultaneously displayed on the alphanumeric display.

FIRE PROTECTION ACTIVATED – lit when fire protection equipment has been activated by the *MX1* (driven by output logic).

SMOKE CONTROL ACTIVATED – lit when the *MX1* has activated smoke control equipment (driven by output logic).

ALARM DEVICES ACTIVATED – lit steady red when the alarm devices are activated.

ALARM ROUTING ACTIVATED – lit steady red when an alarm signal is being sent to the monitoring service.

ALARM DEVICES FLT/DISABLED - flashing yellow if there is a fault with the alarm devices; or steady yellow if the alarm devices are disabled.

ALARM ROUTING FLT/DISABLED - flashing yellow if there is a fault with the alarm routing equipment, or steady yellow when the alarm routing signal is disabled.

OPERATING/POWER - lit steady green if mains power is applied to the *MX1,* flashes if mains not present and running on batteries. Off if no power applied.

FAULTS – lit steady yellow when there are one or more faults present.

Zone Indicators

In the Slimline cabinet, up to two sets of 16 indicators can be fitted for zone status (31 zones).

In the 15U cabinet, up to 2 sets of 16 zone indicators can be fitted. Additional zones (up to 191 total) can be shown by adding ME0457 80 Zone Display Modules and FP1002 Zone Display Boards. For each zone, a steady red LED shows alarm, and a yellow LED shows Fault (flashing) or Disable (steady) status.

An additional green LED is fitted in the first zone position to show Common Normal status for NZ applications. The other LEDs in the first zone position indicate Common Alarm and Common Fault/Defect.

Internal Buzzer

Gives short “beep” for a valid keypress of the keypad, a long beep for an invalid keypress, or no beep for an inactive key if part or all of the keypad is disabled.

3.10 Other Optional Modules

The following are some optional modules that may be mounted in the *MX1* cabinet.
Note: The 8U cabinet does not have space/mounting facilities for some items.

Product	Part No.	Description/Usage
3U 60W GR3	FP1121	Grade 3 EWS 3U Door with T-Gen 60 and Microphone
3U Grade 3 UI	FP1122	Grade 3 EWS 3U door with Microphone
HLI board	FP1143	T-Gen2 HLI board with looms
Mini-Gen Mk2	PA1026	Multi Tone and Speech Generator (24V)
Strobe Driver	PA1043	ISO8201-compliant strobe driver module
16 Relay Outputs	PA0470	16-way relay output board
16 Input Module	PA0479	16-way protected input board
16 Output Term Board	PA0480	16-way protected output board
16 Output Unprotected Bd	PA0483	16-way unprotected output board
Dual Pole Relay Board	PA0730	Dual pole relay (24V)
Fuse Board	002-109K	4-Way Fuse Board
ASE Door	KT0199	3U 19” door to mount one Centaur ASE or V-Modem
Dual V-Modem Door	KT0212	3U 19” door to mount two V-Modems
T-Gen 60	FP1115	60 Watt Alert & Evacuate Tone Generator
T-Gen 120	FP1116	120 Watt Alert & Evacuate Tone Generator
100V Switching Module	FP1117	100V Audio Link Switching & Monitoring Module
100V Splitter Module	FP1118	100V Audio Line Splitter & Monitoring Module
Grade 2 EWS Door	FP1124	FP,GRADE 2 EWS UI 3U DOOR,C/W LOOM & MIC,GREY
Grade 2 8Z Door	FP1126	FP,GRADE 2 16Z EWS EXTENDER,3U 19" DOOR,GREY
Grade 2 8Z Exp	FP1128	FP,GRADE 2 8Z EXPANSION BRD,C/W LOOM & MTG
Grade 2 EWS	FP1129	FP,120W,T-GEN2 EWS,GRADE 2,4Z,15U CAB
T-Gen2 HLI	FP1143	FP,T-GEN2 HLI BOARD C/W LIT,LOOMS & MTG BRKT

Networking Equipment and Mounting Kits:

Part Number	Title & Description
FP0771	I-HUB RS485 Ring Network Adapter
FP0986	PIB IP Network Adapter
FP1012	Bracket to mount Moxa Fibre switch and 2 Ethernet Extenders
FP1013	MX4428/F3200 IP Networking Bracket
FP1044	IP Network STP Cable Termination Bracket
FP1032	Mounting bracket and looms to mount 2 OSD fibre-optic modems
OSD139HS	Fibre-Optic Modem for use with I-HUB, Multi-Mode (not AS 7240.2 listed)
OSD139HSL	Fibre-Optic Modem for use with I-HUB, Single-Mode (not AS 7240.2 listed)
SU0319	Moxa switch, 3 Ethernet Ports, 2 Multi-Mode fibre
SU0320	Moxa switch, 3 Ethernet Ports, 2 Single-Mode fibre
SU0325	Moxa switch, 5 Ethernet Ports (not listed to AS 7240.2)
SU0326	Moxa switch, 8 Ethernet Ports (not listed to AS 7240.2)
SU0328	Westermo Ethernet Extender, DDW-120

4 Concepts and Operation

4.1 General

This chapter describes the operation of the *MX1* system and explains some of the underlying concepts you will need to know to make the best use of *MX1's* flexible configuration abilities.

Under the topic of Operation, the external and internal controls of the *MX1* are described.

Under the topic of Concepts, the relationship between the system software and the configuration data in the *MX1* is described. This is followed by descriptions of the concept of points and zones and how these are used in configuration of an *MX1* system.

4.2 System Structure

Figure 4.1 shows the basic structure of the *MX1*, and the functional interconnections between the hardware modules in the cabinet.

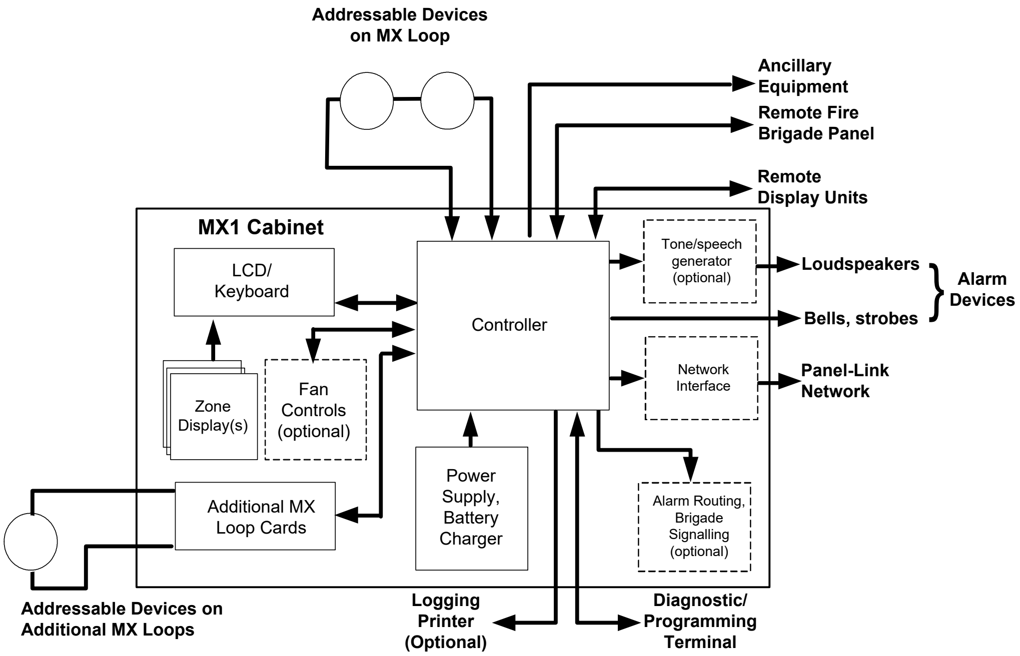

Figure 4.1 – Block Diagram of *MX1*

The Controller is the core part of the *MX1*. It:

- contains nearly all of the interfaces to external equipment
- monitors and distributes the power from the power supply
- receives keypresses and other front panel control operations from the LCD/Keyboard and Remote FBP and passes back information to be presented on the LCD and zone displays
- powers and communicates with addressable devices on the in-built *MX* Loop
- communicates with any *MX* Loop Cards fitted
- sends zone and text information to any connected Remote Display Units, and event messages to the optional logging printer
- sends alarm and fault signals to the alarm routing/brigade signalling equipment
- controls alarm devices of various types
- controls ancillary equipment.
- generate and processes messages sent on the Panel-Link network.

The LCD/Keyboard manages the front panel operation. It detects keypresses on the keyboard and passes these to the Controller for processing. The Controller sends back text to be displayed on the alphanumeric display, and control information about which indicators and sounders on the LCD/Keyboard should be active. The Controller also sends a stream of information about which zone indicators should be lit or flashing, since the LCD/Keyboard drives this optional chain of zone display boards.

The LCD/Keyboard also detects the state of its switch inputs and sends this to the Controller for processing. The Controller, in turn, sends back control information for the open collector outputs.

4.3 Front Panel Controls

The front panel and keyboard (see figure 4.2) are the primary operator interface to the *MX1*.

4.3.1 Operator Interface

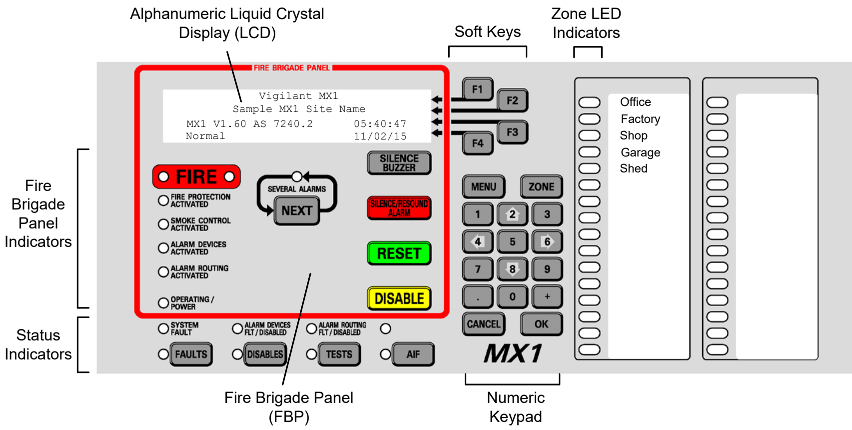

Figure 4.2 – *MX1* Front Panel Display and Keyboard

Table 4.1 – Components of the Operator Interface

Component	Description
Alphanumeric Display	Displays details about alarms, faults, and other service-related system information, as well as menus of command options and messages.
Fire Brigade Panel	Controls within the border are for use by brigade personnel during alarms.
Soft Keys	These function keys located beside the alphanumeric display have different meanings, depending on the current display. The key's function at any time is shown by the text displayed at the right hand end of the display.
Status Indicators	LED indicators showing the presence of alarms, faults, disabled items, tests in progress and power. The associated keys provide a direct way to display more detail about these.
Numeric Keypad	Commonly used keys are OK and CANCEL, to confirm or cancel commands, MENU to display the current possible actions on the item displayed, and ZONE to provide direct access to zone functions. Other keys are used for detailed servicing of the system.
Zone Indicators (optional)	These show the state of individual zones or groups or zones. A red indicator shows alarm, a flashing yellow indicator is a fault and a steady yellow indicator shows a disabled zone. The first set of LEDs usually displays the Common Fire, Defect and Normal (Green) states.

4.3.2 Other External Controls

As well as the standard display and keyboard, the *MX1* may be fitted with additional front panel controls to meet installation or local requirements.

Brigade Keyswitches

Three "Bulgin Key" brigade switches are fitted to NZ versions of *MX1* for use by brigade personnel:

- SILENCE ALARMS – this has two mandatory functions:
  - To silence all the alarm devices controlled by the *MX1* when this switch is operated.
  - To disable all the zones currently in alarm when this switch is restored to its normal position.
- EVACUATION – this has a single mandatory function: to activate the alarm devices controlled by the *MX1* when this switch is operated.
- SERVICES RESTORE – this control is not mandatory but is permitted under NZS 4512 as a means for brigade personnel to selectively manage building services equipment.

AS/NZS 1668.1 Fire Fan Controls

Up to 126 Fire Fan Controls may be fitted to an *MX1* NZ panel in rack cabinets (15U FP1010 or custom cabinet sizes). These provide the mandatory control and indications for Fire Fan Control Panels, and may also be used for other applications requiring switches and indications, such as sprinkler test valves.

4.4 Operator Access levels

4.4.1 Description

The *MX1* operator interface uses the concept of Access Levels to manage access to front panel commands that display or affect the state of the system. These Access Levels are based on the descriptions found in ISO 7240-2. The NZ Brigade Key Switches are unaffected by the operator Access Levels and are available at all times.

There are four operator Access Levels: 0, 1, 2 and 3.

4.4.2 Level 0

When the system is fully secured and no alarms are present, and the *MX1* is configured for the keypad to be completely disabled. There is some viewing ability but no control.
This is the default NZ configuration.

4.4.3 Level 1

This is the access level when the system is fully secured, i.e., cabinet door closed and locked. In NZ operation, Level 1 access will only be available while there is an alarm condition present, or, for local mode, if the fault sounder is on.
In NZ operation at this level, you can:

- View the Alarms list
- Silence the buzzer
- Acknowledge alarms (if this function is enabled)

You cannot affect the operation of the system at this level.

4.4.4 Level 2

Access to this level requires a key to the cabinet door. On the slimline cabinet insert the key in the door lock and turn it 45° anticlockwise to enable this level. On the 15U cabinet use the key to unlock and open the outer door.

At this level, you can:

- Use all the level 1 commands.
- Perform most operator functions to:
    - Reset and enable/disable zones and points.
    - Initiate tests.
    - Recall the history.
    - Recall zone and point status.
- Silence or re-sound the alarm devices and internal buzzer.

4.4.5 Level 3

Access to this level requires a key and a user code and PIN. From the base menu, press MENU then LOGON and enter your User Code and PIN to enable this level.

At this level, you can:

- Use all the level 1 and level 2 commands.
- Enter Commissioning mode.
- Restart the system on a specific configuration.
- Re-address a replacement detector.
- Permanently disable (mute) the buzzer.

You cannot alter the system configuration at this level.

These lists are not exhaustive, but indicate the degree of system control available at each level.

4.5 Internal Controls

Inside the *MX1* cabinet are these controls:

- Mains outlet switch – switches the mains supply to the power supply/battery charger
- RESET on the Controller – forces the system firmware to restart execution
- DATABASE WRITE ENABLE – this link on the Controller allows the stored system datafiles to be rewritten. Note that a new datafile can be loaded into the *MX1* without having to halt alarm processing.
- FIRMWARE WRITE ENABLE – this link on the Controller allows the system firmware to be updated. This should only be fitted when firmware updates are being done, otherwise alarm processing may halt unexpectedly.
- BATT CONNECT – this link on the Controller allows the battery disconnect circuit to be over-ridden to allow the power supply to charge a very flat battery. Under normal circumstances, it should not be fitted.
- LCD Contrast – this adjustment potentiometer on the LCD/Keyboard module on the front panel allows the contrast of the LCD to be adjusted. It has no other effect on system operation.

Other internal modules such as tone/speech generators and alarm routing/brigade signalling devices may also have their own controls and adjustments. Refer to the documentation for the individual modules.

4.6 Device Alarm Processing

A critical part of a fire alarm system is the early detection of a fire, and smoke and heat detectors are critical to this early detection.

If early detection were the only requirement, then this could be easily achieved by making the detectors as sensitive as possible. However, this would lead to numerous false activations or nuisance alarms due to traces of dust or wafts of warm air that had nothing to do with a fire. Given the disturbance and cost of a nuisance alarm, detector sensitivity alone is not sufficient.

MX1 supports a number of techniques to assess a detector's response and decide whether it represents a real fire. The detail of the verification method depends on the type of detector.

AVF is for conventional/collective detectors. Algorithms are provided for analogue addressable devices. These are discussed in the next sections.

4.6.1 Conventional Detectors - AVF

For conventional point type smoke detectors, the smoke sensitivity is set internally in the detector. The detector's only response is to signal that this level of smoke has been reached, and the detector latches in this state.

The AVF technique for this type of detector is to reset the detector to its normal state and start a timer running. The timer is typically set for about 2 minutes. If the detector activates again during this period, this is immediately taken to be proof of a real fire situation, and normal alarm processing is done, i.e., activate alarm devices and alarm routing. If the timer runs out and the detector has not re-activated, no further action is taken.

If the initial detector activation was caused by some stray event such as a waft of dusty air, it is unlikely to repeat during the timer period, and therefore will be ignored.

In *MX1*, AVF for conventional detectors applies only to the DDM800 and DIM800 *MX* modules. The details of the AVF delays are set in the delay profile assigned to the module, and can be viewed and adjusted with the configuration tool SmartConfig.

For the DDM800 the AVF delay, if enabled, is applied only when the circuit is in the alarm band, because it is probably a smoke detector, but not the fast alarm band, because it is probably an MCP or heat detector.

4.6.2 Analogue Addressable Detectors - Algorithms

These devices have a more subtle range of responses to fire products. Heat detectors report the actual temperature, smoke detectors report an actual smoke density, and CO detectors report an actual CO concentration. Some devices contain dual or multiple types of sensor.

The *MX1* processes the values from each detector according to the selected algorithm to determine the various conditions – alarm, pre-alarm, fault, etc.

For heat detectors, a common processing technique includes "rate-of-rise", i.e., the rate at which the measured temperature increases, along with the actual temperature. Filtering and thresholds are applied to the sensor reading to decide whether a real fire situation has been detected.

For 850 series and intrinsically safe detectors using the count-of-3 algorithm a fixed temperature alarm is signalled after the temperature threshold is exceeded for 3 consecutive polls, and a ROR alarm is signalled after the ROR alarm threshold is exceeded for 6 polls.

814 series heat detectors utilise the processing shown in Figure 2.2.

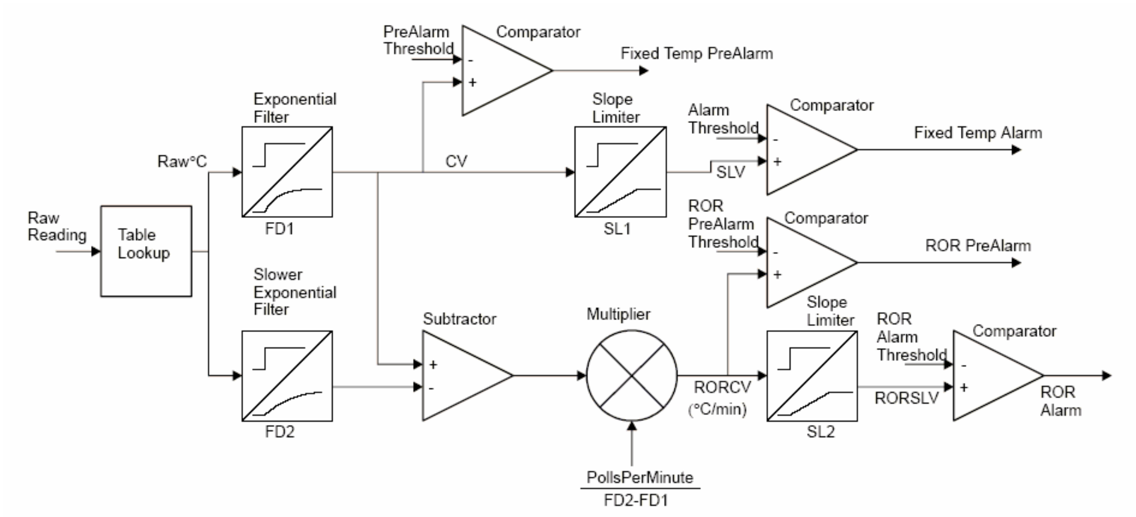

Figure 4.3 – Heat Processing Diagram (Conceptual)

MX1 applies by default an algorithm called FastLogic (refer Figure 4.4) to photoelectric and combined photoelectric and heat detectors. This is a technique that uses "fuzzy logic" to process the analogue value and its changes over a short period of time into a predictor of there being a fire. It can produce a pre-alarm and an alarm condition.

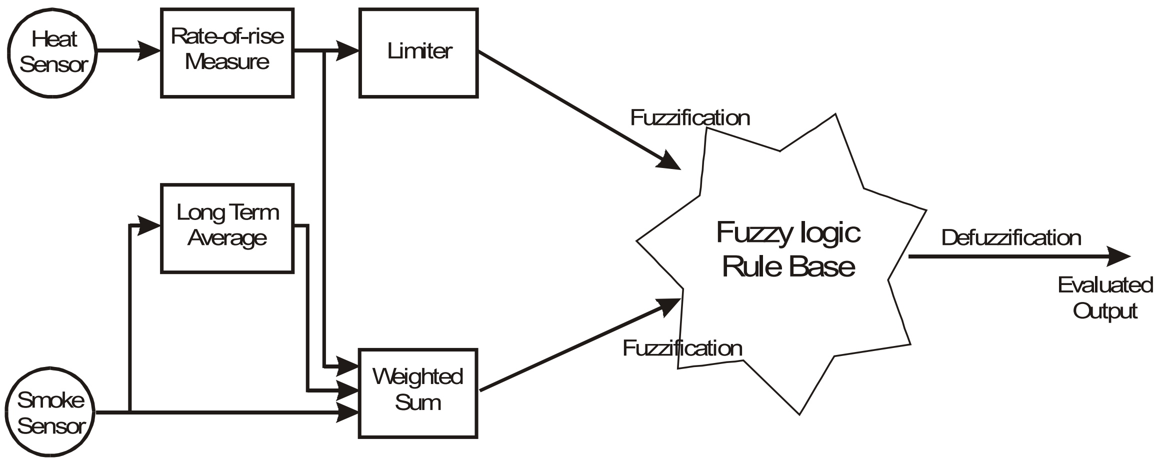

Figure 4.4 – FastLogic Process (Conceptual)

For photoelectric smoke detectors, *MX1* also has an algorithm called SmartSense. This can be applied to a photoelectric-only or a combined photoelectric and heat detector. This uses a set of filters and thresholds (as shown in Figure 4.5) to produce a final alarm and pre-alarm decision.

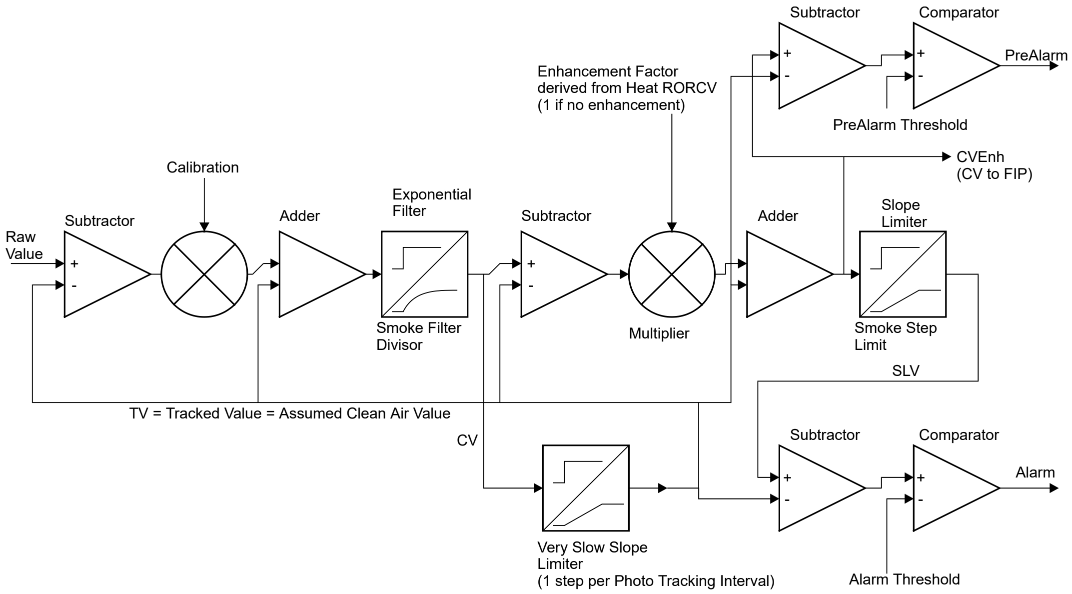

Figure 4.5 – SmartSense Process (Conceptual)

MX1 uses similar algorithms to these for ionisation smoke detectors and CO detectors, with appropriate filter settings and thresholds.

These settings can be viewed and adjusted with the configuration tool SmartConfig. Refer to the SmartConfig manual or the help file.

4.7 System Operation

Modern software-controlled fire alarm systems use microprocessors to provide the required system behaviour by means of stored instructions. These instructions contain the “rules” for how input signals from the physical hardware are interpreted and processed, and how these signals are combined to produce output signals to be passed back to the physical hardware.

There are two types of stored instructions:

- System software (firmware) – this comprises the core instructions used by the microprocessor to define and control the intended range of possible system behaviours, i.e., the allowed rules. System software is common to the make and model of the fire alarm system. It is loaded into the system during manufacture and can be field updated as new versions are released.
- Site-specific configuration data – this information is used by the system software to determine which of the allowed rules should be used and where they should be applied. This information is specific to a particular installation of the fire alarm system. It is loaded into the system during installation, and is often changed and adjusted in the field, to match building extensions and other changes at the installed site.

An important part of *MX1*’s design is the unusually wide range of allowed rules defined by the system software. Furthermore, the *MX1* system software also allows many of these rules to be modified by the configuration data. Because of this, it is possible to change or extend the basic alarm processing rules to meet the requirements of particular standards and/or particular installations or types of installations.

This gives the *MX1* system a great deal of flexibility and adaptability. However, to prevent this flexibility from overwhelming a system designer, the configuration software tool, SmartConfig, provides simplified options and pre-packaged profiles (templates) to cover the most common requirements. This means that a system designer only has to deal directly with the full flexibility of *MX1* in the few installations that really require it.

The *MX1*'s flexibility has the potential for an inappropriate configuration to upset mandatory behaviour required by local standards and codes. To guard against this, the configuration tool protects some key parts of the configuration datafile from accidental changes.

A key part of achieving this high degree of flexibility has been to use the concept of "points" to represent most of the logical or physical parts of the system. Despite the fact that the actual system components being represented are physically and electrically diverse and complicated, the points that are used to represent them in the system software are relatively simple and consistent in behaviour.

4.8 SID

The SID address is a unique number in the range 1-254 allocated to each panel or device on the Panel-Link network. It allows equipment on that panel/device to be identified and controlled.

4.9 Points

In the *MX1*, a point is a representation of a part or component of a fire alarm system. Some examples are:

- a detector such as a heat sensor
- a relay output that could control alarm devices such as bells
- an internal part of the control equipment such as a fuse or power supply status.

A device is the collection of all sub-points associated with a physical device. A device number can be used (usually) to perform a command (such as enable, disable, reset) on all sub-points of the device without an operator needing to know how many sub-points it has.

4.9.1 Point States

For each point in the system, there is a state. This point state is a standardised condition derived from the actual status of the part of the system represented by the point. The point state can be one or more of:

- **Normal** – the component is operational and no other condition is present.
- **Pre-Alarm** – the component is a detector that has reached a condition suggesting an impending alarm.
- **Alarm** – the component is a detector and has activated. Generally, this calls the fire brigade.
- **Operate** – the component is an output device (relay, transistor etc.) and has activated.
- **ActInput** (Active Input) – the component is an input device that is being driven out of its normal condition, but is not in alarm or fault.
- **Fault** – the component is in a condition that may adversely affect its ability to function correctly.
- **Dirty** – a detector is in a state that requires maintenance/attention.
- **Disabled** – the component has been disabled by the operator to prevent it from affecting system operation.
- **Device Fail** – communication with this *MX* device is not possible (for example, because it has been removed from the loop).

- **Type Mismatch** – the wrong type of *MX* device is installed/programmed at this address.
- **TestOp** (Test Operate) – the component is under test and has been put into the operate state.
- **AutoReset** – the component is undergoing an auto reset test.
- **AlarmTest** – the component is undergoing an alarm test.
- **AlTstFail** (Alarm Test Fail) – the component has undergone an alarm test and has previously failed. This state clears after a successful alarm test.

Not all of these states apply to all points, e.g., input points will never be in the Operated state, and output points will never be in the Active Input state.

4.9.2 Point Values

All points have a state, but some can also have analogue values, usually a whole number between 0 and 255. The meaning of the analogue value and the conversion factor to normal units depends very much on the particular type of point. For a smoke detector, one value might represent the smoke level. For a heat detector, one value might represent the current temperature. For an internal system point for battery status, one value might represent the battery voltage.

4.9.3 Point Numbering

In *MX1*, points are identified by a three part number with the form ***Eq.Dev.Sub*** where the parts are:

- Eq – Equipment number – the part of the *MX1* system this point is in.
- Dev – the physical device number within the particular equipment part, which will usually relate to a specific part of the system such as a detector or power supply.
- Sub – Sub-point number – which indicates which part of the particular device is required. Some devices do not have more than one sub-point, which means that their only valid sub-point number is 0.

For accessing a point on another *MX1* panel in a networked system, the SID of the other panel is multiplied by 1000 and added to the equipment number. For example, to access point 1.23.0 on an *MX1* panel with a SID of 12 you would use a point number of 12001.23.0.

In the *MX1* system, equipment numbers are:

- 1 – the *MX* Loop connected to the Controller
- 2 onwards – for the additional *MX* Loop devices when fitted
- 241 – the Controller in the *MX1* cabinet
- 242 – “pseudo points” created by the configuration to produce special operations
- 243 – the LCD/Keyboard in the *MX1* cabinet
- 244 – RDU points/equipment, if any RDU has been configured.
- 245 – points for the additional *MX* loop cards when fitted.
- 246 – Remote Fire Brigade Panel points (if fitted).
- 247 – Network Status points.
- 248 – DSS Controls (Distributed Switch System, usually for Fire Fan Controls)

Refer to “Appendix A – Equipment Point Descriptions” for a detailed list and description of “internal” points for equipment numbers 241, 243, 244, 245, 246, and 247. Equipment 248 does not have points, but does have common status points under Equipment 245.

For *MX* loop devices, sub-point 0 represents the physical device and is responsible for logging to the history and printer the Device Fail and Type Mismatch events. Note that when these events occur all sub-points will enter the fault state, but only sub-point 0 will log these events.

Disabling sub-point 0 will prevent the logging and the signalling of fault by sub-point 0, but will not prevent the fault being signalled on the other sub-points.

Therefore, when disabling an *MX* point that is in Device Fail or Type Mismatch it will be necessary to disable all sub-points of the device to remove the fault indication. When preparing a system database in SmartConfig it is recommended all sub-points of an *MX* detector have the same or similar text name.

For modules with multiple inputs such as MIO800, sub-point 0 should have a text name that represents the physical location of the module, whereas the text name of the individual inputs and outputs should reflect the function the input or output is used for.

4.10 Zones

In its most general sense, a zone is an area or region of the protected premises. The boundaries of zones usually have some significance in terms of the operation of the fire alarm system.

A zone can be a physical area, being part of the premises protected by the fire alarm system. In this instance, the boundaries of the zone coincide with physical boundaries such as walls, floors, or buildings. This is the meaning of the term “zone” used in most fire alarm standards, and is used by the brigade and other emergency personnel to manage evacuation and fire-fighting responses. These standards usually specify limitations on the extent of these zones which must be taken into account when planning a fire alarm system.

A zone can also be more abstract, such as all the heat detectors in a particular building.

Zones can physically overlap, if required (and permitted by the relevant standards)..

For accessing a zone on another *MX1* panel in a networked system, the SID of the other panel is multiplied by 1000 and added to the zone number. For example, to access zone 37 on an *MX1* panel with a SID of 9 you would use the zone number 9037.

4.10.1 Mapping Points to Zones

Each *MX1* can support up to 999 zones, with each zone defined by “mapping” one or more points to it. The mapping effectively states that the point is “in” the zone, either by virtue of its physical location or its significance to the required operation.

This mapping establishes a particular relationship between the state of the point(s) in the zone and the resulting state of the zone, and the system behaviour resulting from that zone state. In most instances, the default behaviour of points and zones provided by the basic mapping meets all the requirements for indication and signalling of alarms, faults and disabled conditions.

For the remaining few instances where the mapping behaviour does not meet the requirements, specific behaviour can be defined with User Logic equations in the configuration data file.

4.10.2 Zone States

Like points, the *MX1* maintains a state for each zone defined in the configuration. The zone State can be one or more of:

- **Normal** – this is the default zone state, when no other state is present.
- **Pre-alarm** – a point mapped to the zone has gone into the pre-alarm state.
- **FirstAlrm** – For an AIF, AAM or dual-hit zone a point has gone into alarm, but the zone is not in alarm due to a timer running or it is waiting for a second alarm.
- **Alarm** – a point mapped to the zone is in the Alarm state.
- **Resetting** – the zone is being reset.
- **Operate** – output points mapped to the zone will be operated.
- **Fault** – a point mapped to the zone is in the Fault state, or Device Fail or Type Mismatch.
- **Disabled** – the zone itself has been disabled or all points mapped to the zone are disabled.
- **TestOp** – all items mapped to zone will be put into test operate state.
- **AutoReset** – all items mapped to zone will be put into auto reset test.
- **AlarmTest** – the zone is undergoing an alarm test.
- **AlTestFail** – there has been an alarm test run on the zone that failed. This state will clear after the next successful alarm test.
- **FltTest** – the zone is undergoing a fault test.

4.10.3 Zone Groups

MX1 also has a concept called Zone Groups, to which zones can be mapped. Each zone group combines the status of the zones that map to it, along with the alarm type (heat, smoke, MCP, etc.), and makes these states available for output logic equations to use. This can be used to drive LED indications showing a common alarm type, e.g. smoke alarm, for example.

4.11 System Processing

As described earlier, *MX1* uses points to represent most of its internal and external components. The configuration data controls the way these points interact to provide the required system operation.

Figure 4.6 shows diagrammatically the flow of information within the *MX1* system. The system software:

- interacts with the internal system and external hardware
- creates a table of points which includes point and sub-point status and analogue values, and
- generates logic tokens which summarise high-level system statuses.

The configuration data defines:

- what zones and *MX* Loop points are present and their operational parameters
- which points are mapped to which zones
- which zones are mapped to which zones/zone groups for default behaviours
- logic equations to provide special behaviour and interaction between points, zones and logic tokens, including behaviour to comply with required standards.

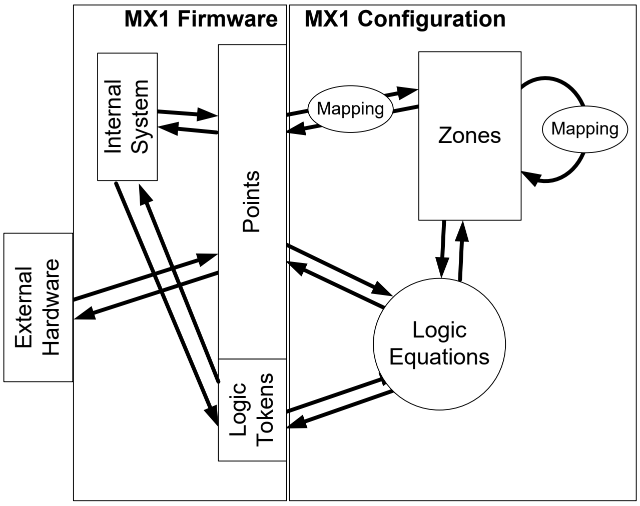

Figure 4.6 – Block Diagram of *MX1*'s Internal Processing

The system configuration is created and maintained using the software tool SmartConfig.

SmartConfig provides a range of templates for creating new configuration data. Each template is designed to provide the basic operation for a particular type of installation, and includes profiles and behaviours that are required for that type of application. New templates can also be created by the user if required.

SmartConfig also performs some consistency checks on configuration data, and provides protection to profiles and user logic equations which control mandatory and other critical behaviour to prevent accidental changes to these.

Refer to the SmartConfig manual and on-line help for details on the available points and possible states, how these can be combined to provide the required alarm processing functions, and detail about templates and the general use of SmartConfig.

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5 System Design Procedure

5.1 General

This chapter summarises the typical procedure of designing, dimensioning and configuring an *MX1* system. Detailed descriptions of the individual steps are given in the following chapters.

A Fire Alarm System must be reliable in all aspects and must be engineered correctly to suit the requirements of each installation. Consideration must be given to the following:

- Choice of basic system operation, for example whether the system is connected to the brigade or not.
- Choice of the most appropriate type of detectors and alarm devices.
- Choice of best position for detectors, alarm devices and Controller.
- Division of property being protected into zones.
- Consideration of level of protection (and hence cost) versus reduction in risk.

In all cases the importance of good planning cannot be over-emphasised. It is essential that the personnel responsible for planning and engineering fire alarm systems are properly trained, familiar with all the relevant fire alarm standards, and also with general fire alarm planning methods and procedures.

5.2 *MX1* System Operation

5.2.1 Components Affecting Basic System Operation

The basic system operation of *MX1* is controlled by:

- System option settings
- Point flags and Logging settings for selected controller points
- System Logic equations

System option settings determine how the user interface functions, how power supply monitoring is done, how the system clock operates and so on.

The configuration of controller points, for example brigade relay outputs, determines whether brigade interfaces (alarm routing equipment) are monitored for faults, and whether activity on the brigade signals is logged.

System logic equations tie together the various system statuses to drive brigade relays (or not), determine which inputs are used for system functions, (for example Silence Alarms switches) and control access to the keyboard according to access level and operational requirements.

5.2.2 System Profile-Controlled *MX1* Operation

System Profiles (in conjunction with system logic) control the basic system operation.

Selection of a particular System Profile will automatically determine basic system settings, and the settings for the controller points. It will also determine how the corresponding System Logic will operate by providing “on/off” controls to the logic equations by use of special logic substitutions.

Selection of the inputs and outputs to drive and be controlled by System Profiles is still done manually.

5.2.3 Individual Settings for *MX1* Operation

All settings controlling operation appear individually in the System page, and the *MX1* Controller page. System Logic is fixed.

Changes to system operation must be done by changing settings individually.

5.3 Detectors

The steps in determining detector types and numbers are:

1) Using the site or building plans, divide the protected area into zones. This may already have been done by a consultant. The size and boundaries of these zones will be affected by the restrictions in the applicable fire alarm standards as well as the physical layout of the protected area.

2) In each room or section of the protected area, choose the type and number of detectors which are appropriate to the activities or hazards present and are compliant with the relevant fire alarm standards.

3) In each zone, allocate the required number of call points according to local codes or site requirements.

4) Where there are contact outputs from other systems that must be monitored, e.g., sprinklers or air handling units, allow for an addressable input module of an appropriate type, i.e., single or multiple input. There are several input options which can be used, depending on circumstances.

5) Where there are inputs to other systems that are driven by the fire alarm system, allow for addressable output modules of an appropriate type, e.g., a relay module or relay base.

6) Allocate a unique number to each device on each *MX* loop.

See Chapter 6 for more about addressable detectors and devices.

5.4 Intrinsically Safe Detectors

When devices are to be installed in a hazardous environment – that is, where flammable gases or vapours, combustible dusts or other easily ignited airborne substances may be present – Intrinsically Safe (IS) devices must be used. These devices are designed to operate at a power level too low to present a risk of ignition.

Johnson Controls devices designated with the suffix “Ex” in the part number are Intrinsically Safe and suitable for use in hazardous areas if they are correctly selected and installed. In addition there are other Intrinsically Safe devices (such as S271i+) that do not carry this suffix.

Note that there are requirements for wiring in hazardous areas that must be satisfied. These include (but are not limited to):

- Matching “Ex” rating of equipment chosen with hazardous area classification.

- Ensuring cable capacitance and inductance are within the limits of the repeaters used.

- Providing adequate physical protection for equipment according to local hazardous area wiring regulations.

- Using cable of the correct insulation and physical strength according to local hazardous area wiring regulations.

- Complying with manufacturer's instructions for mounting of "Ex" rated devices.

- Ensuring that wiring for intrinsically safe equipment is sufficiently separated from non-IS wiring to ensure that stray energy cannot be transmitted into the IS part of the system.

- Intrinsically Safe devices MUST be installed in conjunction with suitable isolators. Within a hazardous area, both the Intrinsically Safe devices AND the wiring that connects them to the system MUST be isolated.

- Inspection and certification of the finished installation is generally required.

See Sections 6.10 and 7.6 for more details.

5.5 Alarm (Alerting) Devices

An appropriate type of alerting devices must be chosen to suit the particular installation. *MX1* can use the following:

- Tone/speech generator driving loudspeakers via a 100V line (e.g., T-Gen2).
- Separate Emergency Warning System, e.g., QE20, QE90, controlled by *MX1*.
- Individual sounder bases controlled by addressable detectors. These are often used for local (non-brigade call) alerting in residential applications.
- Flashing Visual Alarm Devices (VADs), beacons or strobe units. E.g., AVI, 850 series VADs and Solista range of conventional VADs.

See Chapter 8 for more about alarm devices. Also, see Chapter 9 about apartment systems using AZM800.

5.6 Ancillary Loads and Other Devices

Apart from the alarm devices, there may be additional external loads powered from the *MX1*'s internal supply. These loads must be identified and incorporated into the battery requirements calculations.

Interfacing may also be required between the *MX1* and other devices, e.g., printer, modem, remote buzzer.

See Chapters 10 Miscellaneous Applications and 15 Remote Access for more details.

5.7 Zone Displays – Alphanumeric and Individual

Zones in alarm are displayed on the *MX1*'s alphanumeric display in a list of up to 99 alarms. Some aspects of alarm list operation are configurable.

Generally individual indicators for zones are required as well. *MX1* can be fitted with zone indicators in multiples of 16, comprising a red alarm indicator and a yellow fault/disabled indicator for each zone. The Slimline cabinet can accommodate up to 32 zone indicators (31 zones plus common status) in 2 modules of 16, and the 15U cabinet can accommodate up to 192 zone LED indicators (191 zones plus common status) in 12 modules of 16.

See Chapter 12 for more about zone displays.

5.8 Remote Zone Displays

MX1 has several options for driving zone displays which can be at other locations of the protected premises. These remote displays can be compact alphanumeric displays, or individual zone indicators, or a combination. Some of these remote displays can also provide some remote control of the *MX1* system.

Additionally a Remote FBP can be connected to the *MX1*. This has the same LCD and keyboard as the *MX1* to provide a remote operator interface for the fire brigade or site personnel.

See Chapter 13 for more about remote zone displays.

5.9 Alarm Routing/Brigade Signalling

MX1 has been designed to accommodate a variety of Brigade interfaces. In brief, the configurations supported are:

- General Purpose SGD (PA0862) – The GP SGD is configurable for 4-wire mode (powered from the ASE Mk2), or 2-wire mode (powered by the *MX1* system). Connection to the main board is via a 10-way FRC.
- General Purpose Brigade Relay Interface (PA0861). Mounts in the same manner as the GP SGD via 4 standoffs onto the gear plate. Connection to the main board is via a 10-way FRC.
- ASE – an isolated protected 2 wire interface that connects directly to the FAS input of a Centaur ASE (not used in NZ).
- Alarm, Fault and Disable voltage-free relay outputs are also provided directly on the *MX1* Controller. These allow connection to virtually any remote monitoring system.

See Chapter 14 for more about alarm routing/brigade signalling options.

Note that some systems are not required to be connected to the fire brigade. In these situations the brigade outputs may be assigned to, or reserved for, other functions such as external defect sounders.

5.10 *MX* Loop Card

As supplied, *MX1* panels have one in-built *MX* Loop supporting up to 250 *MX* devices. Optional *MX* Loop Cards can be added to provide additional loops. The system design needs to encompass the loop design and power requirements of these.

Installation procedures are covered in the *MX* Loop Card Installation Instructions (LT0443).

5.11 Battery Requirements

Once the full tally of required equipment for the *MX1* system has been completed, the necessary battery capacity for the system can be calculated. The size of the required battery may affect the size and type of cabinet required to house the system.

A calculation tool, MX1COST, is available to make this calculation a straightforward task, and to provide printed reports for inclusion in the system commissioning documents. This tool also checks that the load of the *MX* Loop is within acceptable limits. Alternatively, the calculation can be done manually for simple systems.

See Chapter 11 for more about battery capacity design.

5.12 User Logic for Custom Control

MX1 has a facility for setting up customised control logic to provide specialised functions that may be required in some installations, such as air handling and other building services controls.

Special features that *MX1* includes to make preparation of output logic easier are:

- Logic substitutions – a textual name can be given to commonly used points, statuses, or even complete logic equations.
- Pseudo Points – there are 255 pseudo points whose status can be controlled via logic equations and the points can be mapped to zones/outputs, etc. These could be used to generate alarm/fault, etc., on complex situations.
- Templates – databases can be prepared with various pre-programmed settings and then saved to act as templates for new jobs.
- Logic blocks – these "wizards" allow pre-defined functionality (e.g., AS1668 controls) to be inserted for specific inputs/outputs, etc.

Examples of user logic equations are given in this manual in the chapters on detailed design.

Further information is contained in the SmartConfig User Manual.

5.13 Profiles

Profiles are used to store basic information and choices regarding the operation of *MX1*. Normally they do not need to be edited by the user. However profiles can be edited when necessary, or new profiles added to match site, state or country requirements.

All profiles are identified by name within SmartConfig. It is strongly recommended that names chosen for profiles should be descriptive of the specific function of the profile. Note that some profiles are usually already set up to comply with standards or other legal requirements. These are normally locked.

Refer to the SmartConfig User Manual for further information about profiles.

5.14 Networking

Some information on designing *MX1* networks is contained in Section 16 of this manual. Further technical details are contained in the *MX1* Network Design Manual LT0564.

5.15 Fire Fan Control Panels and Distributed Switch System

MX1 can provide a Fire Fan Control Panel (FFCP) of up to 126 controls per panel. There are 12 controls per 3U door fitted to a rack cabinet. Programming of an FFCP is done using Logic Blocks to simplify configuration.

As the FFCP application is based on the Distributed Switch System (DSS), the FFCP can be duplicated over a Panel-link network, allowing for multiple control locations able to view and control the fans at the same time.

Section 10.18 describes how to design an FFCP for *MX1.*

The DSS can also be configured for general purpose switching and indication applications, such as control of test valves or plant isolation.

Section 10.21 describes how to configure the DSS for these types of applications.

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6 *MX* Devices

6.1 Device Types

MX Devices fall into four basic types:

- Detectors
- Modules
  - Input (Monitor)
  - Output (Control)
  - Isolator (SCI)
- Bases
  - Universal Base
  - Short Circuit Isolator Base (IB)
  - Relay Base
  - Sounder Base
- Intrinsically Safe Devices – refer to Section 6.10.

In addition, compatible non-addressable (conventional/collective) smoke, CO, thermal, or flame detectors may be connected to the *MX* Loop by means of the DDM800 Universal Detector Module or DIM800 Detector Input Module.

MX addressable devices compatible with *MX1* are as follows:

Table 6.1 – Device Types

Device	**Description**	**Input / Output**	**Remote LED**	**Comments**
814P	Photoelectric Smoke Detector	I/O	Y	Requires base
814PH	Photoelectric Smoke + Heat Detector	I/O	Y	Requires base
814CH	Carbon Monoxide + Heat Detector	I/O	Y	Requires base
814I	Ionisation Smoke Detector	I/O	Y	Requires base
814H	Heat Detector	I/O	Y	Requires base
801F	IR Flame Detector	I/O	N	Requires base
801PC	Photoelectric Smoke, Heat and CO Detector with SCI	I/O	Y	Requires base
850H	Heat Detector with SCI	I/O	Y	Requires base
850P	Photoelectric Smoke Detector with SCI	I/O	Y	Requires base
850PH	Photoelectric Smoke and Heat Detector with SCI	I/O	Y	Requires base
850PC	Photoelectric Smoke, Heat and CO Detector with SCI	I/O	Y	Requires base
S271f+	Flameproof Triple IR Flame Detector	I/O	N	Flameproof
FV411f	Flameproof Triple IR Flame Detector	I/O	N	Flameproof
FV412f	Flameproof Triple IR Flame Detector	I/O	N	Flameproof
FV413f	Flameproof Triple IR Flame Detector	I/O	N	Flameproof
FV421i	IS Triple IR Flame Detector	I/O	N	Intrinsically safe
CP820/ CP830 MCP820/ MCP830 MCP821 MCP831	Manual Call Point (not NZS 4512 compliant) Manual Call Point with SCI (not NZS 4512 compliant) NZ Indoor MCP with SCI NZ Outdoor MCP with SCI	Input	N	Built-in LED
CIM800	Contact Input Module	Input	N	EOLR 200Ω Alarm R (if used) 100Ω Max Wiring R 10Ω
DDM800	Universal Detector Module	Input	N	

Device	Description	Input / Output	Remote LED	Comments
DIM800	Detector Input Module	Input	N	EOLR 4k7Ω Requires external supply.
LPS800	Loop-Powered Sounder Driver	Output	N	Controls & supervises loop-powered load up to 75mA.
MIM800	Mini Input Module	Input	Y	EOLR 200Ω Alarm R (if used) 100Ω Max Wiring R 10Ω
MIM801	Mini Input Module normally closed interrupt	Input	Y	N/O mode - EOLR 200Ω Max wiring R 50Ω
MIO800	Multiple Input/Output Module	Input/ Output	N	3 Multi-State inputs 2 Relay outputs
QIO850	4 Input, 4 Output Module	Input/ Output	N	4 x Alarm/Flt Inputs 3k3 EOL 4 x Relay/ Switched Outputs
QMO850	4 Supervised Output Module	Output	N	4 x Supervised Switched Outputs
QRM850	4 Output Module	Output	N	4 x Relay/ Switched Outputs
RIM800	Relay Interface Module (unsupervised load wiring)	Output	N	2A 30VDC
SAB801	Loop-Powered Sounder base address module with Beacon Driver	Output	N	Controls Relay/ Sounder base. Includes red flashing beacon.
SAM800	Sounder base Address Module Driver	Output	N	Controls Relay/ Sounder base. No beacon.
SNM800	Sounder Notification Module (relay output with supervised load wiring)	Output	N	2A 30VDC Requires external supply
SIO800	Single Input/Output Module	Input/ Output	N	1 x Alarm/Flt Input 3k3 EOL 1 x Relay/ Switched Output
VIO800	MIO800 configured for connecting to VESDA units.	Input/ Output	N	3 Multi-State inputs 2 Relay outputs
VLC800	VESDA Aspirating smoke detector	I/O	Y	
AZM800	Apartment Zone Module	I/O	N	Refer to Section 6.6.6 “AZM800 Apartment Zone Module”
P80AVB	Addressable Visual & Audible Alarm base	Output	N	Refer s6.6.8
P81AVB	Addressable Visual & Audible Alarm base – High Power	Output	N	Refer s6.6.8
P80SB	Addressable Audible Alarm base	Output	N	Refer s6.6.9
P80AVR	Addressable Wall mount Visual & Audible Alarm device (red)	Output	N	Refer s6.7.15
P80AVW	Addressable Wall mount Visual & Audible Alarm device (red)	Output	N	Refer s6.7.15

Device	Description	Input / Output	Remote LED	Comments
Ex Devices				
801FEx	IS IR Flame Detector	I/O	N	Requires IS base
S271i+	IS Triple IR Flame Detector	I/O	N	
801CHEx	IS CO + Heat Detector	Input	N	Requires IS base
801PHEx	IS Photoelectric Smoke + Heat Detector	Input	N	Requires IS base
801HEx	IS Heat Detector	Input	N	Requires IS base
IF800Ex	IS Contact Input Module	Input	N	
CP840Ex	IS Manual Call Point	Input	N	
FV421i	IS Triple IR Flame Detector	I/O	N	

The devices above are addressed by the 801AP Service Tool, 850EMT Engineering Management Tool, *MX* Loop Tester, or by command from the diagnostic menu of an *MX1*.

The following bases and modules may also be used:

5B	Universal Base
5BEx	Ex-rated Base for Ex Detectors
5BI	Isolator Base
814IB	Isolator Base (obsolete)
814RB	Relay Base
814SB	Sounder Base (obsolete)
802SB	Sounder Base (loop powered)
901SB	Sounder Base (external power)
80DSB	Sounder Base (loop powered)
4B	Universal 100mm Base
4B-C	Universal 100mm Base with Continuity Switch
4B-I	Universal 100mm Base with Isolator
D51MX	Duct Sampling Unit with a 4B-C base (requires 850P)
EXI800	IS Spur Interface Module (contains internal short circuit isolator)
LIM800	Loop Isolator Module – SCI

The 814RB Relay Base may be plugged into a Universal Base or Isolator Base, or mounted directly on a wall / ceiling.

Note that none of these bases are addressable devices. The functional bases (relay, sounder) are controlled from the *MX1* via the detectors or SAB801/SAM800 that are plugged into them.

The devices marked as “I/O” in Table 6.1 are always inputs, but may also be used as outputs via the Remote Indicator output and the signal to the functional base. The output functionality is programmable and is not necessarily related to the input status. Intrinsically safe “Ex” devices may not be used in relay or sounder bases.

The devices which have a remote LED output may drive a E500Mk2 remote LED. The functionality of this LED is programmable and it does not have to follow the internal indicator status. See Figure 6.1 and Section 6.6 for wiring details.

MX1 can communicate with a mix of up to 250 addressable devices, within limits defined by loop resistance and capacitance. MX1COST can be used to verify a loop design against these limits.

The functional base output sub-point for MX addressable detectors can be used when the detector is fitted to one of the following bases:

814RB Relay Base
802SB Sounder Base
812SB Sounder Base
901SB Sounder Base

Do not enable the functional base output sub-point if the detector is installed in any other base type. This is especially important for 850 series detectors in 4B-C continuity bases because if the functional base output is activated, it could open circuit the loop. This is because the functional base control signal is shared with a signal to activate the short circuit isolator in these detectors.

6.1.1 850 Series Detectors

The 850 series detectors have in-built short circuit isolators (SCI). To use the in-built SCI, the 850 detectors must be installed in a 4B-C base and wired correctly.

When fitted in the 4B-C base, you must not configure the functional base as present (as the functional base output control will turn the SCI on/off).

850 series detectors can be fitted to the 4B, 4B-I, 5B, 5B-I, sounder base, relay base, VAD base: the detector's internal SCI will be non-functional.

When 850 Series detectors are fitted to functional bases (80DSB, 802SB, 812SB, 901SB, 814RB) the yellow LED of the detector is turned on when the functional base is activated. This draws an extra 3mA of current. If a large number of 850 detectors turned on their functional bases at the same time, this could add extra current to the loop that is not allowed for. MX1Cost V2.13 onwards includes the facility to enter these devices separately so the current can be included in the MX loop calculations.

6.2 Device Installation – Mounting the Devices

6.2.1 Detectors and Detector Bases

Detectors plug in to a circular, plastic base which has holes for screw mounting to a flat surface, and screw terminals for connecting the loop wiring. There are four different types of base available. Three of the base types (Universal, Isolator and the 802SB/812SB/901SB Sounders) may be mounted only as just described. The 814RB Relay Base and the 814SB sounder base may be mounted as just described, or may be plugged into a Universal or Isolator base to interpose between it and the detector.

6.2.2 Modules

The Modules are normally mounted within the enclosure of the equipment to which they connect, or in a cabinet, junction box or switch box. They may be mounted on plastic standoffs (e.g., 4 x HW0130) on a gearplate or cabinet, or to a face plate that mounts on a double flush or surface box. A hole may be required for the on-board LED. A standard plate with a hole for the LED and three holes for the Service Tool is available (Ancillary Cover M520). This fits a plastic surface box K2142. Most modules can also be mounted in the IP65 rated D800 box.

The MIM800/801 is smaller than the other modules, and is supplied in a plastic housing which has a lug for screw mounting.

The MIO800 is physically larger than most modules and can be mounted in a D800 box or on a DIN rail mounting kit (part no. 557.201.303).

The *MX1* Loop Card/*MX* module mounting bracket (FP1027) provides mounting for *MX* Modules on the 19” rack cabinet *MX1* gear plate, or inside an *MX1*-NZ slimline cabinet.

The *MX1* Loop Card/*MX* module mounting bracket is supplied with the hardware required to mount the bracket and the *MX* modules, plus instructions.
The bracket provides mounting for:

- 2 x standard-size *MX* Modules: CIM800, DDM800, DIM800, LIM800, LPS800, RIM800, SIO800 or SNM800; or
- 1 x MIO800 module.

The 4 x *MX*/DDM800 mounting bracket (FP1062) provides mounting for 4 x standard size *MX* modules and can be fitted on the *MX1* gear plate instead of bracket-mounted *MX* Loop Cards. It is supplied with mounting hardware and a screw terminal block.

A version of this bracket is available (FP1063) with 4 x DDM800 modules factory-fitted and wired to provide 8 conventional detector circuits. Up to 6 of these modules can be fitted (4 easily, 2 with more work) to the 15U *MX1* gear plate (with no T-GEN) to provide 48 circuits of conventional detection, e.g., for retrofit applications.

The AZM800 is designed to mount on a standard electrical flush box or equivalent fittings.

6.3 Address and LED Blink Programming

Addresses for *MX* detectors and modules, and options such as LED blink on poll, are most easily set using the *MX* Service Tool or 850EMT. These are set by placing the detector onto the Service Tool, or connecting the module to the Service Tool with the supplied interface lead, and programmed as per the *MX* Service Tool Instructions.

Also the *MX* Loop Tester or the *MX1*’s change address function can be used to automatically address devices as they are added to the loop one at a time.

For all input devices, including detectors, the LED turns on steady when in alarm. For output devices (RIM800, etc.) the LED turns on when the device is activated.

6.4 Detector Descriptions

6.4.1 850H

The 850H is an analogue heat detector. The detector senses the air temperature and sends this value to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal, etc. The integral LED is turned on by the *MX1* when an alarm is detected.

Features:

- temperature sensing range of -25°C to 70°C (short term to 90°C)
- temperature accuracy typically ± 2°C
- can be configured to operate as a A2S, A2R, CS or CR heat detector
- in-built short circuit isolator (functions when fitted to a 4B-C base)
- remote LED and functional base outputs separately controllable
- can be remotely addressed using the 850EMT tool in IR mode.

6.4.2 850P

The 850P is a photoelectric smoke detector. The detector senses the amount of smoke present and sends this value to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal, etc. The integral LED is turned on by the *MX1* when an alarm is detected.

Features:

- photoelectric smoke detector
- in-built short circuit isolator (functions when fitted to a 4B-C base)
- remote LED and functional base outputs separately controllable
- can be remotely addressed using the 850EMT tool in IR mode
- operating temperature range -25°C to 70°C
- selectable detection algorithms

6.4.3 850PH

The 850PH is a photoelectric smoke detector which also includes a temperature sensor. The detector senses the amount of smoke present and the temperature and sends these values to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal, etc., based on the smoke level, temperature, or rate of rise of temperature, and/or a combination of these. The integral LED is turned on by the *MX1* when an alarm is detected.

Features:

- photoelectric smoke sensor
- heat sensor
- in-built short circuit isolator (functions when fitted to a 4B-C base)
- remote LED and functional base outputs separately controllable
- can be remotely addressed using the 850EMT tool in IR mode
- operating temperature range of -25°C to 70°C
- selectable detection algorithms for smoke and heat sensors.

6.4.4 850PC

The 850PC is a multi-sensor detector incorporating a photoelectric smoke sensor, a carbon monoxide (CO) sensor and a heat sensor. The detector senses the amount of smoke and carbon monoxide present and the temperature and sends these values to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal, etc., based on the smoke level, CO level and temperature and/or a combination of these. The integral LED is turned on by the *MX1* when an alarm is detected.

Features:

- photoelectric smoke sensor
- CO sensor
- heat sensor
- operating temperature range of -25°C to 70°C
- in-built short circuit isolator
- remote LED and functional base outputs separately controllable
- can be remotely addressed using the 850EMT tool in IR mode
- selectable detection algorithms for the smoke, CO and heat sensors.

6.4.5 814P Photoelectric Smoke Detector

The 814P is a photoelectric smoke detector. The detector senses the amount of smoke present and sends this value to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal etc. The integral LED is turned on by the *MX1* when an alarm is detected.

The detector's remote LED and functional base outputs are separately programmable for their functionality.

6.4.6 814PH Photoelectric Smoke + Heat Detector

The 814PH is a photoelectric smoke detector which also includes a temperature sensor. The detector senses the amount of smoke present and the temperature and sends these values to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal etc., based on the smoke level, temperature, or rate of rise of temperature, and/or a combination of these. The integral LED is turned on by the *MX1* when an alarm is detected.

Refer to the description of the 814H for more details on the heat-sensing element of the 814PH.

The detector's remote LED and functional base outputs are separately programmable for their functionality.

6.4.7 814CH Carbon Monoxide + Heat Detector

The 814CH is a carbon monoxide (CO) detector which also includes a temperature sensor. The detector senses the amount of CO present and the temperature and sends these values to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal etc., based on the CO level, temperature, or rate of rise of temperature, and/or a combination of these. The integral LED is turned on by the *MX1* when an alarm is detected.

Refer to the specifications of the 814H for more details on the heat sensing element of the 814CH.

The detector's LED and functional base outputs are separately programmable for their functionality.

6.4.8 814I Ionisation Smoke Detector

The 814I is an ionisation smoke detector. It should be avoided in new installations as only limited quantities are available for service requirements, and there may be long-term difficulties with eventual disposal. The detector senses the amount of smoke present and sends this value to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal etc... The integral LED is turned on by the *MX1* when an alarm is detected.

The detector's remote LED and functional base outputs are separately programmable for their functionality.

6.4.9 814H Heat Detector

The 814H is an analogue thermal detector. The detector senses the air temperature and sends this value to the *MX1*. The *MX1* makes any decisions as to whether this is an alarm, fault, normal etc. SmartConfig templates have heat profiles for AS 1603.1 Type A, B, C or D heat detection, or for default NZ operation.

The 814H has a temperature sensing range of -25°C to 95°C. The approved operating temperature range is -10°C to +70°C. The accuracy of the 814H (as interpreted by the *MX1*), within the range 0°C to 70°C, is typically + / - 2°C.

The detector's remote LED and functional base outputs are separately programmable for their functionality.

6.4.10 801PC Photoelectric Smoke, Heat & CO Detector

The 801PC is a triple-sensor fire detector incorporating heat, smoke, and carbon monoxide (CO) sensors.

Each sensor can be used independently, however the usual mode of operation is to select Universal or Resilient modes where enhancement between sensors is combined with individual operation. The *MX1* turns the 801PC's LED on when an alarm is detected.

The 801PC includes remote LED and functional base controlling outputs.

6.4.11 801F Flame Detector

The 801F is a single spectrum infrared flame detector that can be mounted in the same base as the other 800 series detectors.

It has an integral LED that is turned on by the *MX1* when an alarm is detected.

It does NOT have remote LED and functional base controlling outputs.

6.4.12 VLC-800MX VESDA LaserCOMPACT

The VLC800MX is a derivative of the standard VESDA LaserCOMPACT product family, with the primary difference that it communicates directly on the *MX* Loop.

VESDA LaserCOMPACT detectors provide very early warning of potential fire conditions by drawing air samples through 25mm pipe up to 80m long. Smoke is sampled through holes in the pipe and transported to the detector by an integrated aspirator or fan. Holes are positioned according to the application and often follow the spacing of standard conventional point detectors. Where necessary, sampling points can be constructed using capillary extensions.

The *MX1* reads a value as the fraction of the obscuration level set within the VLC800MX and determines the point alarm state by comparing this value with the configured thresholds. A pre-alarm condition based on these thresholds is also available. The *MX1* has two sets of thresholds which it compares this value against. The comparison result against each set of thresholds appears as a separate sub-point of the VLC800MX. The default profiles for these thresholds are for "Fire" and "Major Fire".

The VLC800MX alarm sensitivity can be set to anywhere between 0.005% obscuration/m and 20% obscuration/m. A PC plugged into the VLC800MX is required to set the sensitivity, to normalise the airflow, and perform other setup functions. This sensitivity is NOT controlled at the *MX1*.

Refer to publication 17A-03-VLC for further details on installing, commissioning and servicing the VLC800MX.

6.4.13 FV411f / FV412f / FV413f / FV421i Flame Detector

The FV411f, FV412f, and FV413f are triple waveband infrared flame detectors that are flame-proof rated for installation in hazardous areas. The FV412f and FV413f additionally have a built-in CCTV camera with PAL and NTSC outputs respectively. The FV421i is IS rated and has no camera,

Unlike the other detectors the FV400 series detectors are standalone units and do not mount in a base. The detectors include a remote LED output, but there is no control for this in *MX1,* and there is no functional base output.

Refer to the FLAMEVision FV400 Series – Triple IR Flame Detectors Product Application and Design Information Manual (120.515.123) and FV400 Series Triple IR Flame Detectors Fixing Instructions (120.515.124_FV-D-400-F) for further details.

6.4.14 S271f+ Flame Detector

The S271f+ is a triple waveband infrared flame detector that is rated for installation in hazardous areas.

Unlike the other detectors it is a standalone unit as it does not mount in a base. Although the S271f+ includes a remote LED output there is no control for this in *MX1* and there is no functional base output.

Refer to the S200+ Series Triple IR Flame Detectors User Manual (120-415-400) for further details.

6.5 Detector Algorithms

The 801, 814 and 850 series of detectors support various detection algorithms for use in various applications.

Note: * indicates default algorithm.

Algorithms – Heat Sensor

Algorithm	Description	Supported By	Application
Type A AS1603.1	63 degC alarm plus ROR alarm	814PH 814H 814CH*	Low ambient temperature not exceeding 45°C and not rapidly fluctuating.
Type B AS1603.1	63 degC alarm	814PH* 814H* 814CH	Normal temperature application 15°C to 45°C and potentially rapid fluctuating temperatures (> 6K/minute, e.g. commercial kitchens).
Type C AS1603.1	93 degC alarm plus ROR alarm	814H	Wide ranging temperatures <15°C to 75°C but not rapidly fluctuating.
Type D AS1603.1	93 degC alarm	814H	15°C to 75°C and potentially rapid fluctuating. (> 6K/minute, e.g. commercial kitchens).
Count 57C	57degC Count of 3, for EN-54 devices	801PHEx* 801CHEx* 801HEx*	Hazardous area zones up to 45°C without rapid fluctuating temperatures (<6K/min).
Universal	Class A2S 57 degC. No ROR	801PC*	General commercial and residential application.
Resilient	Class A2S 57 degC. No ROR	801PC	
A1R	Class A1R 57 degC with ROR	801PC	Low ambient temperature not exceeding 45°C and not rapidly fluctuating, where smoke detectors are unsuitable. High risk residential where smoke detection cannot be used.
A2S	Class A2S 57 degC. No ROR	801PC	Low risk residential e.g., laundries and kitchens up to 45°C.
CR	Class CR, 91degC with ROR	801HEx	Hazardous area zones up to 75°C without rapid fluctuating temperatures (<6K/min).
Universal 63C	Class A2S 63 degC.	850PC	Normal temperature application

Algorithm	Description	Supported By	Application
	No ROR		15°C to 45°C and potentially rapid fluctuating temperatures (> 6K/minute, e.g. commercial kitchens).
Resilient 63C	Class A2S 63 degC. No ROR	850PC*	
A2R 63C	Class A2R 63 degC with ROR	850H 850PC 850PH	Low ambient temperature <15°C but not exceeding 45°C and not rapidly fluctuating.
A2S 63C	Class A2S 63 degC. No ROR	850H* 850PC 850PH*	Normal temperature application 15°C to 45°C and potentially rapid fluctuating temperatures (> 6K/minute, e.g. commercial kitchens).
CR 88C	Class CR, 88degC with ROR	850H	Normal temperature application not exceeding 75°C but not rapidly fluctuating. Un-air-conditioned sky light.
CS 88C	Class CS 88 degC. No ROR	850H	Normal temperature application not exceeding 75°C and potentially rapid fluctuating temperatures (> 6K/minute, e.g. commercial kitchens).

Algorithms – Smoke Sensor (Photo)

Algorithm	Description	Supported By	Application
FastLogic High	FastLogic High Sensitivity	850PH 850P 814PH 814P	High value assets in clean areas such as computer rooms.
FastLogic Med	FastLogic Medium Sensitivity	850PH* 850P* 814PH* 814P*	Residential, excluding laundries and kitchens. Smoke hazard management (AS 1668).
FastLogic Low	FastLogic Low Sensitivity	850PH 850P 814PH 814P	Residential, Commercial and Industrial with transient contaminant from steam, cooking fumes, etc.
FastLogic High Enh	FastLogic High Sensitivity, heat enhanced	850PH 814PH	Same as for FastLogic High, but where there is a higher than normal flaming fire risk.
FastLogic Med Enh	FastLogic Medium Sensitivity, heat enhanced	850PH 814PH	Same as for FastLogic Med, but where there is a higher than normal flaming fire risk.
FastLogic Low Enh	FastLogic Low Sensitivity, heat enhanced	850PH 814PH	Same as for FastLogic Low, but where there is a higher than normal flaming fire risk.
Count High Sens	Count of 3, high sensitivity	850PH 850P 801PHEx	High value assets in a clean stable environment requiring a fast transient response and/or hazardous areas.
Count Normal	Count of 3, normal sensitivity	850PH 850P 801PHEx*	Normal asset protection requiring a fast transient response and/or hazardous areas.

Algorithm	Description	Supported By	Application
Count Low Sens	Count of 3, low sensitivity	850PH 850P 801PHEx	Normal asset protection with some background air borne contaminants requiring a fast transient response and/or hazardous areas.
Count High Sens Enh	Count of 3, high sensitivity, heat enhanced	850PH	Same as for Count High, but where there is a higher than normal flaming fire risk.
Count Normal Enh	Count of 3, normal sensitivity, heat enhanced	850PH	Same as for Count Med, but where there is a higher than normal flaming fire risk.
Count Low Sens Enh	Count of 3, low sensitivity, heat enhanced	850PH	Same as for Count Low, but where there is a higher than normal flaming fire risk.
8%	SmartSense 8%/m Obscuration	814PH 814P	Special high sensitivity in clean environments.
12%	SmartSense 12%/m Obscuration	814PH, 814P	General use including smoke hazard management with high transient immunity to cooking fumes.
8% Enh	SmartSense 8%/m Obscuration, heat enhanced	814PH	Special high sensitivity in clean environments with high flaming fire risk.
12% Enh	SmartSense 12%/m Obscuration, heat enhanced	814PH	General use including smoke hazard management with high transient immunity to cooking fumes but with high flaming fire risk.
Universal	Normal sensitivity smoke, heat and CO algorithm	850PC 801PC*	Residential and commercial with unpredictable fire risk and deceptive (non-fire) phenomena.
Resilient	Reduced sensitivity smoke, heat and CO algorithm	850PC* 801PC	Industrial requiring a high degree of deceptive phenomena resistance.
HPO	Increased sensitivity smoke detection only, with heat enhancement	850PC, 801PC	Reserved
HPR	Heat-enhanced Photoelectric smoke - reduced sensitivity	850PC 801PC	Reserved
Smoke Disabled		850PC 801PC	Temporary setting for use during building construction.

Algorithms – Smoke Sensor (Ionisation)

Algorithm	Description	Supported By	Application
0.22 MIC X	SmartSense 0.22 MIC X	814I	Replacement for existing ionization smoke detector.
0.39 MIC X	SmartSense 0.39 MIC	814I*	Replacement for existing ionization smoke detector.
0.59 MIC X	SmartSense 0.59 MIC X	814I	Replacement for existing ionization smoke detector.
Count Low Sens	Count of 3 Low	814I	Reserved

	Sensitivity		
Count Normal	Count of 3 Normal Sensitivity	814I	Reserved
Count High Sens	Count of 3 High Sensitivity	814I	Reserved

Algorithms – CO Sensor

Algorithm	**Description**	**Supported By**	**Application**
23ppm	SmartSense 23 ppm CO	814CH	High value asset protection well removed from the combustion process.
38ppm	SmartSense 38 ppm CO	814CH	Normal life safety protection against slow smouldering fire risks and alternative to smoke detection where smoke like deceptive phenomena is produced, e.g. theatrical smoke.
66ppm	SmartSense 66 ppm CO	814CH	Replacement for smoke detection to generate a general fire alarm where cigarette smoking is permitted.
23ppm Enh	SmartSense 23 ppm CO, Heat enhanced	814CH	As for SmartSense 23ppm CO, but with a high flaming fire risk.
38ppm Enh	SmartSense 38 ppm CO, Heat enhanced	814CH	As for SmartSense 38ppm CO, but with a high flaming fire risk.
66ppm Enh	SmartSense 66 ppm CO, Heat enhanced	814CH	As for SmartSense 66ppm CO, but with a high flaming fire risk.
Count High Sens	Count of 3 High Sensitivity	801CHEx	High smouldering fire risk in hazardous areas with no background CO.
Count Normal	Count of 3 Normal Sensitivity	801CHEx*	Normal smouldering fire risk in hazardous areas.
Count Low Sens	Count of 3 Low Sensitivity	801CHEx	Normal smouldering fire risk in hazardous areas with higher than normal background CO.
Universal	Normal sensitivity CO algorithm	850PC 801PC*	Residential CO algorithm.
Resilient	Reduced sensitivity CO algorithm	850PC* 801PC	Industrial or high background CO, or used for local alarm activation only.
CCO	Normal sensitivity CO algorithm with heat enhancement	801PC	Same as for 814CH using 801PC.
Toxic Gas	Time integrating CO Toxic Gas alarm	850PC 801PC	Residential where gas and oil heating appliances are used in combination with normal smoke and heat detection.
CCO 850PC	Normal sensitivity CO algorithm with heat enhancement	850PC	Used when smoke sensor is disabled in the 850PC.
Count 66ppm	Reduced sensitivity CO algorithm	850PC 801PC	Requires 66ppm CO level for alarm.
CO Disabled		850PC 801PC	Used where transient CO levels make CO sensing unsuitable.

6.6 Detector Base Descriptions

6.6.1 Universal Bases

The 4B 4” Universal Base and the 5B 5” Universal Base accommodate any of the *MX*814 or *MX*850 series detectors.

Wiring of the Universal Base is shown in Figure 6.1.

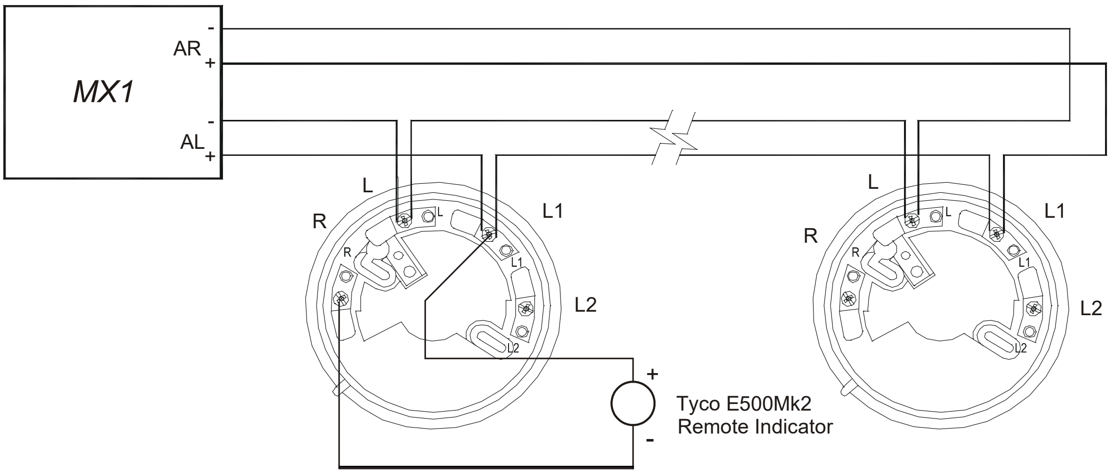


Figure 6.1 – Wiring for Universal, Relay and Sounder Bases

6.6.2 Isolator Bases

The 4B-I and 5BI Isolator bases are designed for isolating short circuited sections of the analogue loop. Typically these are used where the loop wiring crosses zone boundaries, to prevent a short circuit from affecting more than one zone. When isolator bases are used and the *MX1* Controller board is a PA1011 version or the *MX* Loop Card is Rev 1 or 2, it is strongly recommended that two additional isolator bases (possibly with no detectors inserted) be installed at the start and end of the loop, close to the *MX1*. Refer to Figure 6.2 for wiring details. These isolators at the start and end of each loop are not required with a PA1081 Controller and V1.40 firmware onwards or *MX* Loop Cards Rev 3 onwards as the cards have built-in isolators.

Isolator bases and LIM800s may also be used to join multiple lines together in a single star arrangement, for example, when a number of conventionally wired zones are being converted to *MX* devices and a loop cannot be wired. Refer to Chapter 7 for loop design information.

There is a limit to the number of other devices which may be connected to each section of cable between isolator bases. Use MX1COST to check this.

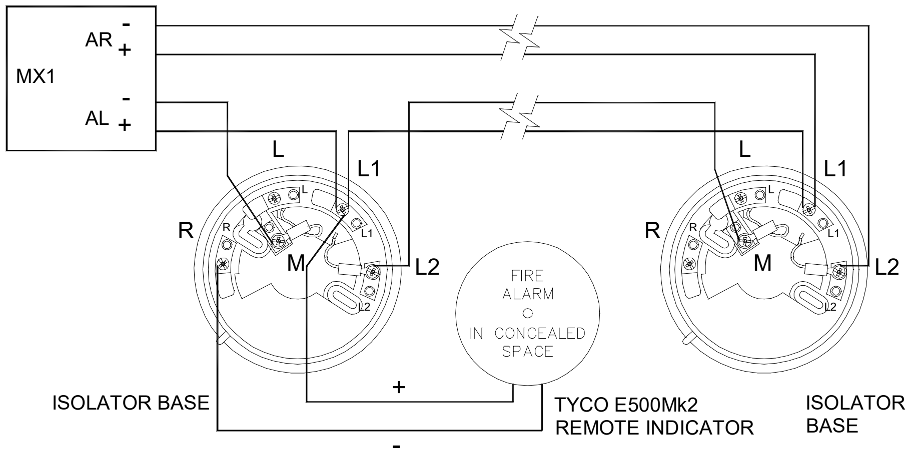


Figure 6.2 – Isolator Base Wiring

When an 850 series detector is installed in a 4B-C base the detector provides an internal short circuit isolator equivalent to the isolator base or LIM800. If the 850 series detector is installed in a 4B/5B base, sounder base, or relay base the isolator is bypassed and not used.

6.6.3 Continuity Base

The 4B-C Continuity base is used with 850 Series detectors as these have an in-built short circuit isolator. The 4B-C base provides continuity for the loop when the detector is removed. DO NOT enable the functional base output in SmartConfig when 4B-C bases are used (otherwise the isolator can unexpectedly turn off).

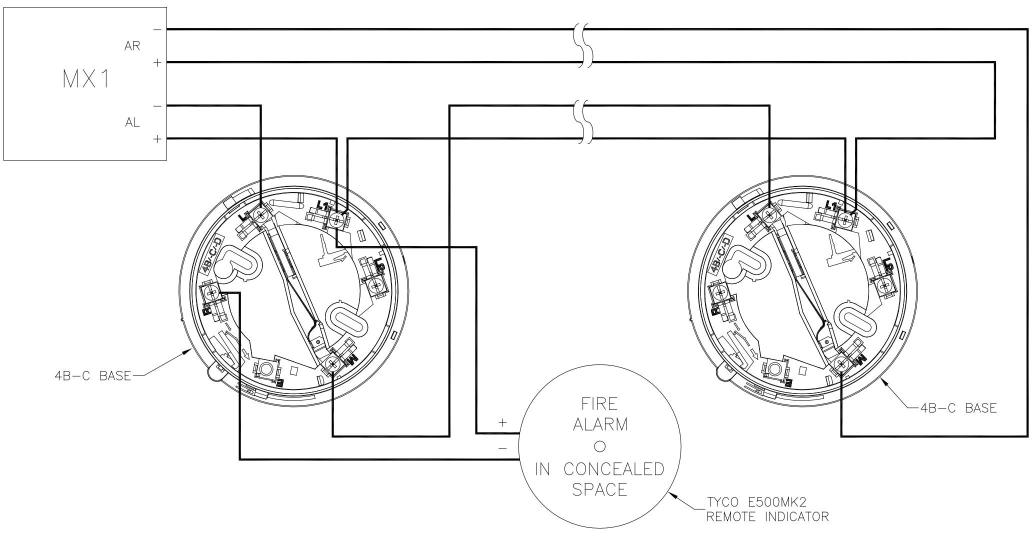


Figure 6.3 – 4B-C Continuity Base Wiring

6.6.4 814RB Relay Base

The 814RB Relay Base is a loop-powered output device. The relay is controlled by the detector which is plugged into the base, but the operation of the relay can be quite separate from the operation of the detector.

The 814RB Relay Base provides two sets of non-supervised voltage-free, change-over contacts capable of switching ancillary equipment rated at up to 1A resistive at 30VDC. One set is labelled NO, C, NC (for normally open, common, and normally closed). The other set is labelled 1 for NC, 2 for C, and 3 for NO (see Figure 6.4). The terminals accept a single cable of up to 2.5 mm^2. Relay operation is controlled by the *MX1* via an output from the detector. Hence, a detector **must** be fitted to the base in order for the relay to operate since the relay base does not have its own address.

The 814RB may be plugged into a Universal or Isolator Base, or mounted directly on the ceiling.

Wiring of the *MX* Loop to the 814RB is shown in Figure 6.1. The relay terminals are shown in Figure 6.4.

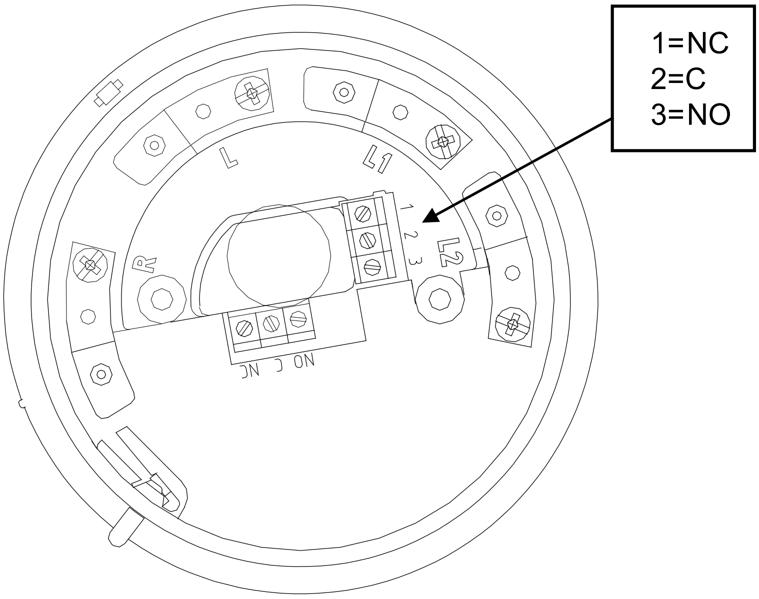


Figure 6.4 – Relay Base

6.6.5 814SB Sounder Base (obsolete)

The 814SB sounder base is a loop-powered detector base warning device. One of three different tones may be selected (none of which are NZS 4512 or AS 2220 compliant), and three sound levels are selectable. Note that the current taken by a sounder base is very much higher than most other loop devices, and therefore the number of sounder bases on a loop is limited by the available current.

The sounder is controlled by the detector which is plugged into the base, but the operation of the sounder can be quite separate from the operation of the detector.
The tone switch allows selection of one of three different tones: –

1) continuous tone (825Hz)
2) fast sweep (saw tooth envelope at 15Hz)
3) slow sweep (saw tooth envelope at 5Hz) (Factory Setting)

The volume switch provides three different levels of loudness:

1) 70dB(A) (quiet)
2) 80 dB(A) (medium)
3) 90 dB(A) (loud) (Factory Setting)

The 814SB may be plugged into a Universal or Isolator Base, or mounted directly on the ceiling.

Wiring of the 814SB to the *MX* Loop is shown in Figure 6.1.

6.6.6 80DSB/802SB/812SB Sounder Bases

The 80DSB (and now obsolete 802SB/812SB) sounder bases are loop-powered sounder bases that provide a higher volume at a generally lower current than the older 814SB. They are controlled by the MX detector / addressing module that is plugged into the base.

The 80DSB has a choice of 9 tones and 4 volume settings, with 90 dBA sound level max.

The 802SB has a choice of 8 tone types and a volume control, and provides 90dBA of sound level typically.

The 812SB has a similar choice of tones, but has a fixed sound level of 100dBA.
The loop loading of the 812SB is significantly higher than other devices.

These sounder bases need to be mounted to the ceiling directly, as they do not mount into another base. Wiring is as per the standard base, refer Figure 6.1.

The 80DSB sounder base is permitted by NZS 4512:2021 for local alerting only – as per clauses 4.6.5, 4.6.7 and 4.6.11. Note the locking mechanism in the base must be fitted so the detector is not easily removed.

6.6.7 901SB Sounder Bases

901SB sounder bases are *MX* loop compatible sounder bases that require an external 18-32Vdc supply. Therefore their loop loading is much lower than the 802SB, and so more can be handled per loop.

The 901SB has a choice of 8 tone types, volume control, and provides 90dBA of sound level typically.

The sounder base is controlled by the detector or SAB801/SAM800 plugged into it.

These sounder bases need to be mounted to the ceiling directly, as they do not mount into another base. Wiring is as per the standard base, refer Figure 6.1. Wiring of the external power source is to the + and - terminals.

This base is not compliant with NZS 4512:2010.

6.6.8 P80AVB/P81AVB Addressable VAD Bases

The P80AVB and P81AVB are addressable MX bases with Visual Alarm and Audible Alarm functions. They are assigned their own address and are controlled from the MX1 panel separately to the optional detector plugged into the base. The visual alarm (bright, flashing white LED) has 2 levels of brightness and two flash rates, and the audible alarm has a choice of sound level (selected in the MX1 configuration – not dynamic). If no detector is plugged in, then a cover should be fitted. The P81AVB has a higher flash intensity compared to the P80AVB.

They are MX-loop powered and contain a short-circuit isolator. Note they draw significant current when operated, and introduce a voltage drop due to the SCI. So, the quantity permitted on a loop may be limited.

The visual functions are compliant with NZS 4512:2021, and the audible function is permitted by NZS 4512:2021 for local alerting only – as per clauses 4.6.5, 4.6.7 and 4.6.11.

The JCI EA0348 Tag plate provides 15mm “FIRE” text on a red background and needs to be fitted alongside the base, if no detector is fitted.

6.6.9 P80SB Addressable Sounder Base

The P80SB is an MX-loop powered addressable sounder base that contains a short-circuit isolator. It is assigned its own address and is controlled from the MX1 panel separately to the optional detector plugged into the base. The audible alarm has a choice of tone and sound level (selected in the MX1 configuration – not dynamic).

The P80SB is permitted by NZS 4512:2021 for local alerting only – as per clauses 4.6.5, 4.6.7 and 4.6.11.

If no detector is plugged in, then a cover should be fitted and the JCI EA0348 Tag Plate fitted on the cover or alongside.

6.6.10 Remote Indicator Wiring

A remote indicator may be wired to any base as shown in Figures 6.1 to 6.3.

A single Remote Indicator may be wired up to a number of detector bases, so that it turns on if any one of the detectors turns it on. The R terminals of the detector bases involved must be looped together.

This group must not include an isolator base, nor may it extend across an isolator.

The brightness may increase slightly if more than one detector turns on the remote indicator.

Note the combining effect can also be achieved using logic equations in the configuration instead of wiring between the bases. There are no grouping limitations when using logic equations.

6.7 Module Descriptions

6.7.1 MIM800 and MIM801 Mini Input Modules

The MIM800 and MIM801 Mini Input Modules are suitable for interfacing voltage-free contacts such as switches, relay contacts, flow switches, or non-indicating detectors.

Addressable Manual Call Point products are available that already incorporate the MIM800 or MIM801.

Both the MIM800 and MIM801 may be used in normally-open or normally-closed configurations, and the normally-open configuration can include short circuit fault supervision.

The normal response time to an input change of state is 0 – 5 seconds, as each device is polled at 5 second intervals by the *MX1*. If faster operation is required, e.g. for New Zealand manual call points, interrupt operation can be enabled. Interrupt operation allows a change to be signalled by the device so that the *MX1* detects the change almost immediately, rather than waiting for the next poll of the device.

The latest release of MIM800 supports interrupt on closing or opening contacts. The MIM801 supports interrupt on opening contacts only. An interrupt can be generated only on the transition from normal to alarm; transitions from alarm to normal will always require up to the poll interval to be recognised.

Fault supervision is provided by a 200Ω EOL resistor - open circuit fault in a normally-open configuration and short circuit fault in a normally-closed configuration. In addition the normally-open configuration can be programmed to also generate fault on short circuit. In this case only one alarm contact is allowed and a 100Ω resistor must be wired in series with the alarm contacts. This same configuration can be used in a normally-closed configuration to generate a fault on open circuit. Only a single contact can be used. Refer to Figure 6.5 for wiring configurations.

Note that the correct profile must be selected in SmartConfig to match the wiring.

The input wiring must be as short as possible (<1m) and located well away from all electrical noise sources.

The MIM800 and MIM801 have screw terminals for an Alarm Indicator LED. No series resistor is required. A current of about 2.5mA will be supplied when the output is on.

WARNING
DO NOT JOIN INPUT WIRING BETWEEN MODULES OR CONNECT TO ANYTHING OTHER THAN VOLTAGE-FREE CONTACTS

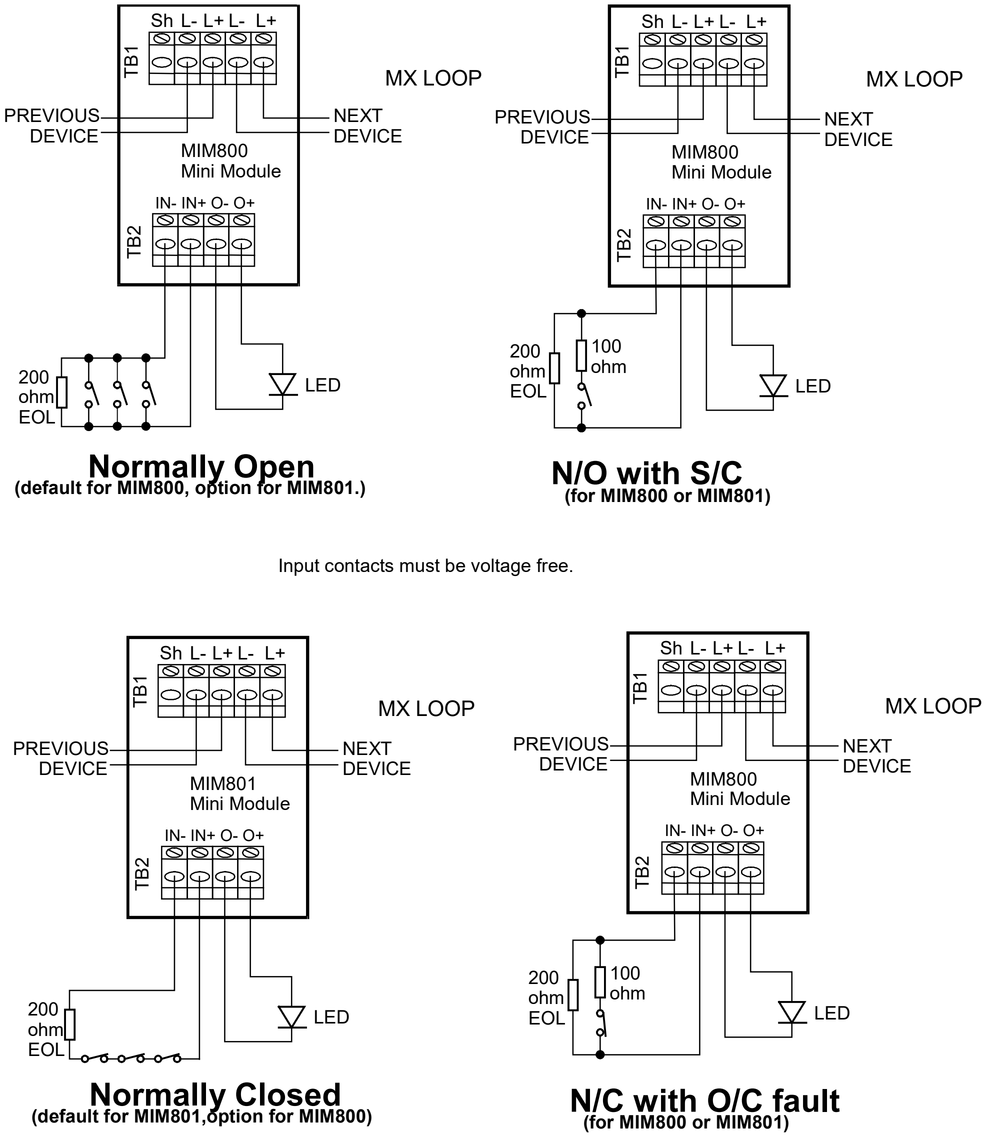


Figure 6.5 – MIM800 and MIM801 Field Wiring

6.7.2 CIM800 Contact Input Module

The CIM800 Contact Input Module is suitable for interfacing voltage free contacts, e.g. switches, relay contacts, flow switches, or non-indicating clean-contact detectors on longer input cables. It has two inputs, the states of which are separately available as sub-points.

The CIM800 may be used in normally-open or normally-closed configurations, and short and open circuit fault supervision can also be included.

The normal response time to an input change of state is 0 – 5 seconds, as each device is polled at 5 second intervals by the *MX1*. If faster operation is required, interrupt operation can be enabled. Interrupt operation allows a change to be signalled by the device so that the *MX1* detects the change almost immediately, rather than waiting for the next poll of the device.

The CIM800 can interrupt only on “closing” contacts, so interrupt operation is applicable for only normally-open contacts. Transitions from closed to open will always require up to the polling interval to be recognised. Therefore it cannot be used for callpoints on NZ systems.

Fault supervision is provided by a 200Ω EOL resistor - open circuit fault in a normally-open configuration and short circuit fault in a normally-closed configuration. In addition the normally-open configuration can be programmed to also generate fault on short circuit. In this case only one alarm contact is allowed and a 100Ω resistor must be wired in series with the alarm contacts. This same configuration can be used in a normally-closed configuration to generate a fault on open circuit. Only a single contact can be used. Refer to Figure 6.5 for wiring configurations.

Note that the correct profile to match the wiring configuration must be selected for each input of the CIM800 in SmartConfig.

WARNING
DO NOT JOIN INPUT WIRING BETWEEN INPUTS OR MODULES OR TO ANYTHING OTHER THAN VOLTAGE-FREE CONTACTS

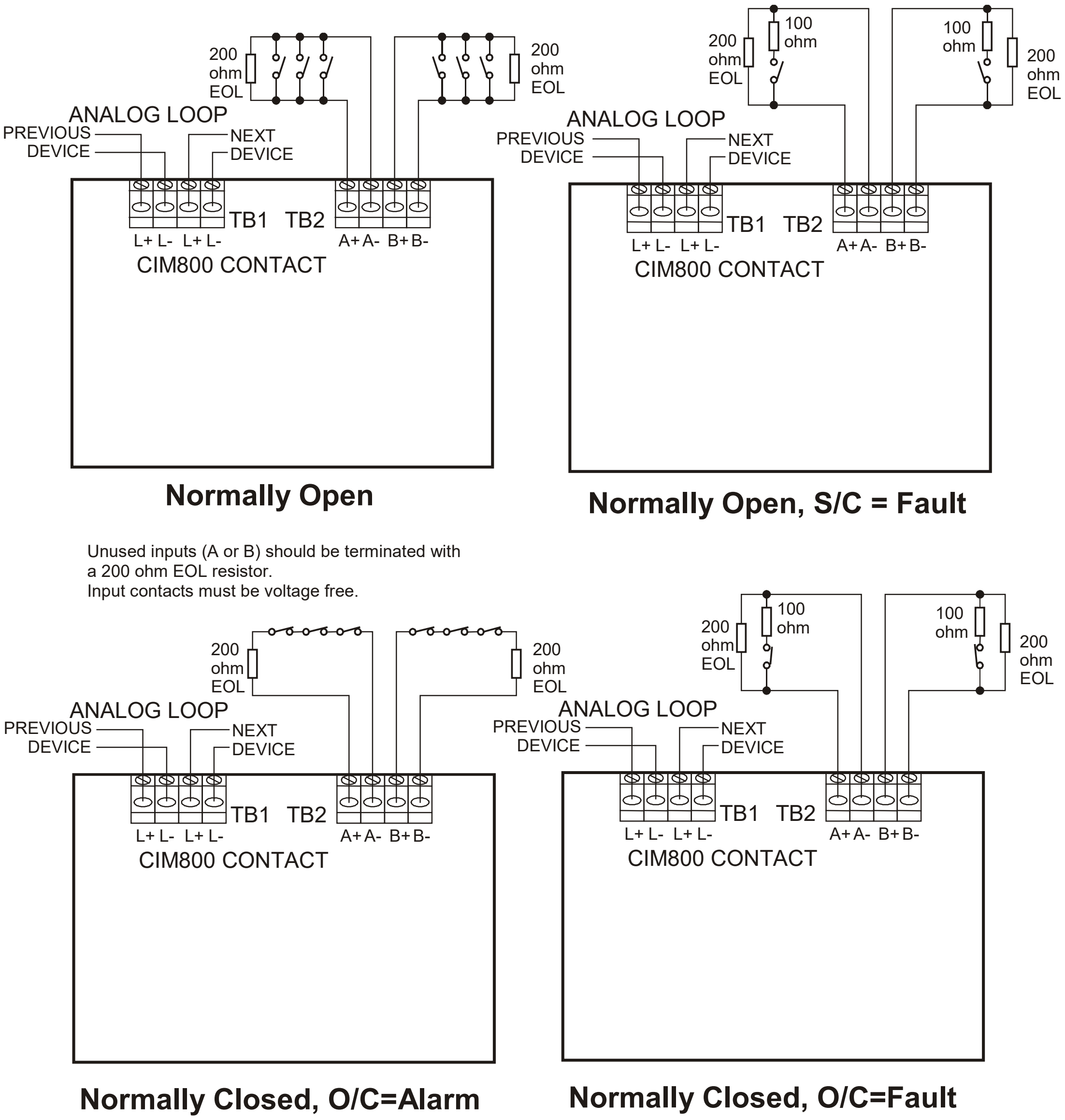


Figure 6.6 – CIM800 Field Wiring

6.7.3 MCP821/MCP831 Manual Call Points

The MCP821/MCP831 are new-style MCPs compliant with NZS 4512:2010. They include a plastic resettable element and cover, and an internal electronics module that includes a short circuit isolator. They are configured in SmartConfig as a MIM801. In fact these MCPs can replace existing 1841 MX MCPs or other MCPs using a MIM801 without reprograming the MX1.

The MCP831 is a weatherproof version of the MCP821, suitable for external use (with suitable sunlight protection).

Default operation for the call points is to not use interrupts, but this can be enabled to give immediate indication (<2s) of an alarm.

The call points include an LED visible from the front. This lights red on alarm and can be programmed to blink when the call point is polled. It lights yellow when the short circuit isolator is operated.

6.7.4 FP0838 / FP0839 1841MX Manual Call Points

The FP0838 and FP0839 1841MX Manual Call Points consist of a MIM801 mounted on an 1841 Break Glass Switch assembly (compliant with NZ Standard NZS 4512). They are configured with normally closed switch contacts as is required in New Zealand.

The normal response time to an input change of state is 0 – 5 seconds, as each device is polled at 5 second intervals by the *MX1*. Because faster operation (<1 second) is required in New Zealand, interrupt operation must be enabled for the MIM801. Interrupt operation allows a change to be signalled by the device so that the *MX1* detects the change almost immediately, rather than waiting for the next poll of the device. Default programming of the MIM801 selects open circuit alarm and interrupt operation.

The FP0838 and FP0839 Call Points include an LED visible from the front. This lights on alarm and can be programmed to blink when the MIM801 is polled. Operation is otherwise the same as the MIM801. Wiring is as per Figure 6.5.

6.7.5 DDM800 Universal Fire & Gas Detector Module

General

The DDM800 Universal Fire & Gas Detector Module is suitable for interfacing collective non-addressable detectors, e.g., smoke, heat, and MCPs, onto the *MX* loop.

The capabilities of the DDM800 are a superset of the DIM800 and it is suitable for use in a much broader range of applications. Additional features of the DDM800 include a built-in *MX* loop short circuit isolator, loop-powered operation, separate fast alarm band for heat detectors and MCPs, intrinsically safe circuit operation, and NZ Legacy profiles.

Remote indicator outputs for 614xx detectors may be used on a DDM800 when S/C is configured as fault, such as most default profiles, whereas this would be prohibited for a DIM800 – for the DDM800 there is no risk of a shorted indicator output causing a valid alarm to register as a short circuit condition. The characteristics of the DDM800 input circuits provide more reliable operation at low input circuit voltage levels as compared to the DIM800.

The DDM800 has two inputs, each of which can be set to be not used. No terminating EOL is required for a disabled input, thereby reducing power consumption.

Alarm and fault conditions are determined by the *MX1*. An alarm can be recognised within 5 seconds if AVF is not enabled for the circuit, or 15-20 seconds if AVF is enabled. Fast alarms (e.g. for MCPs) can be recognised nearly immediately if interrupts are enabled, or within 5 seconds otherwise. Recognition of a fault condition takes about 30 seconds.

A loop power mode can be programmed for the DDM800 module whereby the current to drive the collective detector circuits is derived from the *MX* loop – this functionality can eliminate the need for an expensive external power supply.

When the “low voltage” mode is selected (limits the compatible detectors to specific low voltage types) the *MX* loop voltage can work down to its usual minimum voltage of 20V. When any other mode is selected with loop powering the minimum *MX* loop voltage must be increased to 28V (requiring special *MX* loop design resulting in less loop load, shorter cables or thicker cabling be used).

An external power supply will usually be used for modes other than low voltage modes, but in New Zealand this generally cannot be done as the minimum PSU voltage (19.2V) required by NZS4512 is below the DDM800’s minimum operating voltage of 21.9V. Use of a regulated supply to increase the voltage to the DDM800 is possible, but care must be taken to comply with all other aspects of NZS4512.

If an external supply is used it must comply with NZS4512, and it should be set to 27.3V by default. The wiring from a common PSU to multiple DDM800 modules must be arranged so that a single open circuit does not prevent alarms from being generated in more than one zone. A loop arrangement with supervision and a reverse-feed relay can be used to achieve this – refer to Product Bulletin PBF0200.

The DDM800, when operating with an external supply, provides electrical isolation of the detector circuit(s) from the *MX* loop. If loop powered, this is not the case, the detector circuit –ve is common to the *MX* loop –ve.

If the detector itself requires a 24V power supply that needs to be switched off to reset the detector, e.g. some beam detectors, refer to Product Bulletin PBF0213 for a suitable arrangement.

When the DDM800 power supply (external or loop derived) falls below a configured threshold a Load Supply Fail fault will be indicated. Processing of alarms or other faults will not occur whilst this condition exists. It is important that the loop design is done, otherwise the loop voltage could fall below this voltage and stop the DDM800 from working correctly.

A DDM800 internal fault is the highest priority fault and is presented simply as Fault. This will be generated when the DDM800 jumpers are set for external power mode and no power supply is connected. It will also be present when the DDM800 itself is genuinely faulty and requires replacement.

Detector Field Wiring

Field wiring of the DDM800 using loop power with collective detectors is shown in Figure 6.7. When using an external power supply see Figure 6.9. For both setups, note the position of the jumpers J2, J3, and J4 in the diagrams – they select the power source used. The wiring instructions for the particular detector/base must be referred to as some bases break the negative line, and others the positive line, when the detector is removed. The EOL resistor value is 4k7 ±1%. Maximum line resistance is 50Ω, the detector circuit current limit is 25mA.

Wiring of an IS detector circuit to the DDM is shown in Figure 6.8. Apart from the IS repeater connection, follow all other aspects of Figure 6.7 or Figure 6.9 for loop and external powered modes respectively. The Pepperl+Fuchs KFD0-CS-Ex1.51P (single channel) or KFD0-CS-EX2.51P (two channel) IS repeaters are specified for IS operation with the DDM800. Note the use of a 5k6 ±1% EOL in this mode.

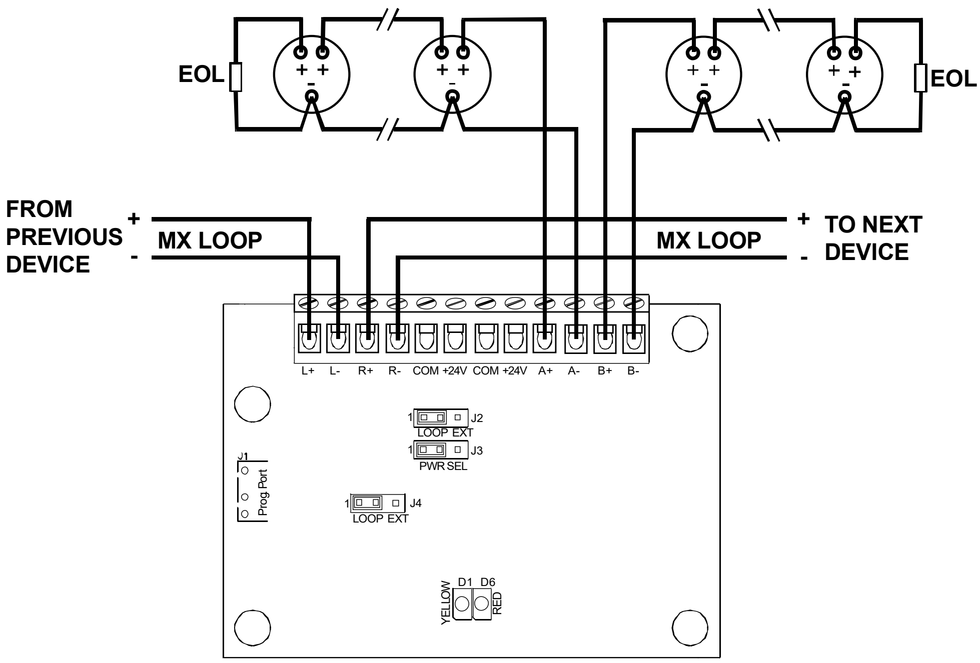


Figure 6.7 – DDM800 Field Wiring – Collective Detectors, Loop Powered

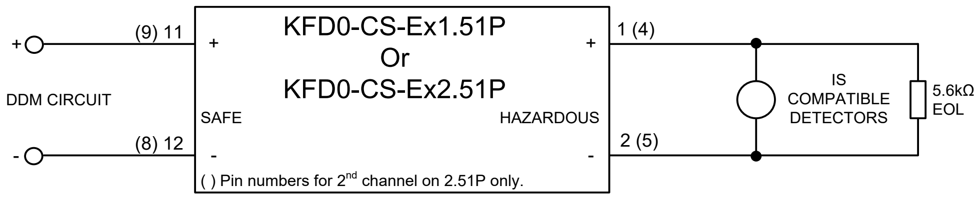


Figure 6.8 – DDM800 Field Wiring – IS Detectors

The FV421i Intrinsically Safe Flame Detector can be used in Conventional mode with a DDM800 on MX1. A P&F KFD2-CR-Ex1.30.200 Isolating repeater must be used on each DDM800 input, with an external power supply to the DDM800 (loop powering is not recommended). The DDM800 input must be configured for a profile of “Intrinsically Safe”. One FV421i is supported per DDM800 input, and the FV421i must be set for non-latching alarm operation as this arrangement does not provide a means to reset an alarm at the detector. Also, a short circuit in the hazardous area wiring will be detected as an alarm condition. Figure 6.8A shows the wiring for Input A.

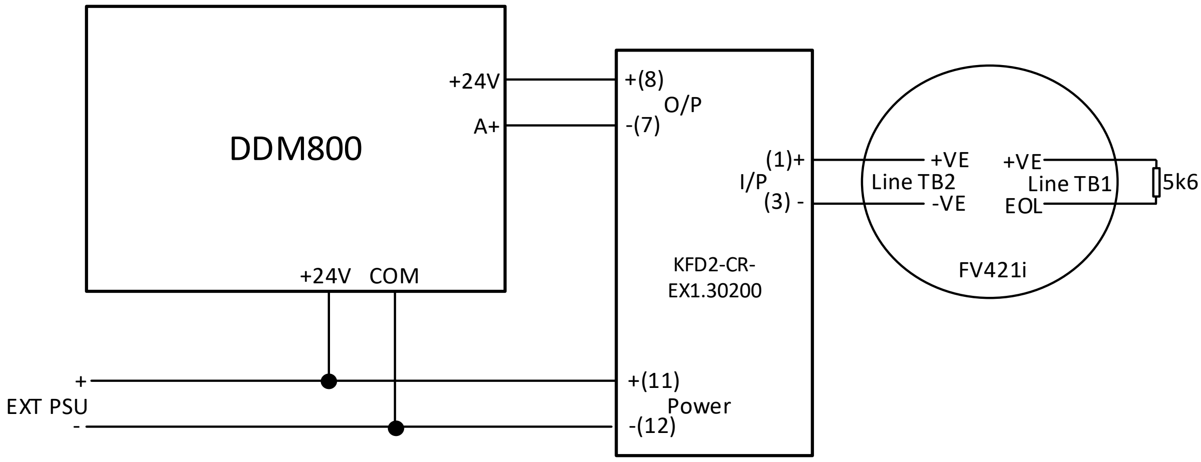


Figure 6-8A – DDM800 Wiring to FV421i Flame Detector

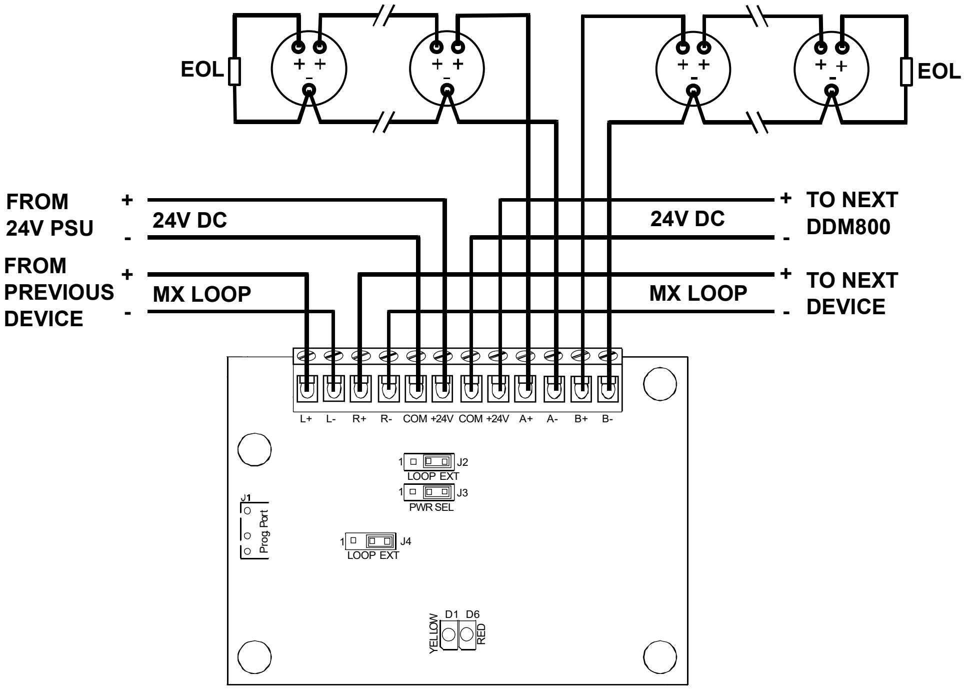


Figure 6.9 – DDM800 Field Wiring – Collective Detectors with External 24V Supply

Mode Selection and Applications

The DDM800 has a number of profiles in the default template available for selection. The Profile Selection Process (shown in Table 6.3) should be followed to determine the most appropriate profile. Consult the collective detector compatibility Table 6.4 for which collective detectors are compatible with each profile.

With the low voltage detector profiles, the *MX* loop voltage may be run down to its normal level (20V). However, the range of compatible detectors suitable for this mode is less than for the standard voltage detector modes. Standard voltage detector modes require the *MX* loop voltage to be run at an elevated level (>28V) when loop-power is selected. Fortification of the *MX* loop, i.e., larger diameter cables, less load, and reduced cable length, will be required to meet this elevated minimum loop voltage.

Many of the profiles define separate alarm and fast alarm bands. This is to allow differentiation between smoke detectors (and others that fall into the detector alarm band), and heat detectors or MCPs which fall into the fast alarm band. The alarm and fast alarm bands for each input map to separate subpoints and so can be mapped to different zones. If there is no need to differentiate between alarm activation sources then both subpoints should map to the same zone.

The choice of profile should be performed on the principle of enabling the least functionality required for operation. For example, if no MCPs or heat detectors are present, then this functionality should not be enabled. The reasoning is that spurious voltages that fall into such bands won’t give invalid operation.

An intrinsically safe detector profile is available for Ex-rated collective detectors used through an intrinsically safe current repeater. Suitable normally-closed, clean contact heat detectors and MCPs may be used, provided the profile that defines open circuit as fast alarm, **Intrinsically Safe, OC = Fast Alarm, Int**, is selected.

The remote indicator outputs of detectors from different brands may be incompatible, so therefore, generally, detectors from different brands should not drive a common remote indicator. An exception to this is Minerva and detectors as they have the same remote indicator output.

Hard/clean contact devices must be rated for at least 30V, and currents up to 27mA.

Note: for NZ detector modes, generally external power is not practical (unless a regulating PSU is used) – loop power must be used, therefore *MX* loop fortification may need to be allowed for.

Table 6.2 - Profile Selection Process

Application	**Select Profile**
New installation where detectors fitted will be selected from limited range – see Low Voltage Detectors in Table 6.4, so as to avoid *MX* loop fortification, and no heat detectors or MCPs	Loop Pwr, Low V, No Heat/MCP (Use Low Voltage Detectors)
New installation where detectors fitted will be selected from limited range – see Low Voltage Detectors in Table 6.4, so as to avoid *MX* loop fortification, and indicating heat detectors or MCPs are used.	Loop Pwr, Low V, Heat/MCP, Int (Use Low Voltage Detectors)
Existing installation utilizing smoke and possibly Indi-VIGIL Mk I detectors, with any N/C MCPs and heat detectors connected through CCM modules (NZ Legacy Smoke)	NZ Legacy Smoke, SC = CCM FA, Int (Use NZ Legacy Smoke Detectors)
Existing installation utilizing smoke detectors with N/C MCPs and/or heat detectors connected directly (NZ Legacy Combined)	NZ Legacy Combined, OC Heat/MCP, OC Int (Use NZ Legacy Combined Detectors)
Existing installation where limited detector selection is not suitable and there are no heat detectors or MCPs	Std Det, No Heat/MCP (Use Standard Voltage Detectors)

Existing installation where limited detector selection is not suitable, and there are heat detectors or MCPs required.	Std Det, Heat/MCP, Int (Use Standard Voltage Detectors)
Hazardous environment requiring conventional Intrinsically Safe devices	Intrinsically Safe, OC = Fast Alarm, Int (Use Intrinsically Safe Detectors)

Available Profiles

For NZ applications, all the detector profiles, apart from the specific low voltage profiles, require a minimum supply voltage that is above the NZS4512 battery fail voltage. The practical implication of this is that these profiles require that the DDM800 be loop powered, or a regulated supply used to ensure a higher minimum supply voltage. If a regulated supply is used then all the DDM800 modules must be contained within the *MX1* panel, or some other means employed to prevent a single circuit fault disabling more than one zone of detectors.

When loop powered operation is used, generally loop fortification is required to maintain the *MX* loop voltage above 28V. The exception to this is the low voltage detector profiles that allow the loop voltage down to 20V.

The NZ Legacy profiles are only suitable for retrofits and the resultant operation is not compliant with NZS4512:2003 onwards. Therefore these profiles must only be used where an installation is not required to be brought up to full compliance with the latest NZ Building Code requirements. Indicating MCPs and heat detectors may not be used with the NZ legacy profiles, however all other detectors supported by the standard profiles are supported. The **NZ Legacy Smoke, SC = CCM FA, Int** profile is suitable for applications where Contact Conversion Modules (PA0443) are used for connection of N/C (normally-closed) heat detectors and MCPs. The **NZ Legacy Combined, OC Heat/MCP, OC Int** profile is suited for applications where N/C heat detectors and MCPs are wired in the circuit directly.

For all NZ profiles except **NZ Legacy Smoke, SC = CCM FA, Int**, a short circuit condition will produce a fault. When a Contact Conversion Module is used, the profile **NZ Legacy Smoke, SC = Fault**, must be used.

For the **Intrinsically Safe, OC = Fast Alarm, Int** profile, an open circuit condition will indicate a fast alarm condition on the DDM circuit. N/C (normally-closed) non-indicating heat detectors and MCPs can be used for IS applications in New Zealand. This is allowed under NZS4512 specifically in hazardous environments through an interpretation issued by the standards committee. If no normally-closed MCPs or heat detectors are fitted open circuit may be programmed to produce a fault instead by using the **Intrinsically Safe, OC = Fault** profile.

The Indi-V*IGIL* Mk I when activated, falls into the detector alarm band and as a consequence cannot be distinguished from other detector types such as smoke detectors that also use this band. Therefore fast alarm will not be entered, and the heat alarm will go through AVF. Such detectors will be present in only retrofits as current practice in the NZ market deems that heat & smoke alarms are indicated separately. The two **NZ Legacy Smoke** profiles would be the most suitable for applications where the Indi-V*IGIL* Mk I is present.

Profile Name	Interrupt	Det Alarm Band	Fast Alarm Band
Standard Voltage Detectors (Loop Powered Only)			
Std Det, No Heat/MCP	No	2.6 – 17.1V	-
Std Det, No Heat/MCP, Int	Yes	2.6 – 17.1V	-
Std Det, Heat/MCP, Int	Yes	4.2 – 17.1V	1.7 – 4.2V
Low Voltage Detectors (Loop Powered Only)			
Loop Pwr, Low V, No Heat/MCP	No	1.8 – 17.5V	-
Loop Pwr, Low V, Heat/MCP, Int	Yes	4.2 – 17.5V	1.7 – 4.2V
Intrinsically Safe Detectors (Loop Powered Only)			
Intrinsically Safe, OC = Fast Alarm, Int	Yes – O/C	11.6 – 18.4V	20.9 – 22.0V
Intrinsically Safe, OC = Fault	Yes	11.6 – 18.4V	
NZ Legacy (Loop Powered Only)			
NZ Legacy Smoke, SC = CCM FA, Int	Yes	3.5 – 17.1V	
NZ Legacy Smoke, SC = Fault	No	3.5 – 17.1V	0 – 3.5V
NZ Legacy Combined, OC Heat/MCP, OC Int	Yes – O/C	2.6 – 17.1V	20.5 – 22.0V

Detector Compatibility

Table 6.4 – DDM800 Detector Compatibility

Brand	Model	Type	Maximum No. per Circuit
Standard Voltage Detectors			
Cerberus	A2400	Beam Photo	1
Cerberus	D900	Fixed Temperature & ROR Heat	15
Cerberus	D920	Fixed Temperature & ROR Heat	15
Cerberus	F716	Ionisation Smoke	100
Cerberus	F906	Ionisation Smoke	166
Cerberus	F910	Ionisation Smoke	61
Cerberus	R716	Photo Smoke	20
Cerberus	R906	Photo Smoke	20
Cerberus	R910	Photo Smoke	16
Cerberus	R936	Photo Smoke	15
Cerberus	S2406	IR Flame	12
Cerberus	S610	IR Flame	15
Kidde	Firewire	Linear Heat Detector	5000 metres
Protectowire	Protectowire	Linear Heat Detector	2000 metres
SAFE	ThermoCable	Linear Heat Detector	5000 metres
System Sensor	1151	Ionisation Smoke	45
System Sensor	1400	Ionisation Smoke	25
System Sensor	1451	Photo Smoke	20
System Sensor	2151	Photo Smoke	55
System Sensor	2351E	Photo Smoke	50
System Sensor	2351TEM	Photo Smoke & Heat	38
System Sensor	2400	Ionisation Smoke	16
System Sensor	2451	Photo Smoke	16
System Sensor	4351E	Fixed Temperature Heat	38

System Sensor	5351E	Fixed Temperature & ROR Heat	41
Tyco	601F	Flame Detector	5
Tyco	601FEx	Flame Detector	5
Tyco	614CH	CO & Heat	35
Tyco	614I	Ionisation Smoke	41
Tyco	614P	Photo Smoke	41
Tyco	FV411f[1]	IR Flame Detector	3
Tyco	FV412f[1]	IR Flame Detector	3
Tyco	FV413f[1]	IR Flame Detector	3
Tyco	S231f+[1]	Flame	7
Tyco/Minerva	MF614	Ionisation Smoke	32
Tyco/Minerva	MR614	Photo Smoke	25
Tyco/Minerva	MR614T	HPO Smoke	21
Tyco/Minerva	MU614	CO	51
Vigilant	VNCPI	Indicating MCP	138
Vigilant	VNCPI-W	Indicating MCP	138
Tyco/Vigilant	1841	Indicating MCP	138
Tyco/Vigilant	Indi-V*IGIL* Mk II	Heat	83
Low Voltage Detectors			
Kidde	Firewire	Linear Heat Detector	5000 metres
Protectowire	Protectowire	Linear Heat Detector	2400 metres
SAFE	ThermoCable	Linear Heat Detector	5000 metres
System Sensor	2351E	Photo Smoke	30
System Sensor	2351TEM	Photo Smoke & Heat	23
System Sensor	4351E	Fixed Temperature Heat	23
System Sensor	5351E	Fixed Temperature & ROR Heat	25
Tyco	614CH	CO & Heat	21
Tyco	614I	Ionisation Smoke	25
Tyco	614P	Photo Smoke	25
Vigilant	VNCPI	Indicating MCP	75
Vigilant	VNCPI-W	Indicating MCP	75
Tyco/Vigilant	1841	Indicating MCP	83
Tyco/Vigilant	Indi-V*IGIL* Mk II	Heat	50
Intrinsically Safe Detectors – Loop Powered or Regulated Supply Reqd.			
Cerberus	F911Ex	Ionisation	26
Kidde	Firewire	Linear Heat Detector	5000 metres
Protectowire	Protectowire	Linear Heat Detector	2400 metres
SAFE	ThermoCable	Linear Heat Detector	5000 metres
System Sensor	1151EIS	Ionisation	26
System Sensor	5451EIS	Fixed Temperature & ROR Heat	7
Tyco	601Fex	Flame	2
Tyco	MD601Ex	ROR Heat	18
Tyco	MD611Ex	Fixed Temperature Heat	18

[1] **Refer Product Bulletin NZ210.**

Tyco	MDU601Ex	Enhanced CO & Heat	12
Tyco	MF601Ex	Ionisation	16
Tyco	MR601Tex	HPO Smoke	7
Tyco	MU601Ex	CO Detector	12
Tyco	S231i+	Flame	2
Tyco	FV421i	Flame (refer text)	1
The following are permitted only when O/C = Fast Alarm is configured.			
-	N/C Hard Contact Devices (T54B, 27120 DETECT-A-FIRE, V*IGIL*, FP0330 non-indicating MCP, etc.)		40

NZ Legacy Smoke Detectors – Loop Powered or Regulated Supply Reqd.			
All detectors, except MCPs and heat detectors, as listed for Standard Voltage detector profiles, plus those listed below.			
Tyco/Vigilant	Indi-V*IGIL* Mk I	Heat	104
Tyco/Vigilant	Indi-V*IGIL* Mk II[2]	Heat	83
The following are permitted only when S/C = Fast Alarm is configured.			
Tyco/Vigilant	PA0443 CCM	Conversion module for N/C heat detectors and MCPs	104
NZ Legacy Combined Detectors – Loop Powered or Regulated Supply Reqd.			
All detectors, except MCPs and heat detectors, as listed for Standard Voltage detector profiles, plus those listed below.			
-	Open circuit heat detectors and MCPs (clean contact)		Unlimited

It should be noted that if the 614xx series of detectors have their remote indicator output shorted, the alarm voltage may fall into the fast alarm band. Whilst not preferable, this is acceptable as an alarm is generated, albeit with no AVF.

6.7.6 DIM800 Detector Input Monitor

The DIM800 Detector Input Module is suitable for interfacing two circuits of 2-wire “20-Volt” conventional non-addressable detectors, e.g., heat detectors, smoke detectors, beam detectors, etc., onto the *MX* Loop.

Alarm and open/short circuit fault conditions are determined by the *MX1*.

The DIM800 provides electrical isolation of the detector circuit(s) from the *MX* Loop.

Refer to Figure 6.10 for wiring details.

The DIM800 requires an external supply to power the detector circuit and the module itself. If external power is not provided the DIM800 will not respond to polls and a DEVICE FAIL fault will be indicated. The supervision of the external power supply is **only approximate**, i.e., it is only a go/no go indication, and varies between different versions of DIM800. The DIM's power supply supervision may be Normal even though the supply voltage is less than the minimum for reliable detector operation. The voltage of the external supply at the

[2] For NZ Legacy Smoke circuits, the Indi-V*IGIL* Mk II must have a 4.7-7.5V zener diode fitted as per Product Bulletin NZ221A. The method described in Product Bulletin NZ208D of using a 100Ω is acceptable provided the configuration, SC = CCM FA (short circuit is fast alarm), is active. However, it must be noted that the latter method is not compliant from NZS4512:2003 onwards.

DIM800 is critical to ensure compatibility with particular detectors. Refer to Table 6.5 for details. This shows the maximum quantity of each detector type per input circuit. When mixing detector types on a circuit the sum of each detector's quantity as a percentage of its maximum quantity must not exceed 100%.

The external supply cannot be derived from the *MX* Loop. Where the voltage range is critical, it is recommended that a dedicated power supply and battery be used. The voltage drop in the wiring from the power supply to the DIM800 must be calculated to ensure the supply voltage at the DIM800 is within specification. If multiple DIM800s are on the same cable, then the maximum current drawn by each DIM800, e.g., input short circuit, must be used.

The external supply must meet the requirements of NZS 4512, and should be set to 27.3V by default. The wiring from a common PSU to multiple DIM800 modules must be arranged so that a single fault does not prevent alarms from being generated in more than one zone. For systems to NZS 4512 a loop arrangement with supervision and a reverse-feed relay may achieve this under some circumstances – see Figure 6.20 later in this chapter.

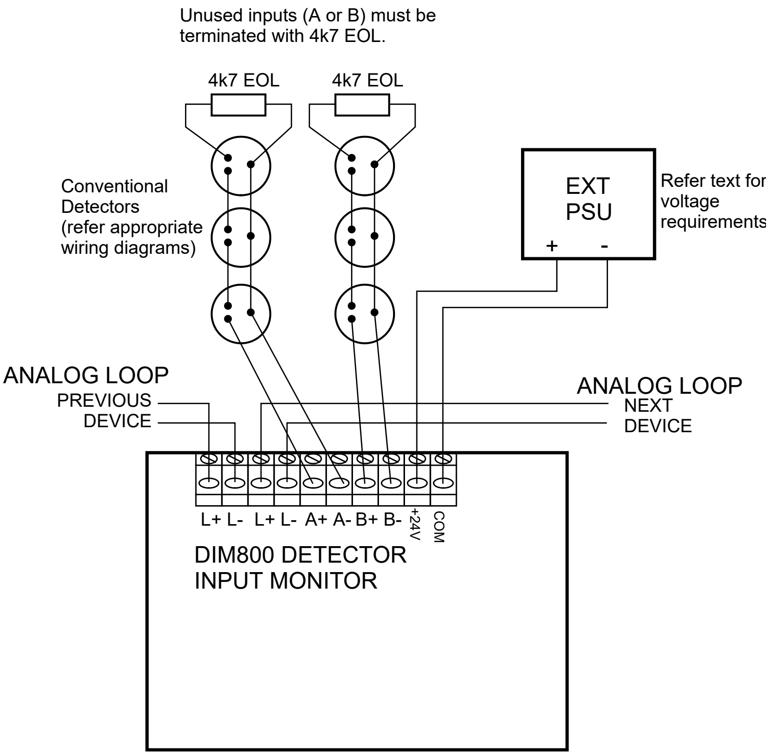


Figure 6.10 – DIM800 Field Wiring

Table 6.5 – DIM800 Detector Compatibility

Series	**Model**	**Max Qty**	**External Supply Voltage at DIM800**
Tyco	614P Photo Detector	25	20V – 28.7V
	614I Ionisation Detector	38	20V – 28.7V
	614CH combined CO and Heat Detector	32	20V – 28.7V
	614T Heat Detector	23	20V – 28.7V
7Series	**Model**	**Max Qty**	**External Supply Voltage at DIM800**
Tyco/Vigilant	PA0443 Contact Conversion Module	113	18.0 – 26.7V (see Bulletin NZ208d)
	Indi-*VIGIL* Heat (Indicating)	86	18.0 – 28.7V (see Bulletin NZ221A)
Tyco/Thorn	S231f+ IR Flame	7	21.0 – 28.7V (see Bulletin NZ210)
Minerva	MD614 Heat Detector	40	20.7V - 28.7V
	MR614 Photo Detector	22	20.7V - 28.7V
	MR614T HPO Detector	21	20.7V - 28.7V
	MU614 CO Detector	40	20.7V - 28.7V
	MF614 Ionisation Detector	30	20.7V - 28.7V
	T614 Heat Type A, B, C, D	23	20.7V - 28.7V
Simplex	4098 – 9603EA Ionisation Detector	24	18.0V - 28.7V
	4098 – 9601EA Photo Detector	24	18.0V - 28.7V
	4098 – 9618EA,-9619EA,-9621EA Heat Detectors	24	18.0V - 28.7V
Olsen	P24B Photoelectric Detector	24	20.7V - 24.7V
	P29B Photoelectric Detector	20	20.7V - 26.7V
	C24B Ionisation Detector	40	20.7V - 26.7V
	C29B (Ex) Ionisation Detector	40	20.7V - 26.7V
	R23B Flame Detector	20	20.7V - 24.7V
	R24B Flame Detector	3	22.7V - 28.7V
	DO1101 Photo Detector	16	21.7V - 27.7V
	DLO1191 Beam Detector	1	22.7V - 28.7V
	P136 Duct Sampling Unit	5	19.0V - 28.7V
	T56B Heat Detector	40	18.0V - 28.7V
	All above Olsen Detectors with Z52B, Z54B, Z54B Mk2, Z56, Z500 base as appropriate		
	T56B Heat Detector with Z52B, Z55B, Z56N, Z500N Base	40	18.0V - 28.7V

Continued…

Series	Model	Max Qty	External Supply Voltage at DIM800
Cerberus	F716 Ion Smoke	130	20.7 – 26.7V
	F906 Ion Smoke	130	20.7 – 26.7V
	F910 Ion Smoke	52	20.0 – 26.6V
	R716 Photo Smoke	24	20.7 – 24.7V
	R910 Photo Smoke	20	20.7 – 26.7V
	R936 Photo Smoke	20	20.6 – 26.6V
	D900 ROR/FT Heat	17	20.7 – 26.7V
	D920 ROR/FT Heat	17	20.7 – 26.7V
	S610 IR Flame	20	20.7 – 24.7V
	S2406 IR Flame	3	22.7 – 28.7V
	A2400 Beam Photo Smoke	1 pair	22.7 – 28.7V
	DO1101 Photo Smoke	16	21.7 – 27.7V
	DLO1191 Beam Photo Smoke	1	22.7 – 28.7V
System Sensor	BEAM 1224 (or 1224S) Reflected Beam Photo Smoke	No Limit	(see Bulletin NZ223a)
	1400 Ion Smoke	26	18.0 – 28.7V
	1451 Photo Smoke	20	18.0 – 28.7V
	2400 Ion Smoke	20	18.0 – 24.7V
	2451 Photo Smoke	21	18.0 – 28.7V
	1151 Ion Smoke	40	18.0 – 28.7V
	2151 Photo Smoke	32	18.0 – 28.7V
	2351E Photo Smoke	40	18.0 – 28.7V
	2351TEM Photo Smoke/Thermal	32	18.0 – 28.7V
	5351E ROR/FT Heat Detector	28	18.0 – 28.7V
	4351E FT Heat Detector	32	18.0 – 28.7V
	885WP-B Weatherproof Heat Detector	40	20V – 28.7V
-	Hard Contact Devices (T54B, B111, etc.)	40	18.0V - 28.7V
Hard contact devices must be rated for at least 30V and currents up to 50mA.			

Information on using the System Sensor Beam1224 beam detector is covered in Product Bulletin NZ223A.

6.7.7 AZM800 Apartment Zone Module

The AZM800 *MX* addressable module integrates the key functions required for Type 5 and Type 7 fire alarm systems as defined in the NZ Building Code Acceptable Solutions. These are typically used for apartments or other residential occupancies.

These functions include:

- Switching and supervision of a 100V speaker line spur.
- Built-in addressable loop short circuit isolator (SCI).
- (optional) connection of conventional heat/smoke/MCP detector circuit, with open and short circuit supervision.
- (optional) smoke alarm silence hush button – integrated or remote.
- (optional) local control relay output (unsupervised).

The AZM800's detector circuit is suitable for interfacing selected 2-wire conventional non-addressable detectors, e.g., indicating heat detectors and smoke detectors, onto the *MX* Loop. It can distinguish the operation of NZ indicating heat detectors and MCPs from smoke detector operation and signal this separately to the *MX1*.

Alarm and open/short circuit fault conditions are determined by the AZM800. The AZM800 also provides local auto-reset behaviour for local smoke detector activations.

The detector circuit is not electrically isolated from the *MX* Loop.

The 100V speaker line spur is indirectly connected to the *MX* Loop in the normal state, but is isolated from the *MX* Loop during alarm conditions.

Refer to Figure 6.11 for wiring details.

MX1 software versions V1.21 and earlier will recognise the AZM800 as MIO800. This is normal and does not prevent use of AZM800 on these systems.

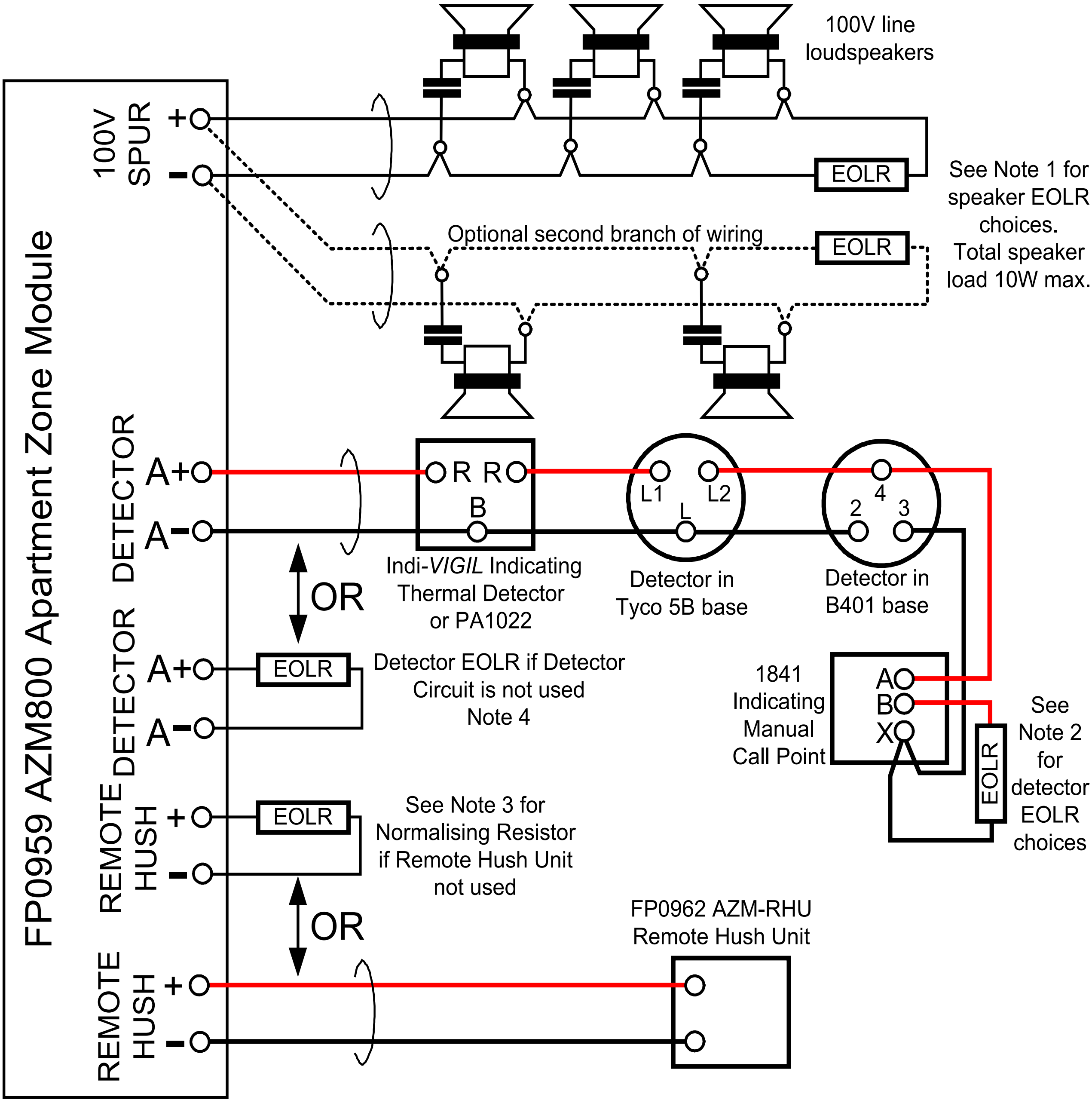


Figure 6.11 – AZM800 Field Wiring Options

Notes

1. A single branch of speaker wiring uses 56kΩ EOLR (marked green-blue-black-red). A dual branch of speaker wiring uses 100kΩ EOLR (not supplied) on each branch.

2. Normal detector circuit uses a 9.1kΩ EOLR (marked white-brown-black-brown). Low Current detector circuit uses a 18kΩ EOLR (marked brown-grey-black-red). Detectors and manual call points can be connected in any order on the detector circuit.
3. When a Remote Hush Unit is not used, fit a 9.1kΩ Normalising Resistor (marked white-brown-black-brown).
4. Unused detector circuits should preferably be configured as Low Current. The default (Normal) detector circuit setting uses more current from the *MX* Loop.

Table 6.6 – Conventional detector devices compatible with AZM800

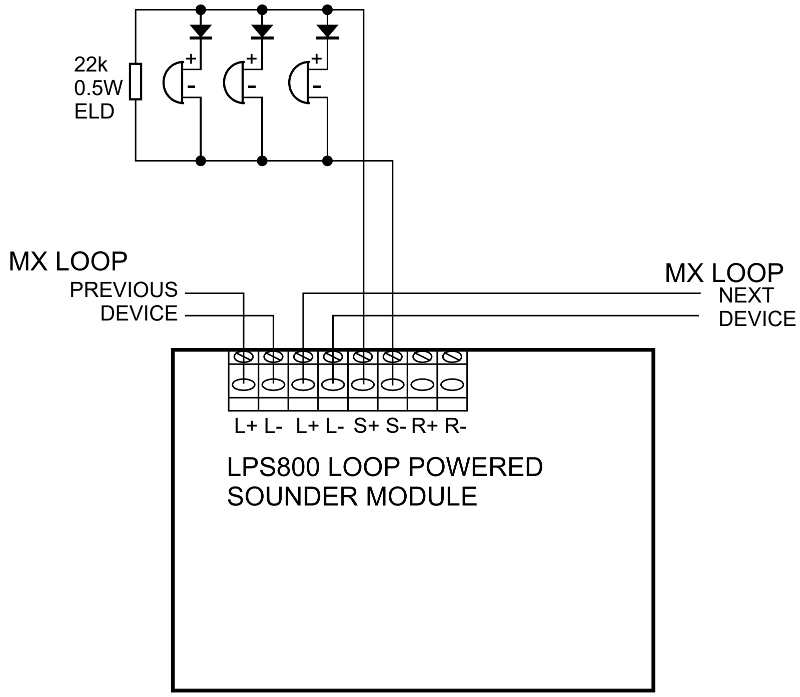
Brand	Detector Type	Alarm Type	Standby Current (µA)	Max. Number (Normal Setting)	Max. Number (Low Current Setting)
System Sensor	2351E	Smoke/Heat *	65	10	2
	2351TEM	Smoke/Heat *	80	8	1
	4351E	Heat *	90	8	1
	5351E	Heat *	80	8	1
	1151	Smoke	40	16	3
	2151	Smoke	45	16	3
Tyco	614CH	CO/Heat *	70	10	2
	614P	Smoke	60	11	2
	614T	Heat *	85	8	1
Vigilant	VNCPI Indicating MCP	Heat/MCP	18	35	8
	VNCPI-W Indicating MCP	Heat/MCP	18	35	8
	Indi-V*IGIL* Mk2 Heat Detector	Heat/MCP	18	35	8
	1841 Indicating Manual Call Point	Heat/MCP	18	35	8
	PA1022 Clean Contact Adaptor	Heat/MCP	18	35	8

* These heat detectors will not produce a brigade alarm unless the AZM800 is specially configured, in which case, any smoke or heat alarm on that AZM800 will produce a latching brigade alarm.

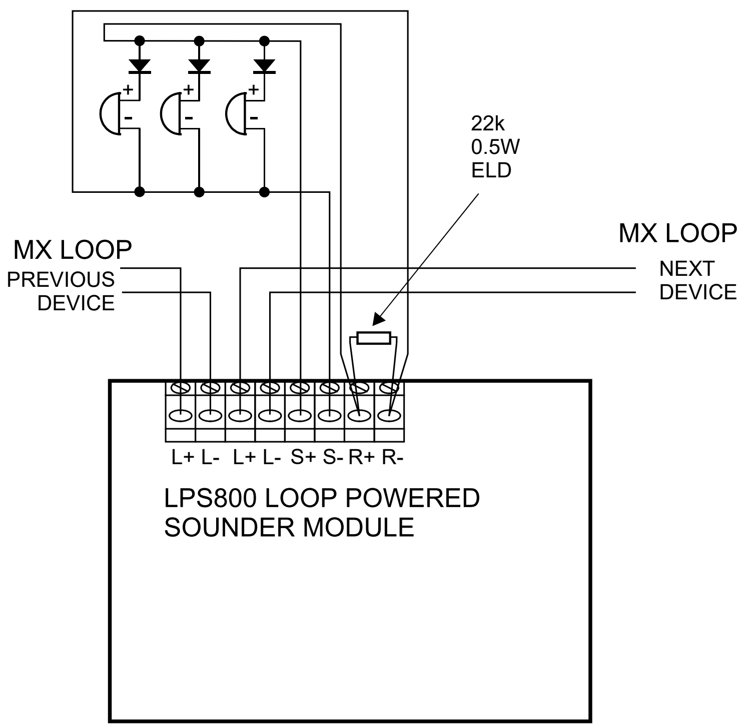
6.7.8 LPS800 Loop-Powered “Sounder” Output

The LPS800 *MX* addressable device provides a loop-powered controllable output that can supply up to 75mA to 24V rated load devices, such as VADs, sounders, relays, etc. It also provides supervision of the wiring to the load devices. Therefore, each load device must have an integral series diode, or one must be fitted externally to allow the reverse voltage supervision to work. A 22k EOL resistor is required.

Figure 6.12 shows the wiring details for the LPS800. Note that the external wiring can be arranged as a loop (Class A) so that an open circuit does not stop operation of the devices.



Spur (Class B)



Loop (Class A)

Figure 6.12 – LPS800 Field Wiring

6.7.9 MIO800

The MIO800 is a Multi-Input/Output Module with three inputs and two outputs from latching relays. Each input can be used to monitor a single normally-closed contact and provide fault on both open circuit and short circuit conditions as required by NZS 4512: 2010.

The MIO800 is a different size to the CIM, DIM, RIM, etc., and will therefore require a different mounting arrangement.

It can be fitted into a D800 Ancillary Housing, may be DIN rail mounted, or fitted to a suitable electrical backbox or standoffs on a gearplate. It may also be supplied fitted with a mounting bracket suitable for internal installation within a VESDA LaserPLUS or LaserSCANNER. This is called a VIO800 – part number 516.018.014.

For NZS 4512 compliant detection circuits the MIO800 should be wired using the normally-closed O/C = Fault, S/C = Fault arrangement (bottom right in Figure 6.13) with interrupt set to OFF.

Where necessary for a normally-open contact, it can be used in the N/O, SC Flt, OC Flt configuration (top right in Figure 6.13). This configuration is NOT compliant with NZS 4512 but may be needed for a normally-open contact.

For legacy installations that must monitor clean contact heat detectors in a normally-closed circuit the N/C, SC Flt, O/C Alarm configuration can be used (bottom left in Figure 6.13). Generally, MCPs cannot be used on the circuit (unless they are modified to mechanically latch) as the MIO800 response time will be up to 5 seconds.

Interrupt operation to speed up response is available on some configurations. As the MIO800 will interrupt on lowering resistance only (alarm or short circuit resistor applied), it cannot be used for normally-closed applications.

The MIO800 also includes two unsupervised change-over relay outputs, labelled Relay 1 and Relay 2, and programmed in SmartConfig as Output 1 and Output 2 respectively. These relays can be programmed to provide on/off control outputs by writing suitable logic equations for them.

The MIO800 also has 4 logic level outputs labelled 01, 02, 03 and 04. Outputs 01 and 02 are the same signals as the two relay outputs. SmartConfig allows the configuration of 03 and 04, but as currently there are no compatible devices to wire to the 01... 04 outputs, these terminals must not be used.

The on-board LED will turn on when any input is in the alarm condition, and can be programmed to blink when the device is polled by the *MX1* panel.

Relay Contact Rating: 2A DC @ 24VDC. The MIO800 must NOT be used to switch mains voltages.

Maximum Wiring Resistance Monitored Circuit: 40 ohms.

WARNING
DO NOT JOIN INPUT WIRING BETWEEN MODULES OR CONNECT TO ANYTHING OTHER THAN VOLTAGE-FREE CONTACTS

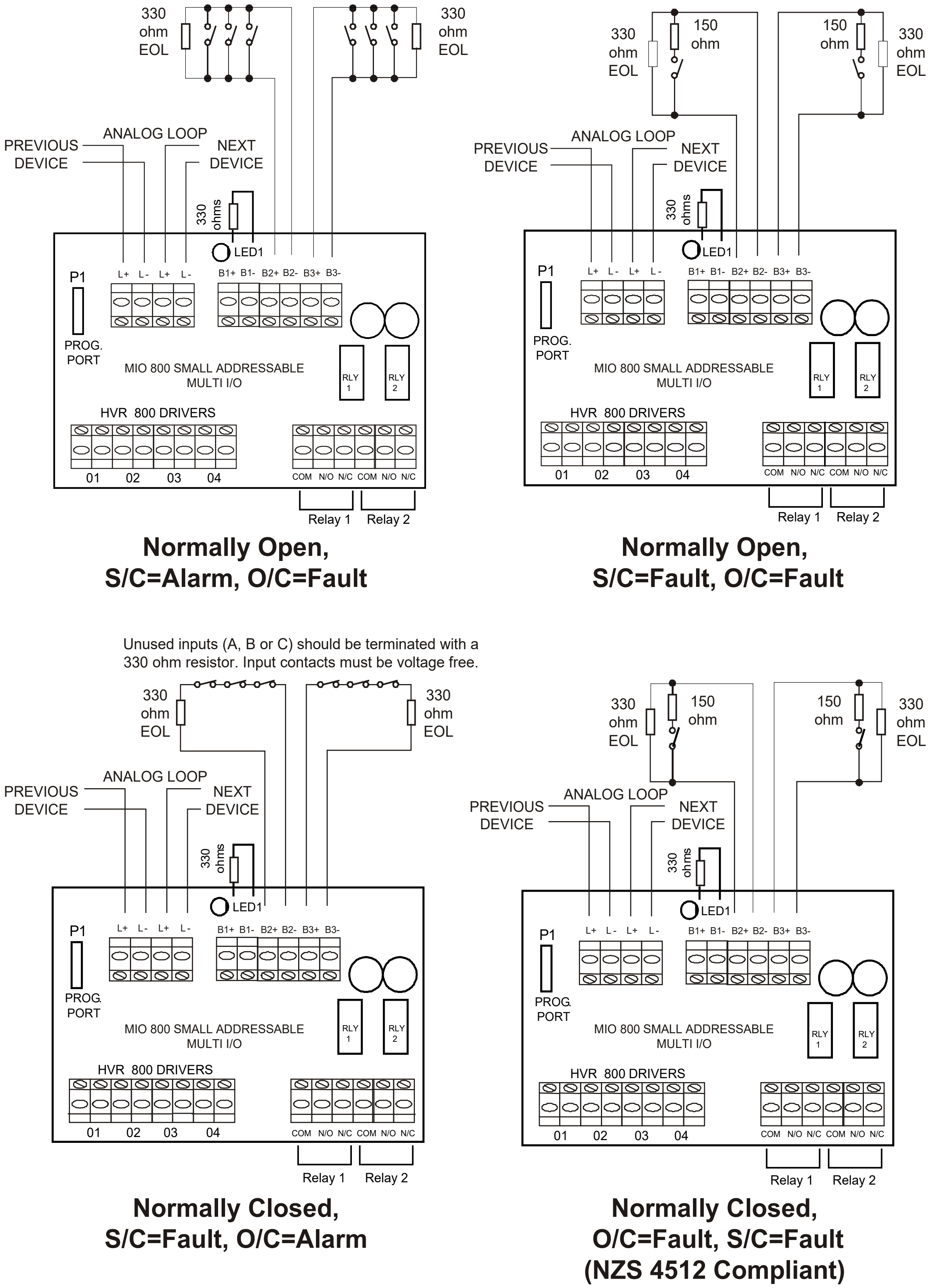


Figure 6.13 – MIO800 Wiring Diagrams

6.7.10 RIM800 Relay Interface Module

The RIM800 Relay Interface Module is suitable for providing control outputs which require clean voltage-free contacts and no supervision. For example, it can be used to signal states to other systems, e.g., BMS or security systems, or to energise loads that do not need to be supervised, e.g., Door Holders. Refer to Figure 6.14.

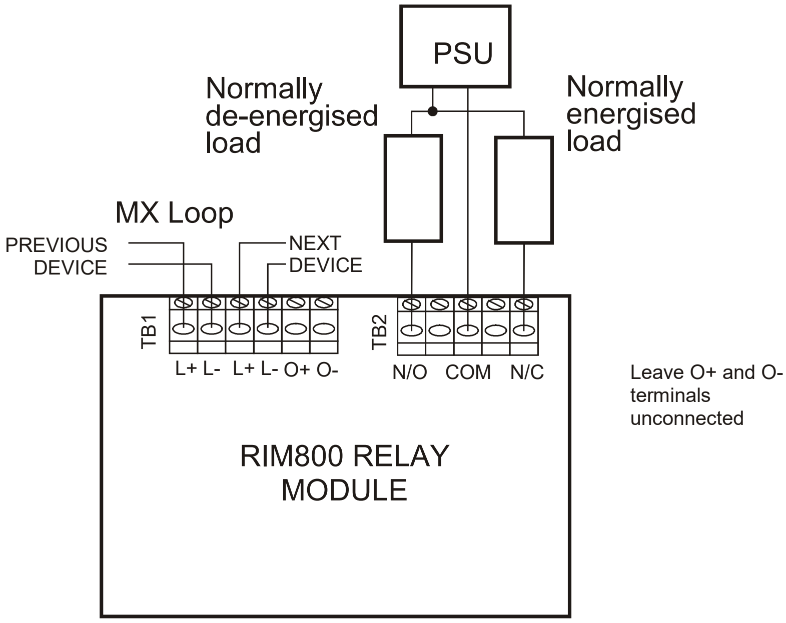


Figure 6.14 – RIM800 Field Wiring

6.7.11 SAB801 & SAM800

The SAB801 and SAM800 are *MX* addressable devices that provide a control output that can operate a sounder or relay base without the need to fit a detector. The SAM800 has a plain white front, whereas the SAB801 has a red flashing LED beacon that can be controlled separately to the functional base output.

These devices simply plug into the sounder base (802SB, 812SB, 814SB or 901SB) or the relay base (814RB).

6.7.12 SNM800 Sounder Notification Module

The SNM800 Sounder Notification Module is suitable for providing a 2 Amp @24V energised output with optional supervision of the load wiring and DC power supply.

When inactive, a reverse polarity supervision voltage is applied to the load wiring. The load devices must therefore have internal or external reverse blocking diodes, if load supervision is required.

The load supervision can detect short and open circuit states on the load wiring only when the relay is inactive.

The load must be isolated from ground and all voltage sources. All inductive loads (e.g. bells or relays) must have back-emf diodes or other noise clamping devices fitted.

Supervision of the load and/or power supply is set by the profile selected in SmartConfig.

Refer to Figure 6.15.

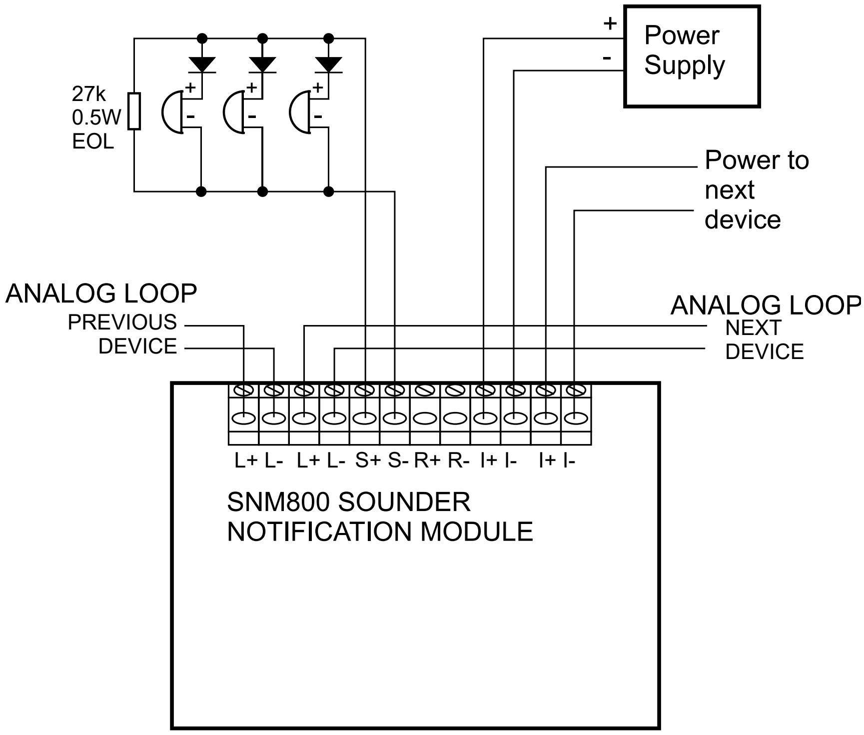


Figure 6.15 – SNM800 Field Wiring

6.7.13 QIO850 / QMO850 / QRM850 Quad Ancillary Modules

The Quad Ancillary Module range includes 3 models: QIO850, QMO850 and QRM850. The QIO850 has four monitored inputs with alarm and fault detection for clean contacts and four un-monitored outputs. Through jumper settings, the outputs can be changed between an auxiliary supply output or voltage free relay contacts. Fit links OUT1-4 in the AUX position (pins 2-3) when the output is to provide a switched 24Volts out (from Aux supply), and remove the links to provide clean contact relay outputs. Do not use the HVR position.

The QMO850 has four monitored outputs. Monitoring is provided by injection of a reverse polarity current through the wiring and the EOL resistor – this can't be disabled. The monitoring of the auxiliary supply voltage can be disabled through a jumper setting. There is no means to override the jumper setting through software. There is no capability to have voltage free contacts with this module. The output monitoring does not work unless an auxiliary supply is connected.

The QRM850 has four un-monitored outputs. Through jumper settings, the outputs can be changed between a switched auxiliary supply output or voltage-free relay contacts. Fit links OUT1-4 in the AUX position (pins 2-3) when the output is to provide a switched 24Volts out (from Aux supply), and remove the links to provide clean contact relay outputs. Do not use the HVR position.

Unmonitored relay outputs can be used to signal states to other systems. e.g., BMS or security systems, or to energise loads that do not need to be supervised, e.g., Door Holders.

The QIO850 and QRM850 modules don't require the auxiliary supply to operate the relays as voltage-free. When an auxiliary supply is connected it can be supervised. All the module outputs are capable of switching 2 Amp @24V loads.

All modules include a built-in *MX* loop short circuit isolator that can be enabled or disabled through jumper settings.

The Quad ancillary modules are quite a different size and physical design compared to the other *MX* modules. They are supplied in a plastic enclosure designed for mounting directly to 35mm top hat DIN rail. E.g., for example in an equipment interface box such as the ME0088 lockable IOR cabinet that is supplied with 3 DIN rails and mounting screws. Nine quad ancillary modules in total may be fitted inside one of these cabinets.

Another suitable enclosure that Johnson Controls supplies that is plastic and IP66 rated is part number 557.201.410. It has a removable plastic cover and pop-outs for cabling – it contains a DIN rail inside suitable for one module.

Each input on the QIO850 supports one of the following modes:

- Normally-open contact, closing for alarm, with o/c fault.
- Normally-open contact, closing for alarm, with s/c and o/c fault.
- Normally-closed contact, opening for alarm, with s/c fault.
- Normally-closed contact, opening for alarm, with s/c and o/c faults.

All the modes have thresholds which are compliant with the AS7240.13 standard – largely this means standardised 10% tolerances for particular thresholds. Additionally, to meet a requirement of this standard, an additional fault band that is indicated as a non-specific fault is present for all modes to detect gradual increases in cable resistance e.g. due to contact corrosion.

For the QIO850 inputs, interrupt operation to speed up response is available for all configurations – both normally-open and normally-closed. It is separately available for each input.

For all modules, the LED, labelled POLL, will be lit when any output on the module is activated. In addition the LED OUT1 - OUT4 LED that corresponds to the activated output(s) will be lit. If more than the maximum number of *MX* devices have their LEDs on, then the LEDs will blink on some modules instead. No LED subpoint exists for the MX points of the quad ancillary modules. It is not possible to change what controls the module LEDs.

The *MX* loop short circuit isolator is monitored by the *MX1*, which will raise a fault on the .0 subpoint if the isolator opens. This will be logged as Isolator Fault. The ISO LED on the Quad Module will be lit when the *MX* line isolator is tripped by a short circuit.

The output relays of all the modules are monitored for becoming stuck (i.e., they’re not in the commanded position). A checkback fault will be raised on the subpoint corresponding to the relay that is stuck.

For the QMO850 only, the outputs are monitored. Monitoring is provided by injection of a reverse polarity current through the wiring and the EOL resistor. The load devices must therefore have internal or external reverse blocking diodes. The load must be isolated from ground and all voltages sources. All inductive loads (e.g. bells or relays) must have back-emf diodes or other noise clamping devices fitted.

QMO850 short circuit monitoring is performed at a hardware level and this will inhibit the switching of the output relays. There is no way to disable this functionality. Short and open circuit states on the load wiring can be detected only when the relay is inactive.

There is no means to adjust the monitoring voltage threshold at the *MX1*. The only applicable voltage for this region that can be set by jumper is nominal 24 V. It must be set to this setting, as 48 V has no application in this region. The actual threshold is 18 volts +/- 1 volt.

The QIO850 and QRM850 have no jumper to enable/disable auxiliary supply monitoring. Each output for these modules has a corresponding subpoint with a selectable profile that allows enabling/disabling supervision of the auxiliary power supply.

There are four available profiles for the QMO850 output subpoints, these control whether EOL and/or auxiliary supply monitoring is enabled.

The QMO850 has a jumper to disable auxiliary supply voltage monitoring. If this is in the disabled position, then the enabling of voltage monitoring by the *MX1* will not work as it will not be receiving the required data to perform monitoring.

Relay Contact Rating: 2A d.c. @ 30VDC. The quad ancillary modules must NOT be used to switch mains voltages.

Maximum Input Wiring Resistance: 50 ohms.

WARNING
DO NOT JOIN INPUT WIRING BETWEEN INPUTS OR MODULES OR TO ANYTHING OTHER THAN VOLTAGE-FREE CONTACTS

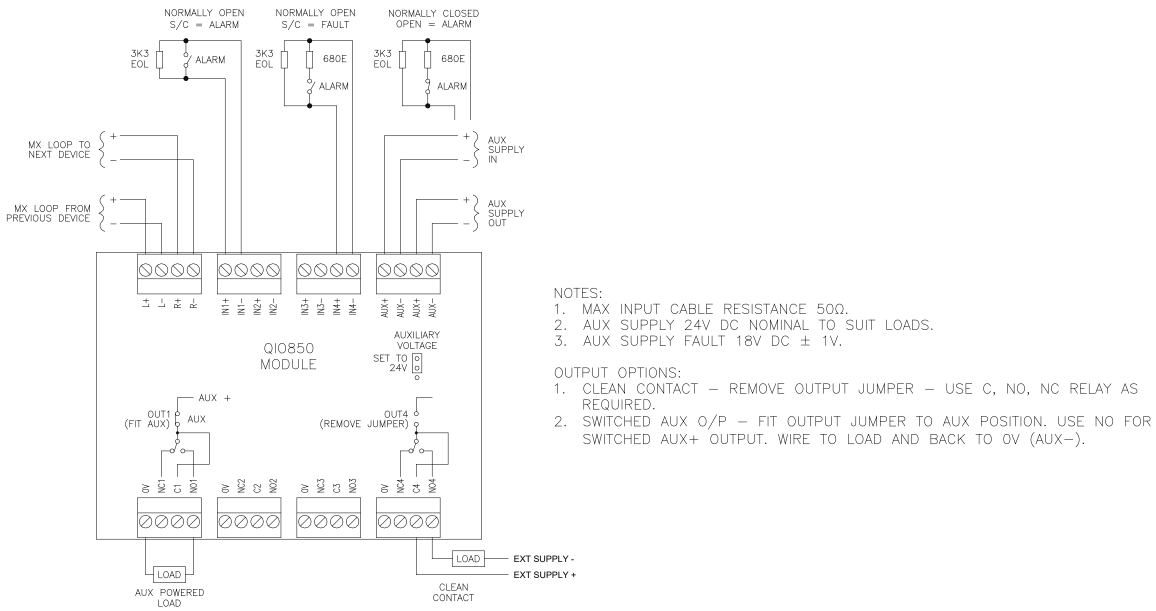


Figure 5.16 – QIO850 Field Wiring

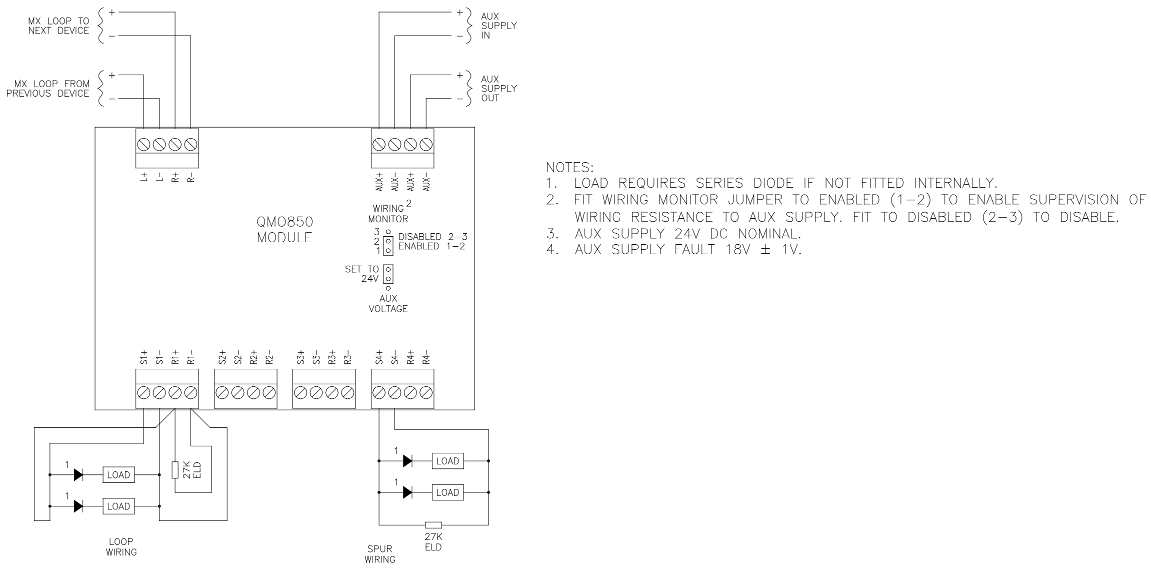


Figure 6.16 – QMO850 Field Wiring

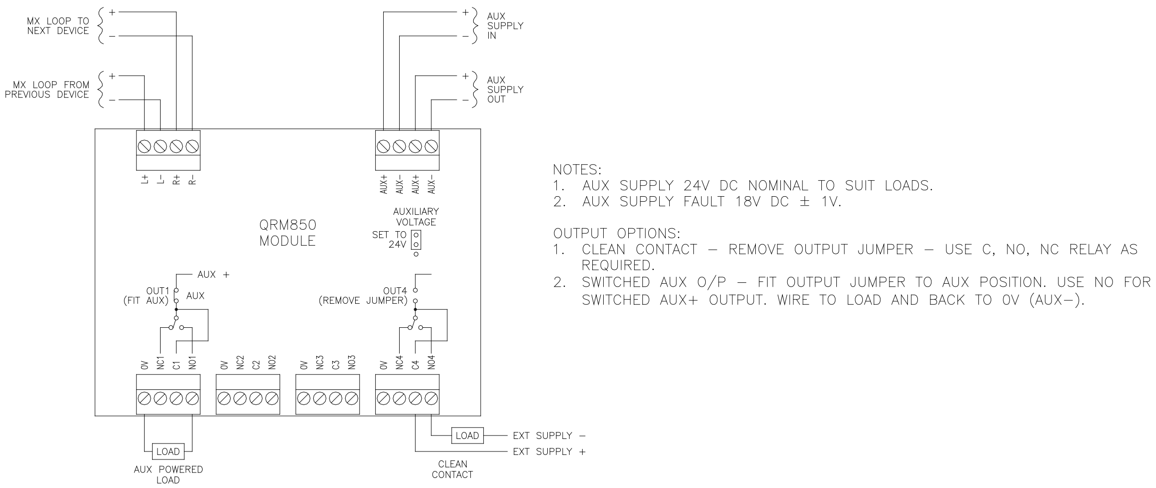


Figure 6.17 – QRM850 Field Wiring

6.7.14 SIO800 Single Input/Output Module

The SIO800 is a single input/output module with one input and one output from a latching relay.

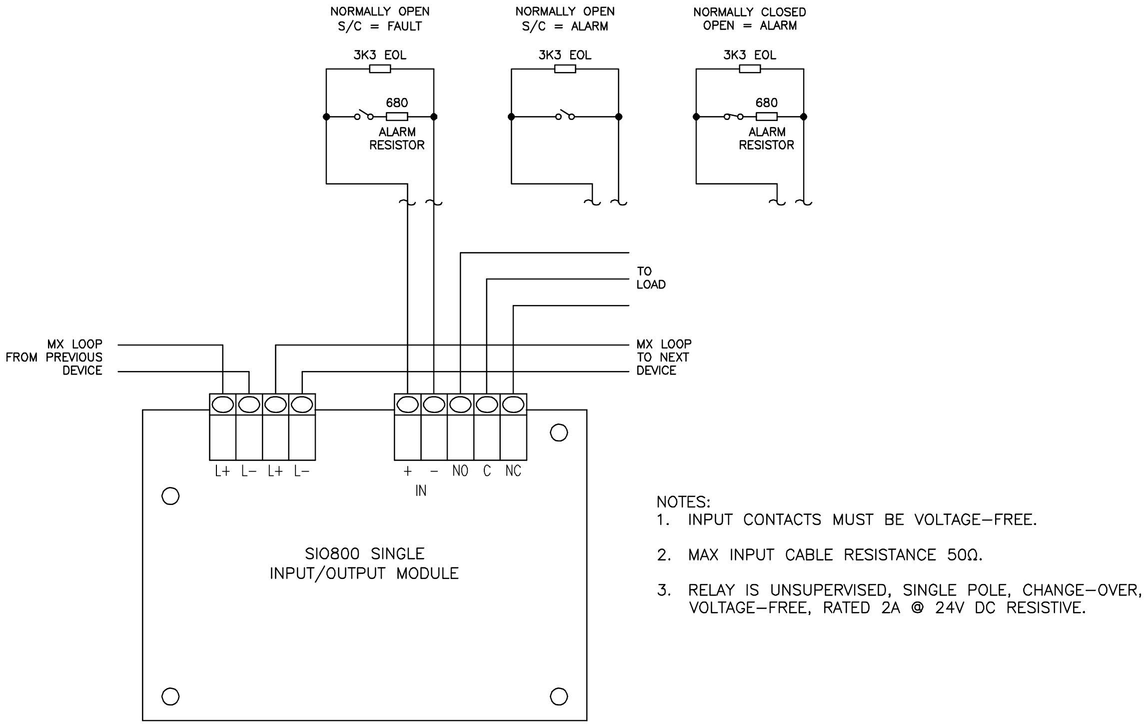


Figure 5.18 – SIO800 Field Wiring

Relay Contact Rating: 2Adc @ 24Vdc. The SIO800 must NOT be used to switch mains voltages.

Maximum Input Wiring Resistance: 50 Ohms

The single input on the SIO800 supports the connection of a clean contact device in the following modes:

- Normally open contact, closing for alarm, with O/C fault.
- Normally open contact, closing for alarm, with S/C and O/C fault.
- Normally closed contact, opening for alarm, with S/C fault.
- Normally closed contact, open for alarm, with S/C and O/C faults.

All the input modes have thresholds which are compliant with AS 7240.13 – largely this means standardised 10% tolerance for particular thresholds. Additionally, to meet a requirement of this standard, there is an additional fault baud that is indicated as a non-specific fault for all modes to detect gradual increases in cable resistance, e.g., due to contact corrosion.

Interrupt operation to speed up response is available for all modes – both normally open and normally closed.

The output is a change-over relay rated at 2A @ 24Vdc and is un-monitored and always voltage free. There is no provision for an auxiliary supply or load supervision. The relay is monitored for becoming stuck (i.e., it is not in the commanded position). In this situation, a check-back fault will be raised.

WARNING
DO NOT JOIN INPUT WIRING BETWEEN INPUTS OR MODULES OR TO ANYTHING OTHER THAN VOLTAGE-FREE CONTACTS

6.7.15 P80AVR/P80AVW Addressable Wall-Mount VADs

The P80AVR and P80AVW are addressable wall-mount MX devices with Visual Alarm and Audible Alarm functions. They are assigned their own address and controlled from the MX1 panel. The visual alarm (bright, flashing white LED) has 2 levels of brightness and two flash rates, and the audible alarm has a choice of tone and sound level (selected in the MX1 configuration – not dynamic). The P80AVR is coloured safety red and the P80AVW is white.

They are MX-loop powered and contain a short-circuit isolator. Note they draw significant current when operated, and introduce a voltage drop due to the SCI. So, the quantity permitted on a loop may be limited.

The visual alerting function is compliant with NZS 4512:2021, and the audible function is permitted for local alerting only – Clauses 4.6.5, 4.6.7 and 4.6.11 apply.

The JCI EA0348 tag plate must be fitted alongside the white-coloured P80AVW to provide the 15mm high “FIRE” text.

6.8 Other Devices

6.8.1 LIM800

The LIM800 is an *MX* Loop isolator module that can be used to provide short circuit isolation between zones and to a separate spur-wired zone of *MX* devices. It is functionally the same as the 5BI isolator base, but is packaged like most *MX* modules, and provides the additional spur output. This could be used to provide a fire-rated spur to a valve tamper device with a MIM800 or similar, for example.

Note that the spur output S+/S- does not have its own short circuit isolator. Shorting this output will cause the two internal isolators to open and thus break the *MX* Loop. If better fault tolerance is required, use an additional LIM800 on the S+/S- output. For example, a second LIM800 with its S+/S- signals connected to the loop LIM800 will provide two separately short circuit isolated spur feeds off the loop – see Section 7.2.4.
Figure 6.19 shows the wiring of the LIM800.

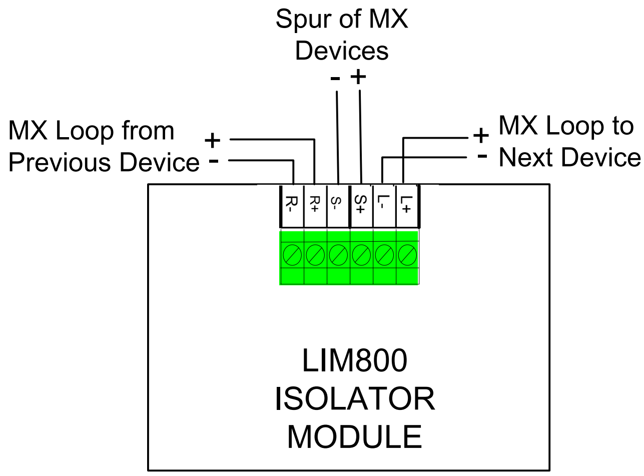


Figure 6.19 – LIM800 Wiring

6.9 Supervised Power Feed Wiring

6.9.1 Requirements

NZS 4512:2010 places requirements on system tolerance and supervision of wiring faults.

- A single wiring fault (open or short circuit) shall not result in a loss of coverage of more than one zone (Section 402.2(o)).
- A defect warning shall be given in the event of an open or short circuit on the circuit wiring to alerting devices (Section 208.1(f)).

These requirements can be met for the signal path on the addressable loop by appropriate use of isolators.

Where the detectors or devices in the field need an external supply, then these requirements also apply to the additional power wiring.

One way to meet these requirements is to wire separate (fused or current-limited) power feeds for each zone, but this could increase the cabling costs. An alternative approach is to wire the power feed to multiple devices in multiple zones in a loop arrangement as shown in Figure 6.20.

This power supply wiring arrangement:

- Does not meet the NZS 4512 requirements for detector supplies.
- Does meet the NZS 4512 requirements for supplies to warning devices and ancillary devices.

This supply loop arrangement can be used to provide Slimline RDUs with a dual power feed.

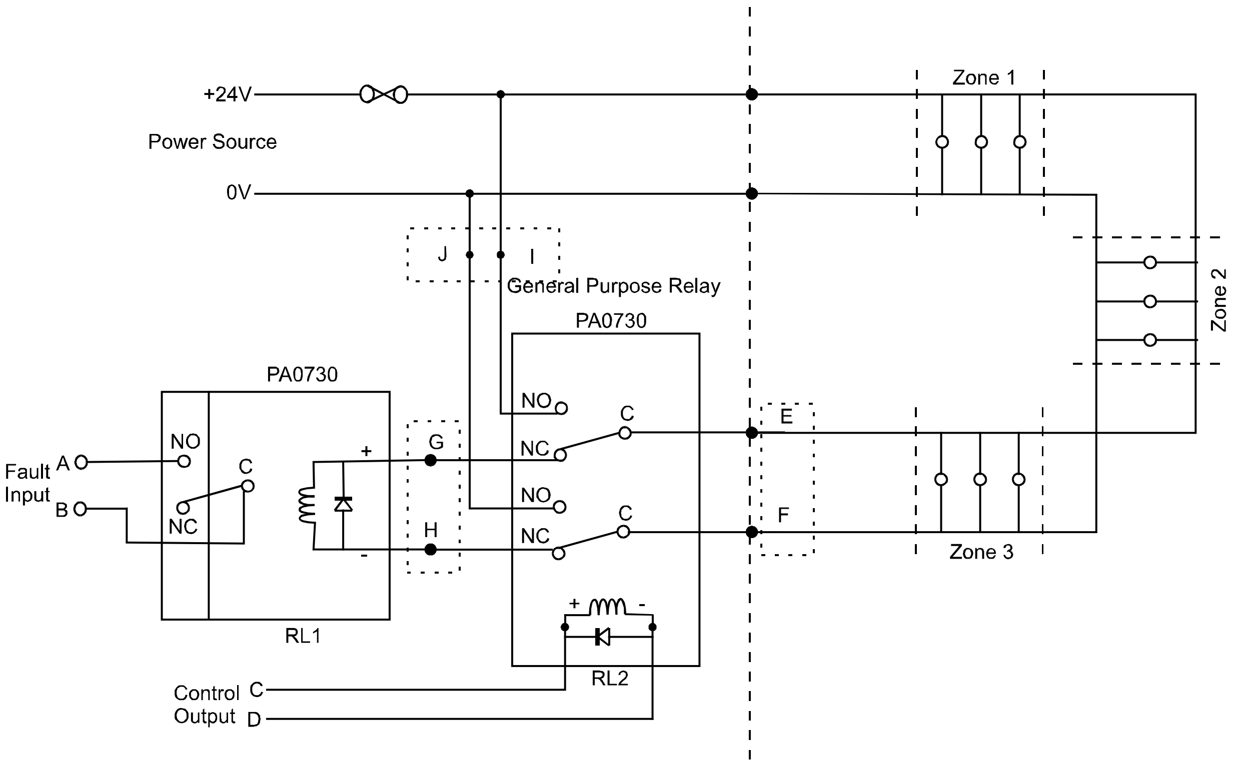


Figure 6.20 – General Supply Loop Arrangement for Multiple Devices in Multiple Zones

Power is normally supplied from one end of the loop and the continuity (no open or short circuit) of the loop is verified by an energised relay (RL1 in Figure 6.20) at the opposite end of the loop.

An open circuit in the loop will de-energise the relay (RL1) and signal a fault to the panel. Logic in the panel will energise the second relay (RL2) via the control output.

This arrangement will still provide power to all devices from both ends of the loop when there is a single open circuit fault in the power supply wiring. It will not provide power when there is a short circuit fault.

A fuse (or other current limiting device) must be used to protect against a short circuit. The fuse is supervised by the normally-energised relay, RL1.

6.9.2 Example Application of Supply Loop Use

Some examples of how to supervise and control the loop power feed are:

- An SNM800 addressable control module.
- An 814RB addressable relay base and a fault detection input (e.g. MIM800).

These devices can be programmed and wired to points A, B, C, D as described in the next sections.

Note: Connection points E, F, G, H, I, and J are for connection to the contacts of an 814RB Relay Base when this is used in place of RL2 in Figure 6.20.

6.9.3 Using SNM800 to Control a Supply Loop

Wiring

The power supply loop arrangement shown in Figure 6.13 can be wired to an SNM800 as shown in Figure 6.21. The SNM800 provides relay control and fault sensing.

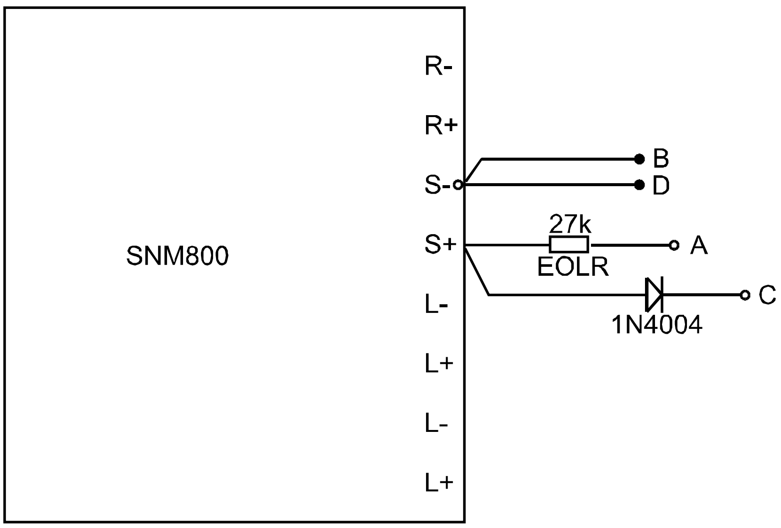


Figure 6.21 – Power Supply Loop Arrangement Using SNM800

Programming

Configure the SNM800 to select load and supply supervision, and map to a zone with an ACZ profile. Enter an output logic equation to operate this zone when it goes into fault. For example:

```
ZxxOP = ZxxF
```

Operation

When a fault occurs on the loop-power wiring, the zone will go into fault and RL2 will be energised.

If the ACZ zone profile specifies that faults will latch, the fault indication will need to be manually cleared by resetting the zone. This will remove the zone fault condition and de-energise RL2 (even if a fault condition is still present on the wiring). If the fault condition is still present on the wiring then a fault will be re-annunciated and RL2 will turn on again.

6.9.4 MIM800 with 814RB Relay Base to Control a Supply Loop

Wiring

The power supply loop arrangement shown in Figure 6.20 can be wired to a MIM800 for supervision and an 814RB for control as shown in Figure 6.22. The 814RB has dual changeover relays (rated at 1A @ 30VDC) so these can replace RL2 in Figure 6.20.

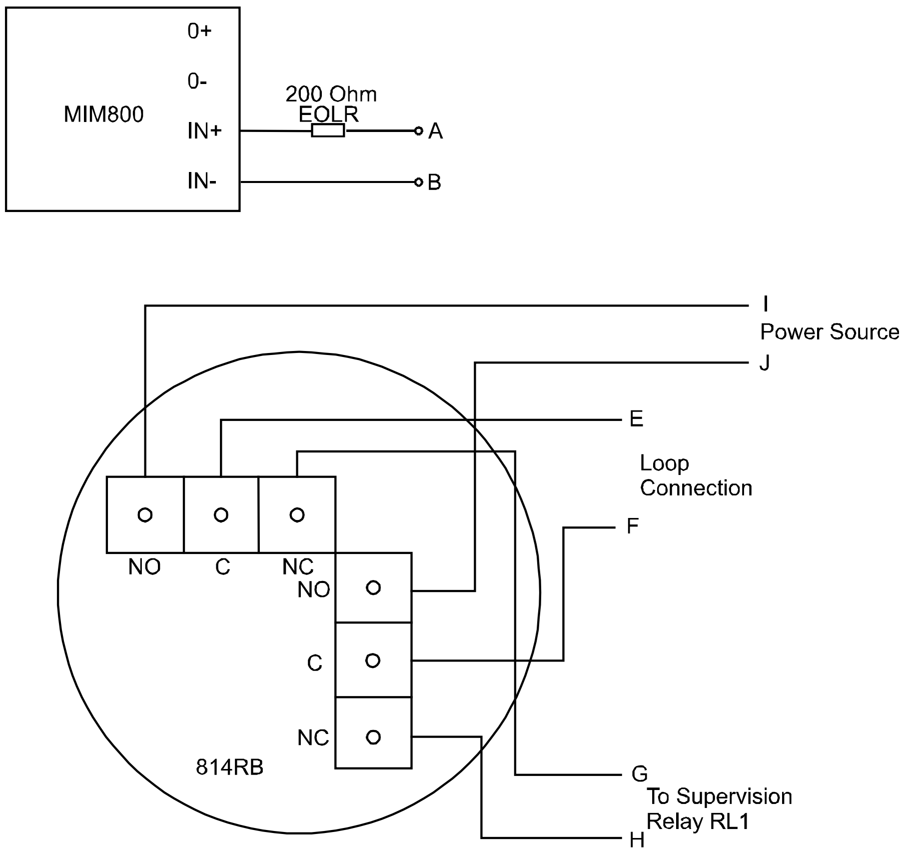


Figure 6.22 – Power Supply Loop Arrangement for MIM800 with an 814RB

Programming

The detector that plugs into the relay base must be programmed to have its base enabled and with output control by Logic.

Program the MIM800 with a profile having O/C Fault. Enter an output logic equation to turn the Relay Base on when the MIM800 is in fault. For example:

```
P1/pp/4OP = P1/mm/0FA ; detector controlling RB has address pp
                      ;the MIM800 has address mm
```

Operation

When a fault occurs on the loop-power wiring, the MIM800 point will go into fault and the relay base will be activated. Once the relay base has switched, the MIM800 will stay in fault, and effectively latch the relay base.

To clear the latched supply fault, the MIM800 point must be disabled. This will mask the input fault and cause the relay base to de-energise, restoring the power feed circuit to its normal mode. With the MIM800 point disabled, check its state on the LCD. If it still shows Fault, the supply fault is still present, enable the MIM800 to allow the power feed from both ends. If the shows Normal while disabled, the supply fault is cleared; enable the MIM800 to restore normal operation.

Note that, with current *MX1* software, disabling the whole detector point in the relay base will de-energise the relay base irrespective of the fault condition. Under fault conditions this will de-power the alternate loop feed.

To avoid this, disable only the sub-points that need to be disabled, or make the functional base sub-point non-disableable.

6.10 Intrinsically Safe Devices

6.10.1 General

The *MX* intrinsically safe (I.S.) devices listed below are suitable for use in New Zealand in classified explosive gas areas. These devices may be connected to the *MX1* addressable loop, but this must be carried out using an EXI800 *MX* I.S. loop Interface and an Intrinsically Safe Galvanic Isolator.

MX* Intrinsically Safe Devices Compatible with *MX1	
801CHEx	I.S. Combined Carbon Monoxide & Heat *MX* detector.
801PHEx	I.S. Combined Photoelectric & Heat *MX* detector.
801HEx	I.S. Heat *MX* detector.
801FEx	I.S. Flame Detector
IF800Ex	I.S. *MX* Single-Input Input Device
CP840Ex	I.S. *MX* Callpoint
S271i+	I.S. *MX* Flame Detector
FV421i	I.S. MX Flame Detector

6.10.2 Fire Detection Approvals

The *MX* 801Ex series intrinsically safe detectors are similar, but not identical, to the 814 series detectors used in normal areas. They are certified to the EN 54 European fire detection standards. All are FPANZ listed except the 801CHEx as a smoke or CO detector. It is the installation contractor's responsibility to ensure before sale and installation that use of these detectors will be accepted by the relevant authorities.

The FV421i and 801FEx have approval to AS 7240.10:2018, the standard for point flame detectors which is accepted under NZS 4512.

6.10.3 Certification for Use in Explosive Atmospheres

In New Zealand, electrical installations in explosive gas areas are governed by the Electricity (Safety) Regulations 2010 (and any amendments) which require compliance with the relevant sections of AS/NZS 2381. The devices listed in the table above have both ATEX intrinsically safe certification ("ia" classification, Gas Group IIC) and IECEx certification, and are accepted for use in Zone 0, Zone 1 and Zone 2 areas (ref. AS/ NZS 2381.1: 2005 section 2.6.2.2).

Copies of the following certificates are available to Johnson Controls employees on the http://www.vigilant-fire.com.au website.

ATEX Certificate for 801PHEx, 801CHEx, 801HEx, IF800Ex, CP840Ex: BAS01ATEX1394X.

ATEX Certificate for S271i+: Baseefa 02ATEX0257.

ATEX certificate for System 800: Baseefa 03Y0265.

ATEX certificate for FV421i: Baseefa 14ATEX0245X

IECEx certificate for FV421i: IECEx BAS 14.0113X

IECEx certificate for S271i+: IECEx BAS 05:0051.

IECEx certificate for 801PHEx, 801CHEx, 801HEx, CP840Ex, IF800Ex:IECEx BAS 07.0063X.

IECEx certificate for 801FEx: IECEx BAS 07.0075X.

IECEx certificate for P&F KFD0-CS-Ex1.54: IECEx BAS 05.0004

6.10.4 Qualifications of Personnel

AS/NZS 2381.1:2005 requires the design, construction, maintenance, testing and inspection of intrinsically safe systems to be carried out only by "competent persons" who have undertaken appropriate training for this type of system (refer AS/NZS 2381.1:2005, 1.7).

6.10.5 Other Requirements

AS/ NZS 2381.1 contains other mandatory requirements such as system documentation and system maintenance, inspection and testing (over and above that normally required for a fire alarm system). While it is primarily the responsibility of the installation owner to ensure that the relevant documentation is produced and testing and inspection is carried out, it will normally be up to the fire alarm installation contractor to ensure that the building owner is given the required information for the relevant parts of the fire alarm system.

NZS 4512 section 410 allows certain relaxations for installations in hazardous areas.

6.10.6 Product Application and Design Information

A general outline only is provided below. Refer to the publication 17A-13-D, "System 800 - Intrinsically Safe *MX* Addressable Fire Detection System Product Application and Design Information" for detailed system design and installation information. This document is intended for use with European fire alarm systems, but the instructions are equally applicable to *MX1* and must be adhered to for compliance with Ex area certifications.

6.10.7 Connection to Addressable Loop

MX I.S. devices must be connected to a branch or spur from the main *MX* loop. This spur is isolated from the main loop by two devices:

- EXI800 – adapts the main loop voltage to match the actual isolator, and to allow the *MX DIGITAL* signal to pass through. This device also provides short circuit isolation, to prevent faults on the spur affecting the main loop.

- KFD0-CS-EX1.54 (or the 2-port KFD0-CS-EX2.54 - manufactured by Pepperl & Fuchs) – provides galvanic isolation and current limiting.

Figure 6.23 shows how the spur is connected to the main loop. The main *MX* loop can have up to eight I.S. spurs connected to it, each with its own EXI800 and KFD0 isolation device.

The I.S. certification places limits on the permissible cable capacitance and inductance of the spur wiring, depending on the hazardous gas that may be present. This will in turn limit the type and length of wiring that can be used for the spur. Refer to publication 17A-13-D for further details including recommended cable types and wiring diagrams.

Note: Despite the apparent (minor) discrepancy, the Pepperl and Fuchs galvanic isolator KFDO-CS-Ex1.54 (Po = 0.653W) is matched to the 800Ex range of IS devices (Pi=0.65W) as evidenced by Baseefa System800 certificate 03Y0265.

Both NZS 4512 and AS1670.1 require that each I.S. spur be a single zone, since a single wiring fault can affect all the detectors on the spur. Also the I.S. certification specifies a combined maximum of 30 x 801PHEx, 801CHEx, 801HEx, IF800Ex and CP840Ex devices on a spur. A maximum of 10 S271i+ or 2 x FV421i flame detectors are permitted on a spur.

The EXI800 and KFD0 isolation devices are normally located outside the hazardous area, as shown in Figure 6.23.

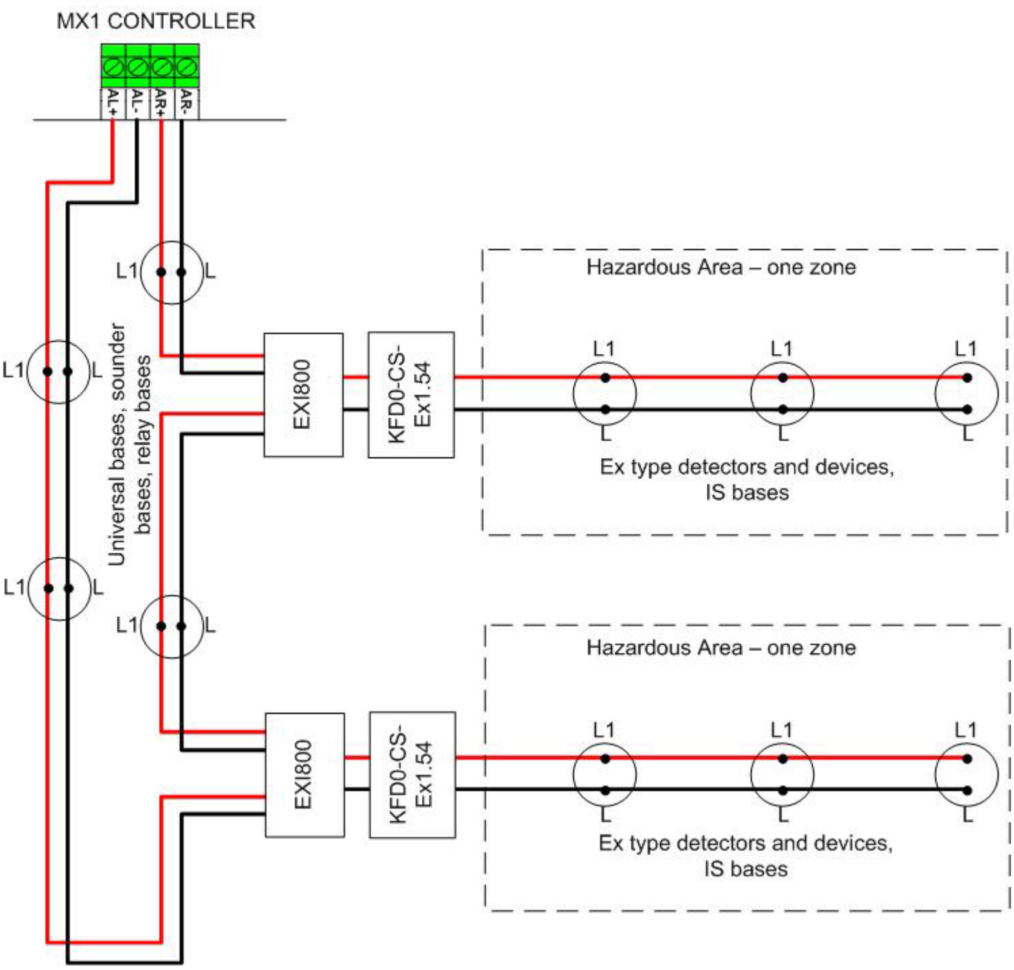


Figure 6.23 – Example of Intrinsically Safe Wiring Spurs

6.10.8 Detector Bases

The 800Ex detectors described in the following sections must be fitted to either MUBEx or 5BEx bases. No I.S. rated isolator or sounder/relay bases are currently available.

6.10.9 801PHEx Photoelectric Smoke & Heat Detector

This I.S. detector has similar, but not identical photoelectric smoke detection characteristics to the 814PH detector, and is a separately listed detector type in SmartConfig. The default SmartConfig smoke detection profile for the 801PHEx is "Count Normal", with alternatives "Count High Sens" and "Count Low Sens" providing high and low sensitivity options. While the other smoke detection profiles normally used with the 814PH (FastLogic, SmartSense etc.) can be selected in SmartConfig for the 801PHEx, these profiles are not recommended as the "Count of Three" smoke detection algorithms are those likely to be utilised in future testing to EN54 standards.

For similar reasons, the "Count 57C" is provided as the default detection algorithm for the heat detector within the 801PHEx.

6.10.10 801CHEx Carbon Monoxide & Heat Detector

The 801CHEx has similar analogue CO and heat sensitivity characteristics to the 814CH. It is separately listed in SmartConfig with "Count Normal" as the default CO detection profile, and "Count High Sens" and "Count Low Sens" provided to give corresponding high and low sensitivity alternatives. "Count 57C" is provided as the default heat detection profile.

Because the CO and heat detection characteristics of the 801CHEx are essentially the same as those of the 814CH, any of the other profiles used with the 814CH may also be used for the 801CHEx.

Caution: The CO detector is not recommended for environmental conditions where an unusually high concentration of Hydrogen or Hydrocarbon vapour is present. Where there is likely to be long term exposure to a particular chemical agent, correct operation should be verified before fitting the detector.

6.10.11 801HEx Heat Detector

The 801HEx has similar analogue heat characteristics to the 814H and "Count 57" is provided in SmartConfig as the default heat detection profile. Because the detection characteristics of the 801HEx are essentially the same as those of the 814H, any of the profiles used with the 814H may also be used for the 801HEx.

6.10.12 801FEx Flame Detector

The 801FEx has a fixed operation determined by SmartConfig and should be used with its default profile.

6.10.13 Remote LED & Functional Base Outputs

The 801PHEx, 801CHEx, 801HEx or 801FEx do not have output terminals for driving remote LEDs or functional bases. Older versions of SmartConfig may show output sub-points for these detectors but controlling these sub-points will have no effect for these devices. If these sub-points are present for these devices, they should be set to “Rem LED Not Used” and “Func Output Not Used”, respectively.

6.10.14 IF800Ex Interface Module

This is an I.S. device for monitoring clean contacts such as ventilation status, extinguishing system controls, etc. It is housed in a moulded GRP box with 3 cable gland holes for cable entry and does not have an internal LED. The remote LED terminals on the internal module must not be used.

This device is the preferred method to connect standard (normally-closed, hard-contact) NZ manual call points and V*IGIL* heat detectors in hazardous areas to the *MX* Loop. Note that the devices connected to the IF800Ex input terminals must be "simple apparatus" only (see below), and therefore must NOT have indicators or contain electronics. The default SmartConfig profile for this device is "Normally Closed". Interrupt operation is not available for the normally-closed profile option, so if used to connect an 1841-style manual call point, the back of the manual call point switch should be modified so that the switch latches mechanically in the "alarm" state.

The IF800Ex does not supervise its input wiring, so where supervision is required, the IF800Ex must be mounted immediately adjacent to the contacts being monitored, keeping the unsupervised input wiring very short.

Only "simple apparatus" may be connected to the input terminals of the IF800Ex, and there are restrictions on the cable parameters of the cable connected to these terminals. Refer to publication 17A-13-D for more information.
Note: NZ electrical inspectors have become very fussy about what constitutes “simple apparatus” and we strongly recommend any proposed device be pre-approved before you commit to using it.

Regardless of this, it is recommended that wiring to the input terminals be kept as short as possible to limit susceptibility to electromagnetic interference. Where possible the addressable wiring should be extended to the module rather than extending the module's input wiring.

The IF800Ex can be used with NO or NC contacts. The input sense is changed by selecting the appropriate input profile for the IF800Ex in SmartConfig.

6.10.15 CP840Ex Manual Call Point

This is an I.S. manual call point similar to the CP820. It is NOT NZS 4512 compliant, but for installation in hazardous areas it MAY be accepted on a case-by-case basis by the relevant Territorial Authority in lieu of compliant, but more cumbersome alternatives. However responsibility for this rests with the fire alarm contractor responsible for the sale and installation of the system.

To provide fast MCP operation, interrupt mode is enabled in the default "CP840" SmartConfig profile.

All input wiring is internal to the CP840Ex, and no EOL is required.

The internal LED is visible from the front. The default settings in SmartConfig are for this LED to light on alarm and flash when the CP840Ex is polled.

6.10.16 S271i+ Flame Detector

This is an I.S. addressable version of the S200 triple channel infra-red flame detector.

It is housed in a robust stainless steel enclosure with a clear sapphire window in the front. There are two 20mm gland holes for cable entry.

The analogue values returned by the S271i+ are based on predefined ranges for specific conditions (window fault, pre-alarm, alarm, etc.) The S271i+ profile in SmartConfig is based on these predefined ranges, and should not be adjusted, otherwise incorrect operation may result.

Refer to the S200+ Series Triple IR Flame Detector User Manual 120-415-400 for further information.

6.10.17 FV421i Flame Detector

This is an I.S. addressable version of the FV400 FlameVision series triple waveband infrared flame detectors.

It is housed in a robust stainless steel enclosure with a clear sapphire window in the front. There are two 20mm gland holes for cable entry.

In SmartConfig the FV41Xf point type needs to be used for an FV421i. Although the *MX1* DP command will identify the FV421i, when the results are imported into SmartConfig the point is not created automatically – so it is necessary to manually enter the detector point (using the FV41Xf type).

The default profile assigned is **S271 Devices Int**, which enables interrupt for fast alarm signalling. A non-interrupt profile is available, if wanted.

The analogue values returned by the FV421i are based on predefined values for specific conditions (window fault, pre-alarm, alarm, etc.). The profiles in SmartConfig are based on these predefined ranges, and should not be adjusted, otherwise incorrect operation may result.

For further information on the FV421i refer to these documents:

- 120-515-204 FV421i Triple IR Flame Detector Fixing Instructions
- 120-515-203 FV421i Product Application and Design Information.

7 *MX* Loop Design

7.1 Analogue Loop Configuration Selection

7.1.1 Lines and Loops

The interface between the *MX1* and its addressable devices requires two wires arranged in a loop.

MX1 has two ports (labelled AL, “left” and AR, “right”) which are designed to be connected to opposite ends of a loop of cable. Additional *MX* Loops can be supported by adding *MX* Loop Cards. The specifications for the in-built Loop and *MX* Loop Card are the same.

MX1 supports LOOP mode only. However, the *MX1* can also be used to connect to multiple lines in a star configuration as shown in Figure 7.2.

MX1 does not support dual line mode where the left and right ports are operated independently.

7.1.2 Loop Fault Tolerance

Fire alarm installation standards generally require that a line/loop fault condition cause limited disruption to the system's ability to detect and transmit alarms. The *MX1* achieves this in the following way:

The *MX1* has access to each device from both ends of the loop. The loop is normally powered from the “left” and monitored at the “right” terminals. Disappearance of 40V power at the “right” end, due to an open circuit on either the + or – wires, can be detected (causing a fault in the *MX1*) and corrected by switching the power feed onto the “right” terminals as well. The LOOP mode is therefore inherently fault tolerant to any single open circuit anywhere on the loop.

However, a short circuit on the loop will, in general, cause the *MX1* to lose communication with all devices, unless devices with short circuit isolators are used to localise the loss from a short circuit to a short stretch of cable.

The following devices provide short circuit isolation:

- 850xx detectors mounted in 4B-C bases
- MCP821 and MCP831 call points
- DDM800 universal fire & gas detector module
- QIO850, QMO850, QRM850 quad ancillary modules
- 4B-I and 5B-I isolator bases
- LIM800 Loop Isolator Module
- EXI800 IS Spur Interface Module
- AZM800 Apartment Zone Module
- P80SB, P80AVB, P81AVB, P80AVR, P80AVW bases and modules.

When designing fire alarm systems, the designer should be aware of any local authority requirements, as well as those of NZS 4512 (see below).

7.1.3 NZS 4512 Design Requirements

New Zealand Standard NZS 4512 requires the analogue loop to comply with the following:

- There is no specific limit to the number of devices connected to the *MX1*. Zone size limits using addressable or non-addressable devices are the same: an area of 750m^2, except where:

  - the zone has only MCPs; the zone area may be up to $900m^2$,
  - the detector or MCP can be uniquely identified by brigade staff at the brigade attendance point; the zone area may be up to $2000m^2$.

- Any single open- or short-circuit in the wiring between the *MX1* and any detector must not cause loss of coverage of more than one zone. This also applies to wiring providing power to detectors, e.g., power to DDM800, DIM800, and VLC800, where devices in different zones are powered via common cabling.

- There is no specific limit on the number of devices in a zone.

- Any fault that prevents a detector or MCP from initiating alarm must produce a fault signal at the *MX1*.

The *MX1*'s alphanumeric display and keyboard meet the requirement for unique identification of the detector or MCP, allowing larger zones. Note that the display and keyboard may be located within the building, but must be located in a readily accessible position – ref NZS 4512:2010, 403.4, 401.2.3(b).

Short-circuit isolators must be connected in the analogue loop between zones. Additional isolators may be required within zones, depending on device and functional base loading. Isolators must be fitted between zones so that a single short circuit will affect no more than one zone.

7.2 Analogue Loop/Line Layout

7.2.1 Line Mode

MX1 is designed to run in Loop mode only. However, a star configuration can be used, described later in this chapter.

7.2.2 Loop Design with Short Circuit Isolators

There are two main reasons for using isolator bases on the analogue loop.

- When the *MX1* powers up a line/loop, it will only have to power up one section of the line/loop at a time, reducing the power surge from the *MX1* during start up.

- If the loop is shorted, then the *MX1* will lose communication with only those devices on the shorted section between two isolators. If every detector was an 850xx detector in a 4B-C base, or was mounted on an isolator base, then all detectors would remain functional in the event of a single short circuit.

Refer to Figure 7.1 for an example of loop wiring with Isolator Bases.

Note the 850xx detector needs to be mounted in a 4B-C base for its in-built short circuit isolator to work.

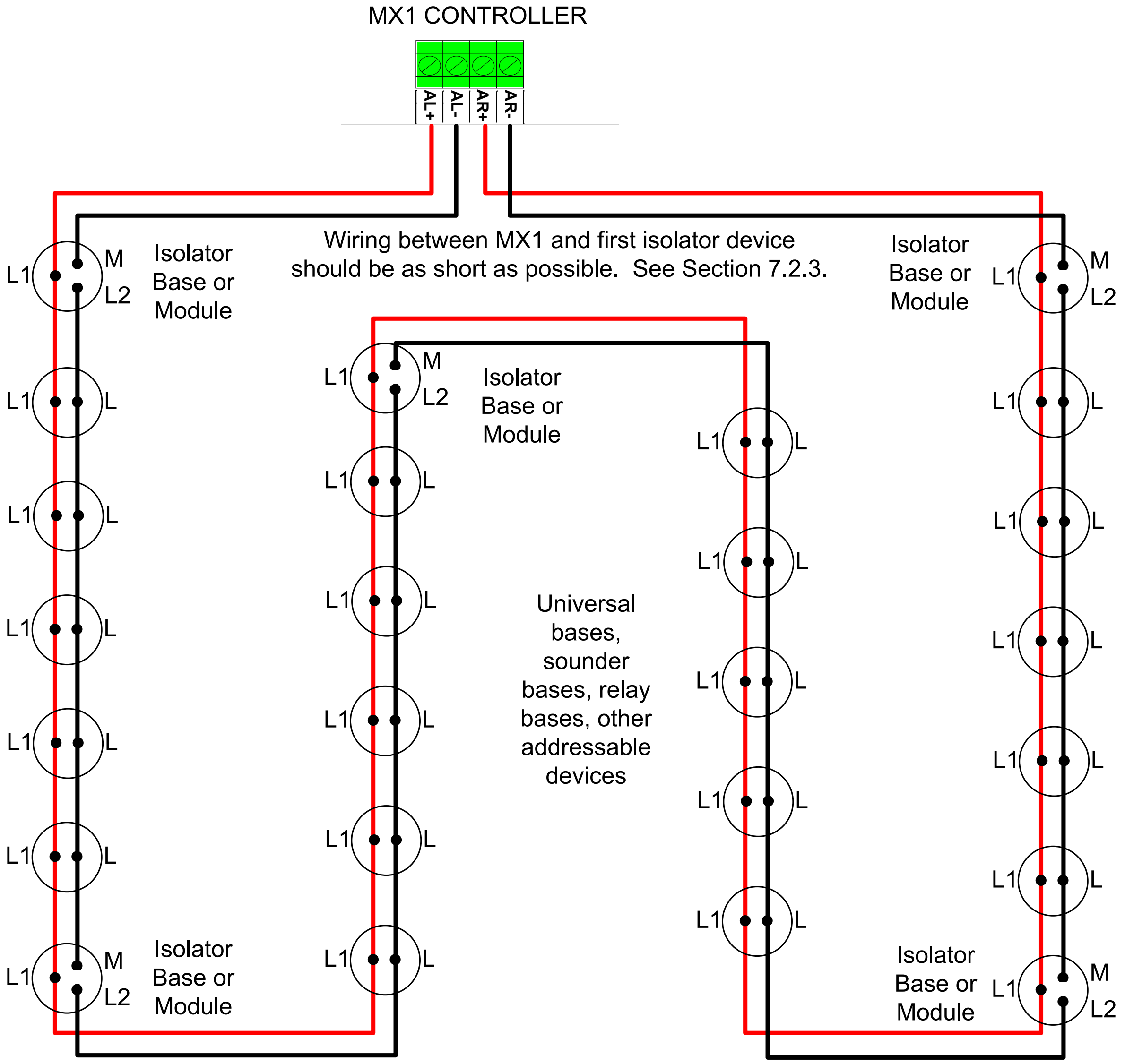


Figure 7.1 – *MX* Loop with Isolators

7.2.3 Design Notes

When using the older PA1011 Controller it is necessary install isolator bases (5BI or 814IB) or isolator modules (LIM800) between the *MX1* and the first and last devices on the loop as shown in Figure 7.1. This gives protection against short circuit faults in this part of the loop wiring. These isolators are not required with the latest PA1081 *MX1* Controller and V1.40 firmware, or *MX* Loop Cards Rev 3 onwards.

On earlier revision hardware, without the isolators, when the short circuit fault occurs, the *MX1* will isolate the power feed to that end of the loop. However, at 30 second intervals, the *MX1* will reconnect the power feed, in case the fault has cleared. If the short circuit fault is still present, this will trip the power feed current limit in the *MX1* and cause a short break in the power feed to the whole loop, until it isolates the faulty end of the loop again.

With isolators present the *MX1* does not see the short circuit as the isolators are open each side of the short.

There is a limit on the number of devices between Isolators which depends on the type of devices being used. Use MX1COST to check the placement of isolators. The sum of IB units for each section must not exceed 100.

The M and L2 connections are interchangeable on the isolator bases.

7.2.4 Star Connection of Loop Wiring

It is not always necessary to connect addressable systems as loops, especially if an existing conventional detector system is being converted to addressable detectors. As the existing detector zone cables probably already terminate at the main panel, it is possible to connect these in a star connection to the *MX1* as shown in Figure 7.2.

The isolators may be either LIM800 modules or isolator bases (with or without a detector fitted).

The *MX1* AL and AR terminals should be joined together as shown in Figure 7.2. The total length of cable connected to the *MX1* (all branches added together) should not exceed 2000m.

Because shorting the cable in one line will short out all the other lines connected to the *MX1*, it is recommended that Isolator Bases be fitted at the start of each line and then be placed every 22 - 32 devices along each line, as required. The cabling from the *MX1* to the initial Isolator Bases should be as short as possible.

Note: the Star Connection is not recommended for new installations. The loop configuration should be used, as it offers complete protection for a single open circuit, maximum protection from multiple open circuit faults, and, with Isolator Bases, short circuit protection.

7.2.5 Spurs

Both the loop format and the star topography can have "spurs" attached. (Spurs on a spur, for the star topography.)

Any such spur should be connected to the loop or its parent spur via an isolator base. See Figure 7.2.

However, spurs with multiple detectors are not recommended for new installations as an open circuit on the spur will disconnect all detectors further away from the *MX1* than the open circuit, and a short circuit on a spur will disconnect the whole spur when the isolator base operates.

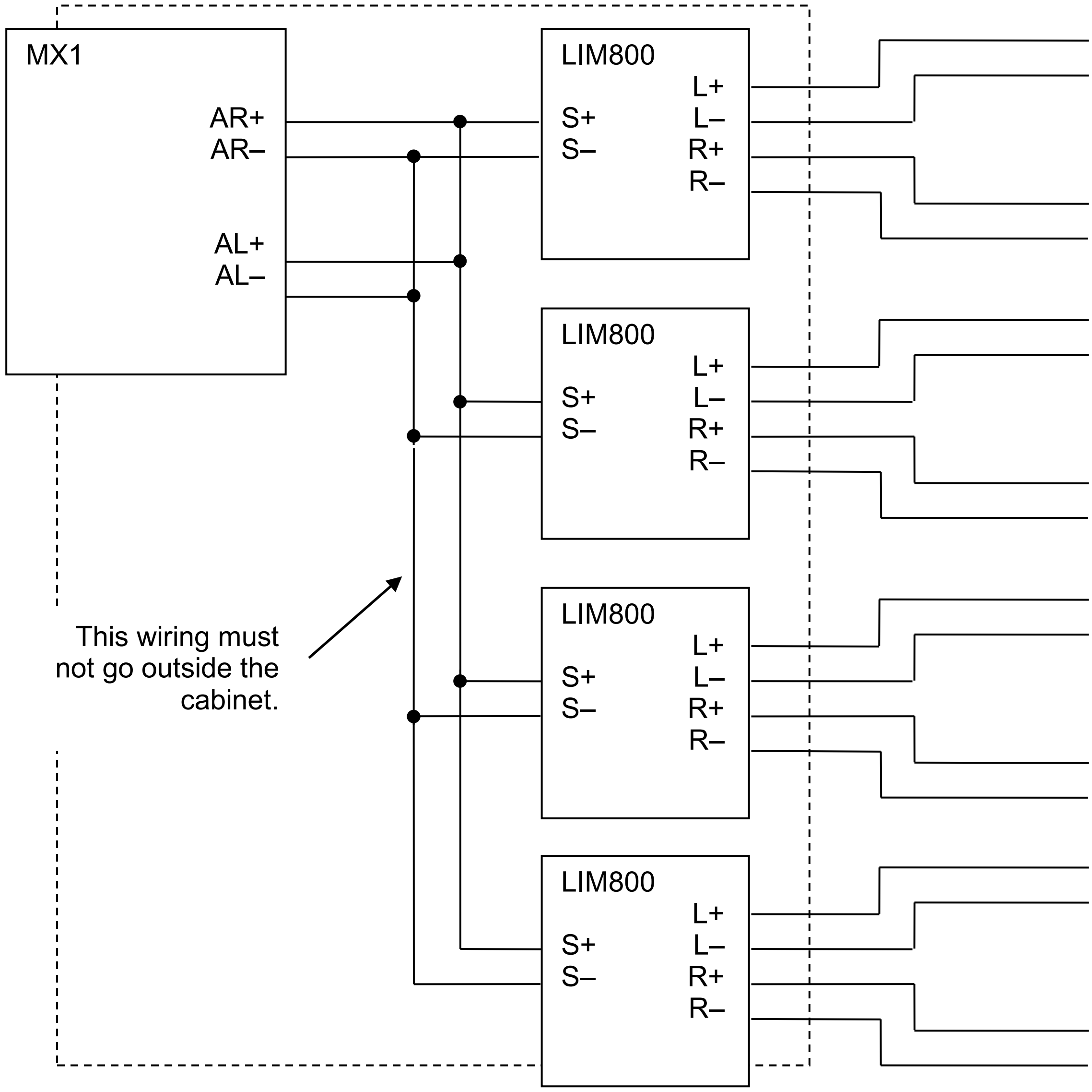


Figure 7.2 – Star Connection on *MX1*

7.3 Cable Selection Considerations

Selection of cable to implement the Analogue Loop requires specification of cable type, i.e. construction and choice of materials.

This is determined from consideration of

- Mechanical Requirements - for instance, does the application specification, or prevailing standards, call for cable that is fire rated, armoured, etc.
- Electrical Requirements - different cable construction/materials give different AC characteristics, noise immunity, etc.
- Cable Weight, i.e., gauge of wire used.
    - Standards - does the application, or prevailing standards, call for a minimum gauge (NZS 4512 specifies a minimum of 0.75mm², for instance).
    - Electrical Resistance - What is the minimum gauge wire that can be used without exceeding the maximum voltage drop for the number of devices over the required loop length.

MX1COST can be used to check the resistance and AC characteristics of the cable to be used in the *MX* Loop.

7.3.1 Noise Considerations

Although the *MX* Loop has been designed for minimum electrical interference, it is still capable of both picking up and generating electrical interference. The longer the loop, the greater the scope for potential problems.

Each installation must be considered on its own merits, taking into account possible noise sources along the loop's proposed routing. Normal engineering practice applies, such as keeping the *MX* loop wiring separate from other wiring, especially power cables, speaker cables, leaky coaxial cable and noise sensitive cables for audio or telephone systems.

In extreme cases it may be necessary to use screened cable for the analogue loop, with the screen connected to earth only at the *MX1*.

In general, physical separation between noisy cables and sensitive cables is more effective and reliable than screening at limiting the effects of interference.

7.4 Loop Calculation

A calculation must be conducted for each *MX* Loop to check that the quantity of devices present does not exceed various design limits (see Section 7.5).

For speed and accuracy, use of MX1COST is strongly recommended. This has the advantage of also doing battery requirements calculations, and producing summary reports for inclusion with commissioning documentation.

However, for straightforward systems (e.g. no IS devices, sounders and loads operate only in alarm), the loop calculation can be done manually, by filling in the following tables. Refer to section 7.6 if IS detectors/modules are present.

7.4.1 Manual Calculation

Fill in Tables 7.1 and 7.2 for each *MX* Loop. Enter the quantity of each device type and base in the Number column. Note there are separate entries for sounder/relay bases with 850 detectors to allow for the extra current taken when the base is activated. Multiply these by the corresponding NAL, AL and AC values for each detector or base and put the results in the totals columns at right. Add the NAL, AL and AC Total columns to produce loop total currents.

The total loop battery loads are the currents drawn from the battery by the 40V loop supply to meet the loop current requirements. These values are used in the Battery capacity calculation in Chapter 11.

Table 7.1 – Addressable Device Currents

Device	Description	Number	NAL mA	AL mA	AC Units	NAL Total	AL Total	AC Total
814PH	Photo/heat Detector		0.275	0.275	1			
814P	Photo Detector		0.275	0.275	1			
814H	Heat Detector		0.250	0.250	1			
814CH	CO / Heat Detector		0.275	0.275	1			
814I	Ionisation Detector		0.33	0.33	1			
850PH	Photo/Heat Detector		0.33	0.33	1			
850P	Photo Detector		0.33	0.33	1			
850H	Heat Detector		0.29	0.29	1			
850PC	Photo/Heat/CO Detector		0.37	0.37	1			
801PC	Photo/CO/Heat Detector		0.300	0.300	2			
801F	Flame Detector		0.300	0.300	1			
CP820/ CP830	Call point (Aust)		0.275	0.275	1			
MCP821/ MCP831	Call point (NZ)		0.28	0.28	1			
1841MX	Call point (NZ)		0.275	0.275	1			
CIM800	Contact Input Module		0.275	0.275	1			
DIM800	Detector Interface Module		0.280	0.280	1			
AZM800	Apartment Zone Module		4.0	20*1	1			
MIM800	Monitored Input Module (NO)		0.275	0.275	1			
MIM801	Monitored Input Module (NC)		0.275	0.275	1			
RIM800	Relay Interface Module		0.285	0.285	1			
SNM800	Sounder Notification Module		0.450	0.450	1			
SIO800	Single Input/Output		0.275	0.275	1			
MIO800	Multi Input/Output		0.480	0.480	1.2			
VIO800	VESDA Input/Output		0.480	0.480	1.2			
LPS800	Loop Powered Sounder		0.450	*2	1.5			
SAB801	Addressable Beacon		0.250	3.25	1			
SAM800	Sounder Addressable Module		0.250	0.250	1			
VLC800MX	LaserCompact Unit		0.300	0.300	2		30	
FV411f / FV412f / FV413f	Flame Detector		3.25	3.25	2			
S271f+	Flame Detector		0.500	0.500	0.2			
QIO850	Quad Input/Output		0.575	0.575	1			
QMO850	Quad Monitored Output		1.175	1.175	1			
QRM850	Quad Relay Output		0.575	0.575	1			
DDM800 Loop Powered	Dual Detector Module (Loop Powered)		16	52	5			
DDM800 External Powered	Dual Detector Module (External Powered)		1.25	1.25	5			

P80SB	Addressable sounder base		0..5	4.3				
P80AVB	VAD base		0.48	*3				
P81AVB	VAD base (high intensity)		0.5	*3				
P80AVR	Wall-mount VAD (red)		0.48	*3				
P80AVW	Wall-mount VAD (white)		0.48	*3				
Device LEDs	Note: LED current for devices in alarm	-		30			30	
	Total Addresses		**Total Device Loads**					

Notes *1: AZM800 alarm current only applies when a conventional detector on the AZM800's circuit has activated.

*2 LPS800 Alarm Current = greater of 12mA or actual load current (<75mA) +4mA.

*3 VAD Alarm Current is loop voltage dependent and increases with lower voltage. Use MX1Cost to do calculations.

7.4.2 Functional Base Currents

Base	**Description**	**Number**	**NAL mA**	**AL mA**	**AC Units**	**NAL Total**	**AL Total**	**AC Total**
4B-I	*MX* 4" Isolator Base		0.08	0.08	0.2			
5BI	*MX* Isolator Base		0.08		0.2			
LIM800	Isolator module		0.16		0.1			
Allowance for a short circuit between IBs						7.00	7.00	
80DSB	*MX* Sounder (High/Mid Volume)		.09	3.9	1			
80DSB	*MX* Sounder (Low/Mid Volume)		.09	2.1	1			
802SB	*MX* Sounder (Loud) with 850 Detector		0.20	9.80	0.5			
802SB	*MX* Sounder (Quiet) with 850 Detector		0.20	4.20	0.5			
901SB	*MX* Sounder Base with 850 Detector		0.20	3.2	0.5			
814RB	*MX* Relay Base with 850 Detector		0.05	3.05	0.3			
802SB	*MX* Sounder Base (Loud)		0.20	6.80	0.5			
802SB	*MX* Sounder Base (Quiet)		0.20	1.20	0.5			
812SB	*MX* Sounder Base		0.20	21.00	0.5			
901SB	*MX* Sounder Base		0.20		0.5			
814SB	*MX* Sounder Base (Loud)		0.40	15.00	2.4			
814SB	*MX* Sounder Base (Medium)		0.40	12.00	2.4			
814SB	*MX* Sounder Base (Quiet)		0.40	9.00	2.4			
814RB	*MX* Relay Base		0.05		0.3			
		Total Base Loads						

Add the Total Device Loads and Base Loads to produce:	**Total Loop Loads**	
Multiply the NAL and AL total loop loads by 2 to produce:	**Total Loop Battery Loads**	

7.4.3 Loop Isolator Limitations

When Loop Isolators are used, the number of devices that can be connected to the loop between each pair of isolators is limited. The sum of IB units for those devices must not exceed 100.

Here are four examples of acceptable numbers of devices between isolators:

1 0-40 detectors + 0-10 Relay/Sounder Bases + 0-5 SNM800/RIM800
2 0-40 detectors + 0-20 Relay/Sounder Bases
3 0-40 detectors + 0-10 SNM800s/RIM800s
4 0-60 detectors + 0-10 Relay/Sounder Bases

There is no need to do specific IB calculations if you are using isolators and your situation matches any of these examples. If necessary, you can add extra isolators to break up heavily loaded sections into smaller sections.

If you have a complicated loop structure, MX1COST should be used to check that the loop loading is within acceptable limits.

The AZM800 has an integral loop isolator. In most apartment installations using AZM800, this isolator will provide all the required isolation between zones, with little or no need for additional isolators in apartments. Isolators may be required for other parts of the building, where these zones are not otherwise separated by loop isolators.

7.5 Loop Limits

7.5.1 DC Load

The maximum current available from the *MX* Loop Driver is 1000mA. Therefore, for each loop the NAL Total Loop Load and AL Total Loop Load must each be less than 1000mA.

A maximum voltage drop of 17V is allowed on the cable from the *MX1* to the most distant device. This applies both where the cable is driven from the "left" end only, and from the "right" end only. This is calculated as:

```
VoltDrop = (0.04 x 0.75 x LoopLength(m) / CableSize (sqmm) + 0.25 x NumberOfIBs) x AL
```

where AL is the AL Total Loop Load before it is converted into a battery load, and NumberOfIBs is the number of short-circuit isolators in the loop.

This voltage drop must be 17V or less.

7.5.2 AC Load

All common types of wiring with a total length of up to 2000m may be used. The total AC units for the loop are calculated:

```
ACUnits = MXDeviceACUnits + LoopLength(m) x 0.1
```

where MXDeviceACUnits is the AC Total Loop Load from the above table.

If one or more IS spurs are part of the system then the AC loading of each spur must be included. Refer Section 7.6.
The `ACUnits` result must be 450 or less, otherwise unreliable polling of devices on the loop may occur.

7.5.3 On-Board and Loop Card Loop Performance Limits

If you are using any SIO800, MIO800, 850PC or AZM800 devices on the *MX1* on-board loop (i.e., loop 1) the maximum number of devices allowed on this loop may be reduced to as low as 220, depending on the number of these devices present.

If you are using any DDM800, QIO850 or QMO850 devices on the *MX1* on-board loop (i.e., loop 1) the maximum number of devices allowed on this loop may be reduced to as low as 107, depending on the number of these devices present.

If you are using any DDM800, QIO850 or QMO850 devices on the *MX1* loop cards (i.e., loops 2 through 8) the maximum number of devices allowed on this loop may be reduced to as low as 125, depending on the number of these devices present.

These limits are to keep the total poll time below 5 seconds. MX1COST and SmartConfig will display a warning message if the maximum number of allowed devices is exceeded.

Note that the DDM800 has DC and AC loading characteristics that limit its numbers even further.

7.6 Intrinsically Safe Spurs

A range of Intrinsically Safe *MX* devices can be connected to the *MX* loop via the EXI800 interface and a galvanic isolator. Refer to Section 6.10. Note there are strict rules as to the number of devices that may be connected and how these affect the overall *MX* Loop design.

The document 17A-02-ISLOOP, published by Johnson Controls UK, describes the rules and calculations necessary for the design of an IS spur attached to the *MX* Loop.

Each IS spur must be calculated separately using the MX1CAL (SF0332) tool (use Issue 1.2 onwards to support FV421i). Enter the required IS devices and cable type and length for each spur on each MX loop.

Each IS spur has a DC load limit of 30 DC units. Check the **DC Load from Loop (ma)** value shown in MX1CAL has not turned red (exceeds 30). If it has reduce the number of devices on the spur.

Each IS spur has a limit of 74 IS Units, reducing for each extra spur on the same MX loop. Check the **IS Units** value for each spur has not turned red. If it has, then the number of devices will need to be reduced (or the number of IS spurs on the MX loop reduced). Note that moving some IS devices to a new spur will not always fix the problem, as this will increase the number of spurs and thus decrease the maximum IS units per spur.

Add the **Total DC load of IS spurs** for the loop to the DC current calculated for the other MX devices on the loop. This must not exceed 1A for each loop.

Add the **Total AC Load of IS spurs** for each MX loop to the ACUnits value calculated for the other MX devices on the loop. This total must not be more than 450.

Add the **Total device Addresses** for each MX loop to the number of other MX devices on the loop. This total must not be more than 250.

We recommend you discuss any IS applications with Johnson Controls Technical Support in advance to avoid potential problems.

8 Alarm Devices

8.1 Introduction

8.1.1 Alarm Device Types

A fire alarm system will almost always require alarm (alerting) devices to be included to alert the occupants of the building to a fire alarm situation and prompt them to leave the premises.

MX1 supports a range of alarm devices including:

- T-Gen 60 & T-Gen 120 tone and speech generators (T-Gen2) with 100V loud speakers,
- Mini-Gen tone and speech generator with 100V loudspeakers,
- AZM800 for selective switching of 100V signals to loudspeakers,
- Addressable Visual Alarm Devices (flashing white LEDs) with audible functions,
- Conventional Visual Alarm Devices (flashing red or white LEDs) and optional audible functions,
- 24V-powered sounders and bells. Controlled from outputs on the *MX1* panel, LPS800, SNM800, or QMO850 addressable control modules,
- Bell Monitor Board,
- Sounder bases for addressable detectors – usually for local alerting only,
- AVI Mk2 – Audio Visual warning signs,
- QE20 and QE90 EWIS systems.

The following sections describe installing, wiring and configuring these types of alarm devices with MX1.

8.1.2 *MX1* Logic Equations

MX1 contains an internal point called Alarm Devices, which is operated when the alarm devices are to sound. This can be used in output logic via the text substitution $ALARM_DEVICES_ON.

Generally, the recommended way to set an output point to be controlled by alarm devices is through setting the point's "O/P Control" field to **$ALARM_DEVICES_ON**. This enables SmartConfig's automatic generation of output logic to control the output and detect fault states. For example, if General Purpose Output 1 is set to **$ALARM_DEVICES ON**, the following statements will be automatically generated in User Logic:

P241/4/0OP = $ALARM_DEVICES_ON
$ALARM_DEVICES_ON_AUTO_FAULT = P241/4/0FA

The automatic fault state generation considers the point's ability to generate a fault. In the above example, should General Purpose Output 1 Supervision be set to supervise GP Out 1, fault states for General Purpose Output 1 will be detected through the supervision point rather than through the output point itself. Accordingly, SmartConfig will automatically generate the following User Logic to compensate:

P241/4/0OP = $ALARM_DEVICES_ON
$ALARM_DEVICES_ON_AUTO_FAULT = P241/5/0FA

ANC1 and ANC3 have "O/P Control" set by default to **$ALARM_DEVICES_ON**. As well, most *MX* output devices will default to this setting when they are created or their functional output is enabled. To use an output for a different function will require the point's "O/P Control" setting to be changed to the required setting (e.g., Zone, Logic, etc.) To change an output point back to follow $ALARM_DEVICES_ON, select the drop-down box in the "O/P Control" field, and select **$ALARM_DEVICES_ON**.

Sometimes it is necessary to set the output point to follow more than just $ALARM_DEVICES_ON. In this case, the **Logic** option should be selected for "O/P Control" and a logic equation entered in the "Logic" field. For example:

$ALARM_DEVICES_ON AND NOT $SOUNDER_DELAY

Note that controlling outputs via “Logic” will not result in automatic fault state generation, and the user is required to manually enter this via the $ALARM_DEVICES_FAULT equation in the “User Logic” page. For example, if ANC1 is set to follow alarm devices using the “Logic” option from above, the procedure would need to be:

Select **Logic** for ANC1 “O/P Control” in the Controller Points page.
In the “Logic” field to the right, enter:
    $ALARM_DEVICES_ON AND NOT $SOUNDER_DELAY
In the “User Logic” page add to the $ALARM_DEVICES_FAULT equation the ANC 1 relay supervision fault condition
    $ANC1_SUPERVSN_FAULT

8.1.3 100V Wiring

100V line output wiring is hazardous.
Observe appropriate safety precautions and ensure that 100V lines are suitably isolated from low-voltage wiring.

8.2 T- Gen2 (T-Gen 60 & T-Gen 120)

T-Gen2 can be used for installations that must meet AS4428.16 Grade 3 and Grade2. For Grade 2 installations, it is required that the power supply is separate and monitored, therefore it is recommended to use a separate T-Gen2 Grade 2 EWS (eg. FP1129 or BTO). Section 8.10 describes interfacing *MX1* with a multi-zone Grade 2 T-Gen2 system using RZDU and Section 10.16 describes using multiple relay outputs.

The following sections cover mounting the T-Gen2 Grade 3 equipment in and powered by the *MX1* panel.

8.2.1 Mounting

The gear plate in both the slimline and 15U *MX1* cabinet has a mounting footprint for a single T-Gen 60 tone generator. The T-Gen 60 mounts on one metal standoff and five plastic standoffs (supplied with the *MX1*). The metal standoff provides all the earthing required by the T-Gen 60.

The 15U cabinet can also have a T-Gen 120 fitted into the same footprint, by using M4x10 screws, and the Loop Card bracket mounting points.

The 15U gearplate also provides a mounting option on the right hand side fold for a single T-Gen 60 if required.

The T-Gen2 3U User Interface doors (FP1121 and FP1122) may be fitted onto the 15U rack mounts. Refer to Section 10.2.2 19” Rack Cabinet Options.

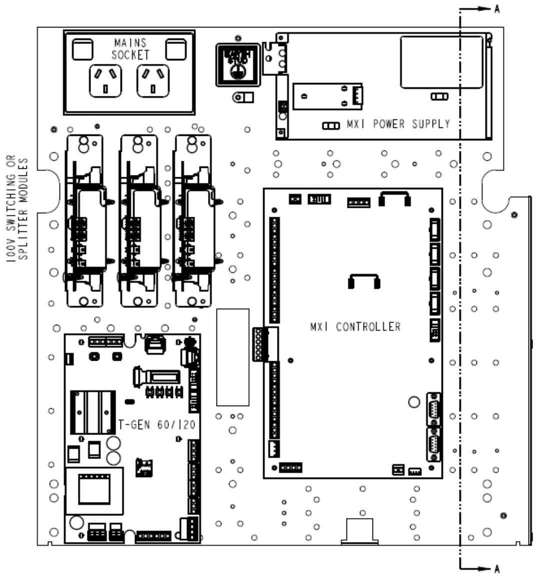


Figure 8.1 – Internal Layout of *MX1* Gearplate showing T-GEN 60

The T-Gen2 100V Splitter Board (FP1118) and T-Gen2 100V Switching Board (FP1117) are mounted on the 15U gear plate in the same places as the *MX1* Loop Card brackets.

8.2.2 Wiring

The T-Gen2 is most easily controlled from the ANC 1 relay on the *MX1* Controller. Figure 8.2a shows the basic wiring for this. A pre-made loom LM0319 is supplied with each *MX1*, which provides all the necessary control and monitoring wiring for connecting a single T-Gen2 to ANC 1. The power wires from ANC1 must not be used – rather, separate power wires are required as per Figure 8.2a.

In this arrangement, all the loom wiring is supervised, and the Fault output from the T-Gen2 is transferred to the *MX1* Controller via the ANC 1 supervision input.

The T-Gen2 can produce Alert and Evacuate tones. The transition from the Alert to the Evacuate tone can be arranged to be done automatically by the T-Gen2 after a predetermined delay, or it can be controlled by the *MX1* panel.

If *MX1* control of the Alert (or other) tone is required, then an additional connection between one of the *MX1* Controller GP Outputs and the T-Gen2 A/I/E- input is required. This is shown as the dotted connection in Figure 8.2a.

The T-Gen2 could alternatively be controlled by the *MX1*'s ANC 2 relay. All the wiring connecting to ANC 1 in Figure 8.2a would need to be shifted to the same terminals on ANC 2.

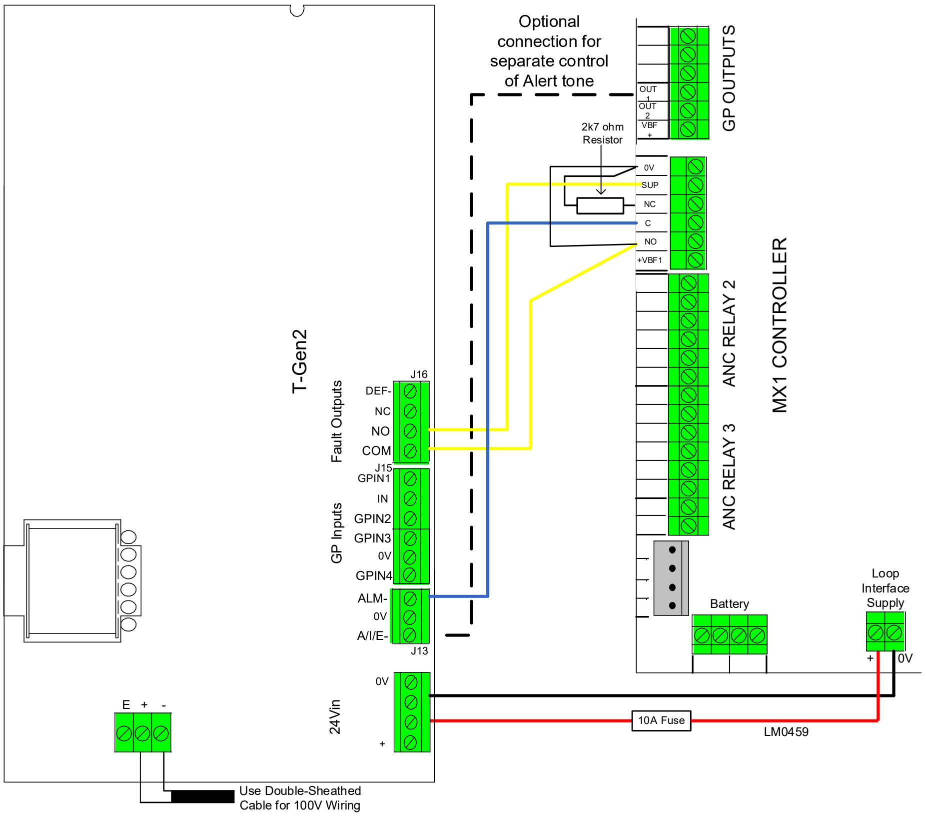


Figure 8.2a – Single T-Gen2 Wiring Details – Grade 3

A T-Gen2 can be controlled by the *MX1* ANC3 relay, using the wiring shown in Figure 8.2b. ANC3 supervision is set to “ANC3”.

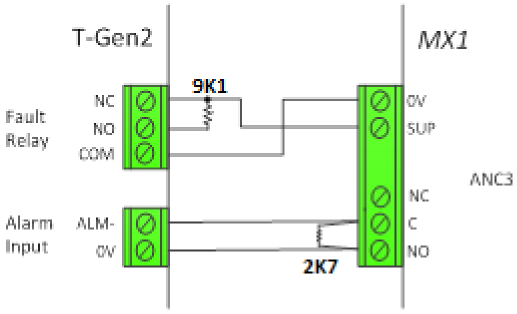


Figure 8.2b – T-Gen2 Wiring Using ANC3

If multiple T-Gen2s are required, then wire a separate PSU connection to the slave T-Gen2s and connect the T-Gen2s’ 0V together. Connect the T-Gen2s together via QBus so the master can control the slaves. Additional T-Gen2s are configured as slaves. Refer LT0667 T-Gen2 Installation & Operating Instructions.

If an external PSU needs to be used, e.g. because the PSU rating of the *MX1* is exceeded, then power the T-Gen2 units from the separate 24V supply (e.g., FP1139). Make sure the 0V connections between the T-Gen2s and the *MX1* are maintained.

If the T-Gen2 is located in a separate cabinet, a longer loom is required. A suitable option may be LM0401, which is in essence a 1.3m long version of LM0319.

8.2.3 Additional T-Gen2 Wiring

The FP1117 100V Switching module mounts in a Loop Card bracket position. It is wired to the T-Gen2 via a QBus loom, providing control signals and power, and the T-Gen2 100V audio output is wired to the FP1117 to provide the audio signal.

The FP1118 100V Splitter module mounts in a Loop Card bracket position. It needs 24V power wired to it, plus the T-Gen2 100V audio output.

Refer to LT0667 T-Gen2 Installation & Operating Instructions, LT0668 T-Gen 100V Switching Module Installation Instructions, LT0671 T-Gen 100V Splitter Module Installation Instructions, and drawings 1982-71 sheets 134 and 135.

The FP1121 Grade 3 EWS UI Door (with T-Gen 60) and FP1122 Grade 3 EWS UI Door (w/o T-Gen 60) are wired as per LT0672 Grade 3 User Interface Installation Guide.

8.2.4 Configuration 1 – T-Gen2 Control of Alerting and Evacuation Tones

In this configuration the T-Gen2 is simply activated in response to the alarm devices being turned on by the *MX1*. The management of Alert and Evacuation tones is done by the T-Gen2.

T-Gen2 Settings

The T-Gen2 must be programmed to use the **AS2220** configuration (refer to LT0667 T-Gen2 Installation & Operating Instructions). This configuration will provide the required operation – no Alert is generated, just Evacuation tone.

***MX1* Settings in SmartConfig**
In the “Controller Points” window, for the “Anc1 Supervision” point (ANC1S), check the supervision mode is **Contact**.

For the ANC1 output check the O/P Control setting is **$ALARM_DEVICES_ON**.

8.2.5 Configuration 2 – *MX1* Control of Alerting and Evacuation Tones

In this configuration, the *MX1* has the ability to separately control the Alert (or other) tone and the Evacuation tone. This type of operation is required for Type 5 and Type 7 apartment installations, or in a residential situation such as a nursing home.

AZM800 modules can be used to selectively switch Alert tone from the T-Gen2 to zone(s) with local smoke detector alarms, or switch Evacuation tone to all zones. See Chapter 9 for more detail about using AZM800.

Alternatively, smoke detectors in single occupancy units may produce a local alarm using a sounder base, and cause the Alert tone to be sounded everywhere else, whereas a heat detector or manual call point will cause the Evacuation tone to be sounded everywhere.

T-Gen2 Settings

The T-Gen2 must be programmed to use the **AS2220** configuration, and the AIE wiring connection must be in place as Figure 8.2a.

MX1 Settings in SmartConfig

The following is a general application suggestion for a residential situation. For specific application details using the AZM800 for Type 5 or Type 7 installations refer to Chapter 9 Application - AZM800 *MX* Apartment Module.

Define a zone or zones for the heat sensors and MCPs which are to be brigade calling. Most templates will have a suitable profile called **Std Detection G1**.

Define a zone or zones for the smoke sensors which are to be local alerting only. These need to use a zone type profile that does not call the brigade, nor activate the alarm devices – such as **Alarm List Only Std Det G2**. The common status of these zones will be available in Zone Group 2.

- Map the heat sensor points and MCP points to the brigade calling zone(s).
- Map the smoke sensor points to the local alerting zone(s).

In the Menu, Profiles, Logic Substitutions window, add this entry:

New Name	**Substituted text**	**Predefined Output Control**	**Comments**
$ALERT_ZONES_ONLY	ZG*nnn*AL(1)	Y	Zone group for local alerting zones

where *nnn* is the number of the zone group of the local zones (2 in this case).

On the ***Controller*** page, for the GP Output that controls the A/I/E- T-Gen2 input, set that GP Output's "O/P Control" to **$ALERT_ZONES_ONLY**.

For the ANC1 output check the O/P Control setting is **$ALARM_DEVICES_ON**.

ANC1 will remain as the Evacuation tone output control and provide the fault monitoring of the T-Gen2.

8.3 T- GEN 50 (OBSOLETE – REPLACED BY T-GEN2)

8.3.1 Mounting

The gear plate in both the slimline and 15U *MX1* cabinet has a mounting footprint for a single T-GEN 50 tone generator. The T-GEN 50 mounts on one metal standoff and five plastic standoffs (supplied with the *MX1*). The metal standoff provides all the earthing required by the T-GEN 50.

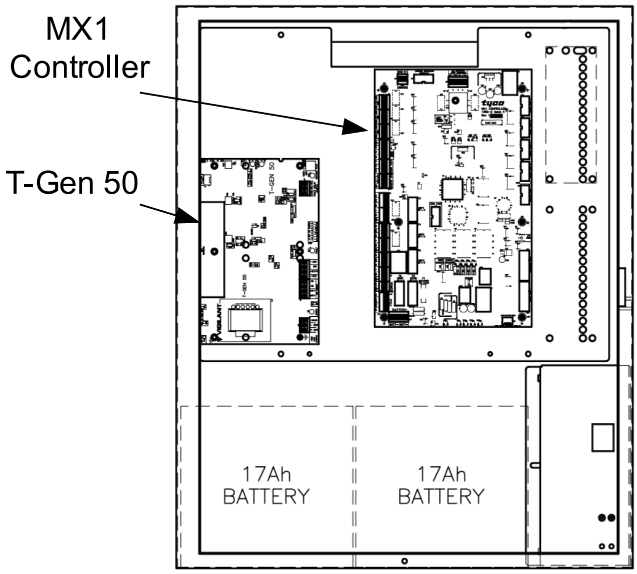


Figure 8.3 – Internal Layout of *MX1* Gearplate showing T-GEN 50

8.3.2 Wiring

The T-GEN 50 is most easily controlled from the ANC 1 relay on the *MX1* Controller. Figure 8.4 shows the basic wiring for this. A pre-made loom LM0319 is supplied with each *MX1*, which provides all the necessary wiring for connecting a single T-GEN 50 to ANC 1.

In this arrangement, all the loom wiring is supervised, and the Fault output from the T-GEN 50 is transferred to the *MX1* Controller via the ANC 1 supervision input.

The T-GEN 50 can produce Alert and Evacuate tones. The transition from the Alert to the Evacuate tone can be arranged to be done automatically by the T-GEN 50 after a predetermined delay, or it can be controlled by the *MX1* panel.

If *MX1* control of the Alert and Evacuate tones is required, then an additional connection between one of the *MX1* Controller GP Outputs and the T-GEN 50 A/I/E- input is required. This is shown as the dotted connection in Figure 8.4a.

The T-GEN 50 could alternatively be controlled by the *MX1*'s ANC 2 relay. All the wiring connecting to ANC 1 in Figure 8.4a would need to be shifted to the same terminals on ANC 2.

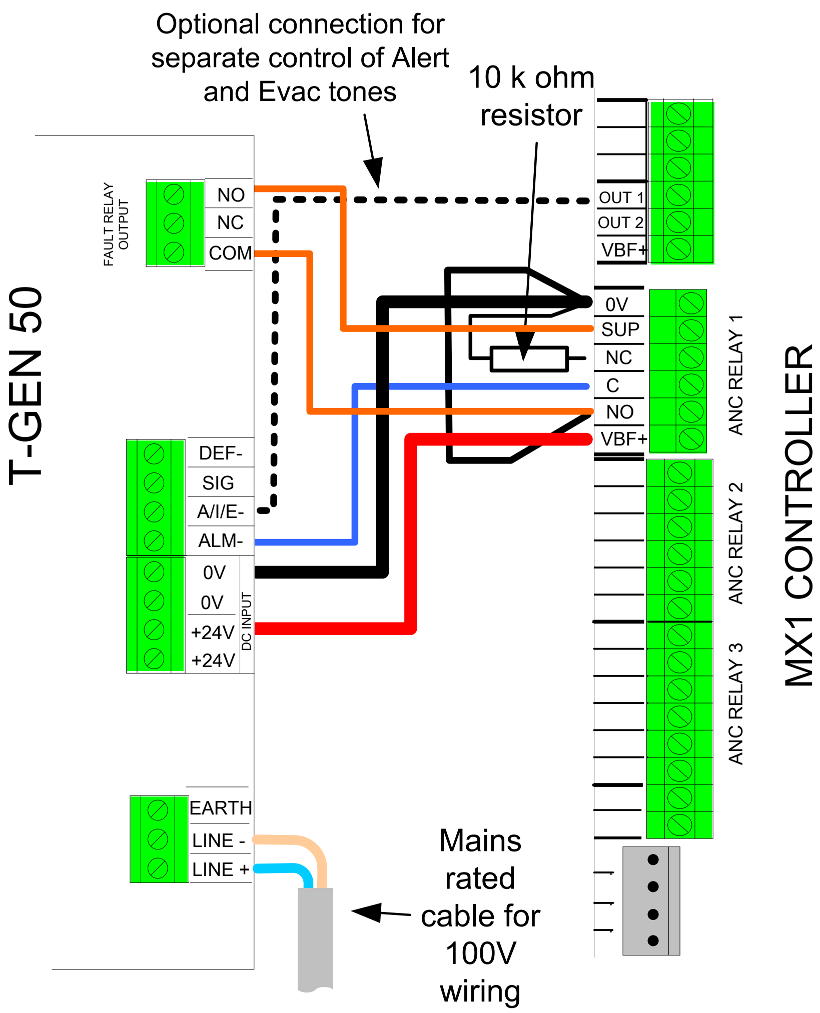


Figure 8.4a – Single T-GEN 50 Wiring Details

If multiple T-GENs are required, then wire separate +24V fused outputs (to avoid over-loading each output) and 0V to the slave T-GEN(s), join the SIG terminals of the T-GENs together, and wire the Fault relays of each T-GEN in series. Additional T-GENs are configured as slaves (see figure 8.4b).

If an external PSU needs to be used, e.g. because the PSU rating of the *MX1* is exceeded, then power the T-GEN units from the separate 24V supply. Make sure the 0V connections between the T-GENs and the *MX1* are maintained.

If the T-GEN is located in a separate cabinet, a longer loom is required. A suitable option may be LM0401, which is in essence a 1.3m long version of LM0319.

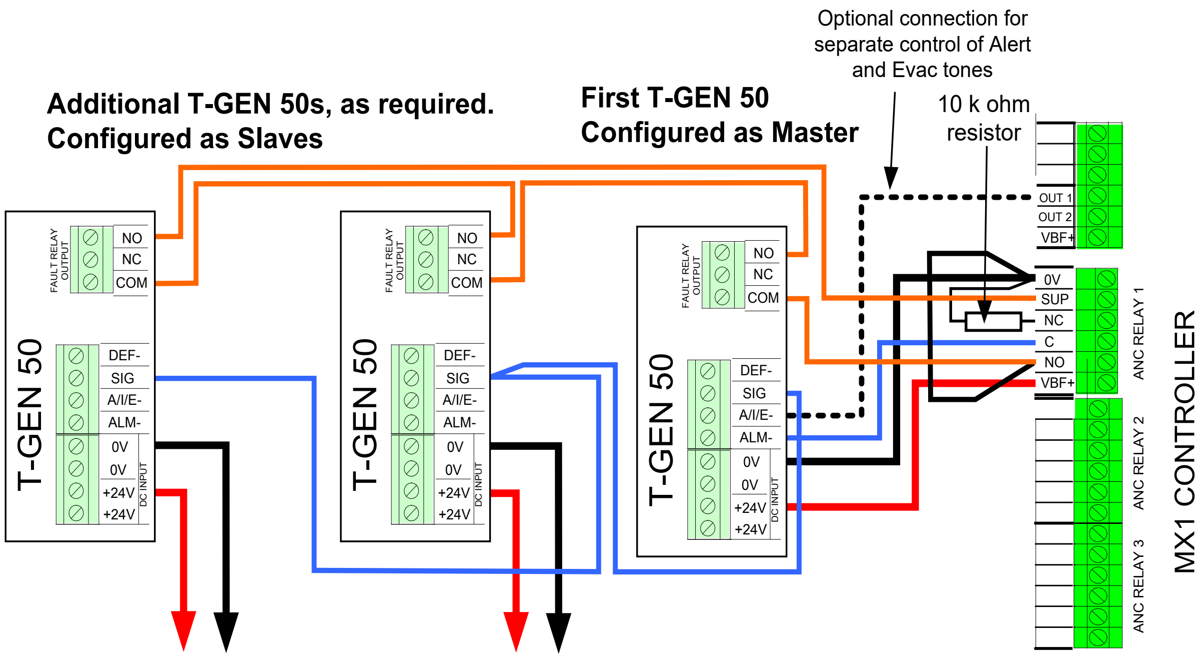


Figure 8.4b – Multiple T-GEN 50 Wiring Details

8.3.3 Configuration 1 – T-GEN Control of Alerting and Evacuation Tones

In this configuration the T-GEN 50 is simply activated in response to the alarm devices being turned on by the *MX1*. The management of Alert and Evacuation tones is done by the T-GEN 50.

T-GEN 50 Settings

- SW1-SW3 – set to the required delay time for transition to Evacuation tone
- SW4 (Mon) – ON, to enable Alarm input supervision
- SW5 (Lat) – OFF to not latch alarms
- SW6-SW7 – as required to select the type of tone required
- SW8 (Att) – OFF for no attenuation of the tone level
- LK1-6 as required – refer T-GEN 50 instructions
- LK7 in the Relay position

***MX1* Settings in SmartConfig**
In the "Controller Points" window, for the "Anc1 Supervision" point (ANC1S), check the supervision mode is "Contact".

For the Anc1 output check the O/P Control setting is $ALARM_DEVICES_ON.

8.3.4 Configuration 2 – *MX1* Control of Alerting and Evacuation Tones

In this configuration, the *MX1* has full control over when the transition from Alert to Evacuate tone occurs. This type of operation is required Type 5 and Type 7 apartment installations, or in a residential situation such as a nursing home.

AZM800 modules can be used to selectively switch Alert tone from the T-GEN 50 to zone(s) with local smoke detector alarms, or switch Evacuation tone to all zones. See Chapter 9 for more detail about using AZM800.

Alternatively, smoke detectors in single occupancy units may produce a local alarm using a sounder base, and cause the Alert tone to be sounded everywhere else, whereas a heat detector or manual call point will cause the Evacuation tone to be sounded everywhere.

T-GEN 50 Settings

- SW1-SW3 – all set ON to select Alert tone only, by default
- SW4 (Mon) – ON, to enable Alarm input supervision
- SW5 (Lat) – OFF to not latch alarms
- SW6-SW7 – as required to select the type of tone required
- SW8 (Att) – OFF for no attenuation of the tone level
- LK7 fit to the Relay position – refer T-GEN 50 instructions
- LK1-LK6 as required

***MX1* Settings in SmartConfig**

The following is a general application suggestion for a residential situation. For specific application details using the AZM800 for Type 5 or Type 7 installations refer to Chapter 9 Application - AZM800 *MX* Apartment Module.

Define a zone or zones for the heat sensors and MCPs which are to be brigade calling. Most templates will have a suitable profile called **Std Detection G1**.

Define a zone or zones for the smoke sensors which are to be local alerting only. These need to use a zone type profile that does not call the brigade, nor activate the alarm devices – such as **Alarm List Only Std Det G2**. The common status of these zones will be available in Zone Group 2.

- Map the heat sensor points and MCP points to the brigade calling zone(s).
- Map the smoke sensor points to the local alerting zone(s).

In the Logic Substitutions window of the User Logic page, check these entries are present and correct:

New Name	Substituted text		Comments
$ALERT_ZONES_ONLY	ZG*nnn*AL(1)		Zone group for local alerting zones
$EVAC_TONE_SELECT	P241/4/0OP		GP Out 1 to T-GEN A/I/E-

where *nnn* is the number of the zone group of the local zones (2 in this case), and P241/4/0 is the point number for the output controlling the A/I/E – input of the T-GEN (GP Out 1).

On the Controller Points page set ANC1 “O/P Control” to **Logic**. In the “Logic” field to the right, enter this equation:

$ALERT_ZONES_ONLY

In the ***User Logic*** page, add an equation to force on the GP Output that controls the A/I/E- T-GEN 50 input:

$EVAC_TONE_SELECT = $ALARM_DEVICES_ON

Append or add $ANC1_SUPERVSN_FAULT to the $ALARM_DEVICES_FAULT equation:

$ALARM_DEVICES_FAULT = $ANC1_SUPERVSN_FAULT

Note: This programming will mean the Alert tone will be sounded if the Silence Alarm Devices function is used to silence the evacuation tone.

8.4 Mini-Gen

8.4.1 Mounting

The gear plate in the Slimline *MX1* cabinet has mounting footprints for up to two 24V Mini-Gen tone/speech generators. This footprint overlaps with the T-Gen2/T-GEN 50 mounting footprint, so that it is not possible to mount both a T-Gen2/T-GEN 50 and Mini-Gens at the same time. 12V Mini-Gens should not be used with *MX1*. The 15U cabinet can accommodate up to three 24V Mini-Gens, or two if a T-Gen2/T-GEN 50 is fitted. The number of Mini-Gens that can be installed is also limited by the number of supervised wiring branches that can be supported (three), and the capacity of the mains power supply and batteries.

The first Mini-Gen PCB mounts on one metal standoff and three plastic standoffs (plastic standoffs and earthed via an earth lead and M3 screw to the nearby M3 metal insert in the 15U cabinet). The metal standoff provides all the earthing required by the Mini-Gen. Subsequent Mini-Gen(s) mount on four plastic standoffs and should be earthed via the first Mini-Gen as shown in Figure 8.5.

Figure 8.5 shows the Mini-Gen MK2, but the original Mini-Gen could also be used, noting that there is no Synch input and the Alert control input is achieved differently on these units.

8.4.2 Wiring

The Mini-Gens are best controlled from the Ancillary Relay 3 output (ANC3) for two reasons:

- The current rating of ANC1 or ANC2 relays is barely enough to handle a single Mini-Gen.
- Only the ANC3 relay supports supervision of multiple wiring branches.

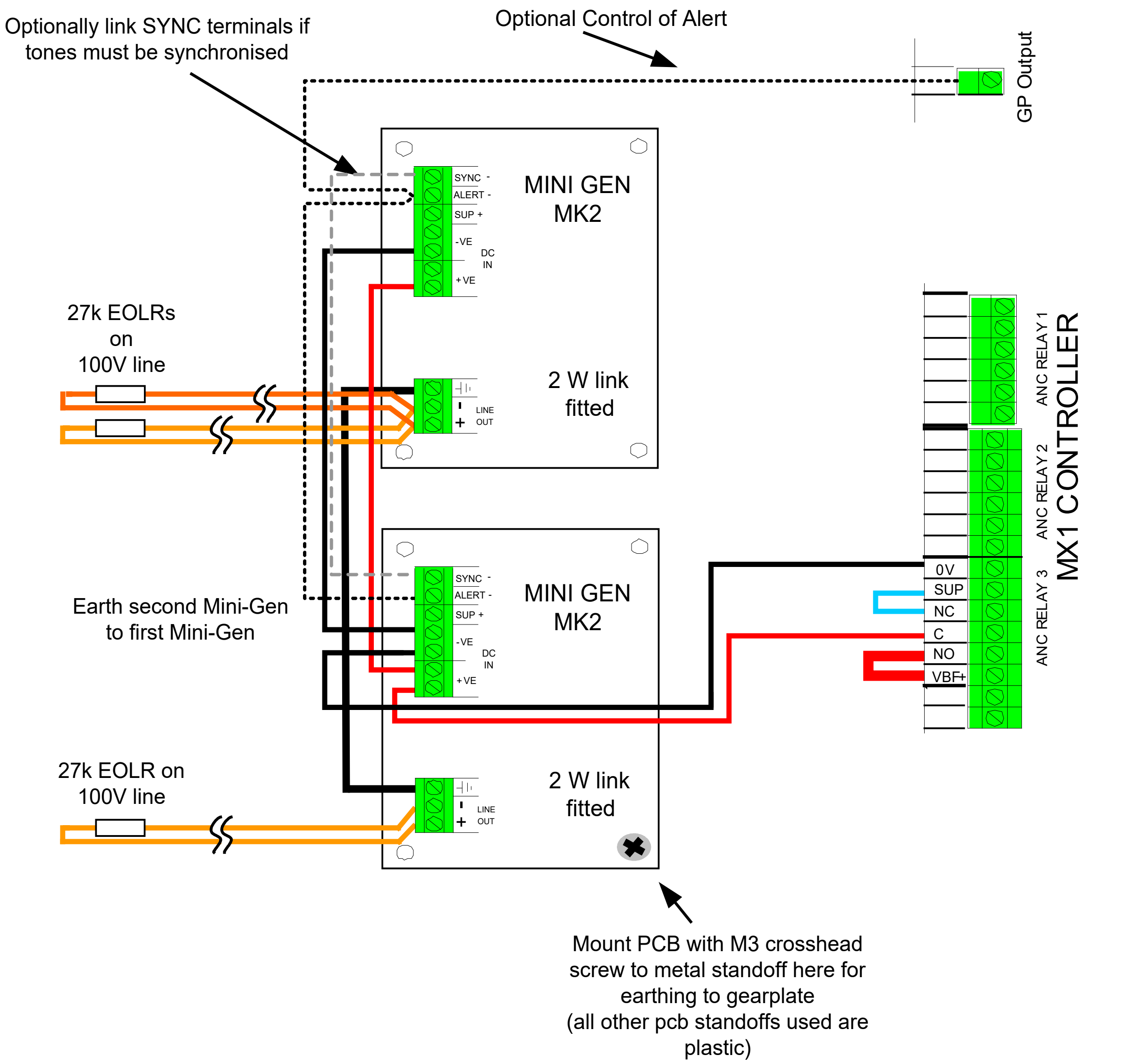


Figure 8.5 – Mini-Gen Mk2 Wiring Details

Only the 27kΩ EOLR provided with the *MX1* should be used on the 100V loudspeaker lines. Do not use the 18kΩ and 9.1kΩ EOLRs on the 100V line as they will overheat when the Mini-Gen is operating.

There can be up to a collective total of three branches of loudspeaker wiring connected to the Mini-Gens. If there are fewer than three branches, the unused 27kΩ EOLRs must be connected across the unused DC IN terminals of the last Mini-Gen so that there are still three EOLRs overall.

For the Mini-Gen Mk2, if synchronisation is required between multiple units, inter-wire the Synch terminals. If panel control of the Alert signal is required (e.g. for a different change-over time) then inter-wire the Alert- terminals and connect to a suitable output on the *MX1*, e.g., one of the GP out terminals. This will need to be programmed – see below.

8.4.3 Configuration

Mini-Gen
All Mini-Gens must have their 2W supervision link fitted. Refer to the appropriate Mini-Gen Installation Instructions for details of the other link setting options for tone selection, change-over time, etc.

***MX1* Settings in SmartConfig**
If supervision is required, then in the "Controller Points" window, for "Anc3 Supervision" point (ANC3S), set the supervision mode to "ANC3". Otherwise, set the supervision mode to "None".

In the Controller Points page set the O/P Control setting for the Anc3 point to $ALARM_DEVICES_ON.

8.4.4 Configuration 2 – *MX1* Control of Alerting and Evacuation Tones

In this configuration, the *MX1* controls whether Alert or Evacuation tone is generated by the Mini-Gen.

Mini-Gen Settings

Links CDEFG on the Mini-Gen must be set up to allow the ALERT- input to produce Alert tone. Refer to the table in the Mini-Gen Installation Instructions (LT0364) for details on the available combinations.

***MX1* Settings in SmartConfig**

Zones for control of Alert and Evacuation must be defined in the *MX1* configuration. Copy the zone definition details in the T-GEN 50 example in Section 8.3.4.

In the Logic Substitutions window of the User Logic Table, add these entries:

New Name	Substituted text		Comments
$ALERT_ZONES_ONLY	ZGnnn2AL(1)		Zone group for local alerting zones
$ALERT_TONE_SELECT	P241/4/0OP		GP Out 1 to Mini-Gen ALERT-

where *nnn* is the number of the zone group of the local zones, and P241/4/0 is the point number for the output controlling the ALERT- input of the Mini-Gen.

For the output controlling the Mini-Gen's Alert input set the "O/P Control" setting to **Logic** and to the Logic cell add
$ALERT_ZONES_ONLY AND NOT $ALARM_DEVICES_ON

Control of Anc3 requires the "O/P Control" setting to be **Logic** and the logic cell to be
$ALARM_DEVICES_ON OR $ALERT_ZONES_ONLY
Supervision of Ancillary Relay 3 is the same as in section 8.3.3.

8.5 VADs, Sounders, Bells and Strobes

8.5.1 Wiring

24V powered VADs, sounders, bells, and strobe lights can be controlled from the Ancillary Relay 3 output, if multiple branches or supervision are required. Loads of up to 5A can be controlled in this way, but note that the VBF+ outputs from the *MX1* Controller are fused at 3A. If supervision is required, then each device must have a series diode connected or incorporated as shown in Figure 8.6. A suitable diode for a load up to 1A is 1N4004 or 1N5404. Inductive loads such as bells must have suppression capacitors or diodes fitted.

For a single branch, the EOLR value is 9.1kΩ. For two branches, each EOLR is 18kΩ. For three branches, each EOLR is 27kΩ. Suitable EOLRs are supplied with the *MX1*.

The Solista range of conventional VADs include flashing red or white-coloured high intensity LEDs with synchronisation of the flash between all units on the same cable. They have a wide operating voltage range, low current consumption, an in-built diode, and separate in and out terminals for wiring. They comply with NZS4512:2021.

The Solista range of audible alerting devices (sounders) are compliant with NZS 4512:2021 for local alerting only (refer NZS 4512:2021 Clauses 4.6.5, 4.6.7, 4.6.11).

NZS 4512:2021 Clauses 2.18.4 and 2.18.5(b) require the VAD/AAD to be coloured safety red or include suitable labelling on or adjacent to the device with the word “FIRE”. For the white coloured Solista devices a suitable label is the JCI EA0348 tag plate. This adhesive-backed label has “FIRE” in 15mm high text on a red label.

The Solista VADs and sounders include a series diode, so there is no external diode needed as shown in the Figure 8.6. Wire the MX1 C output to the +ve terminal of the VADs/sounders and the 0V terminal to the -ve terminal on the VADs and the -V(1) terminals on the sounders. Use the In and Out pairs on the VADs/Sounders so that disconnecting one wire breaks the circuit and generates a defect. Fit the EOL resistor across the Out terminals of the last VAD/Sounder on the branch.

As the VADs draw a higher current at lower supply voltage, it is necessary to determine the maximum current consumption at the lowest operating voltage (say 18V) and use this to determine the quantity that can be supported on each output. With High Power and 1Hz selected, these VADs draw 25mA at 24V. At 18V they draw approximately 33mA, so this should be used to determine how many can be supported on an output.

Many strobe lights draw a large inrush current when first turned on. For this reason, alarm device systems using strobe lights should be controlled from only the *MX1*’s Ancillary Relay 3, which has a higher current rating than the other ancillary relays.

If supervision is not required (doesn’t comply to NZS 4512), the EOLRs and series blocking diodes are not required, and if the total load does not exceed 1A, then this wiring (without the series diodes or EOLRs) could be used on Ancillary Relays 1 or 2.

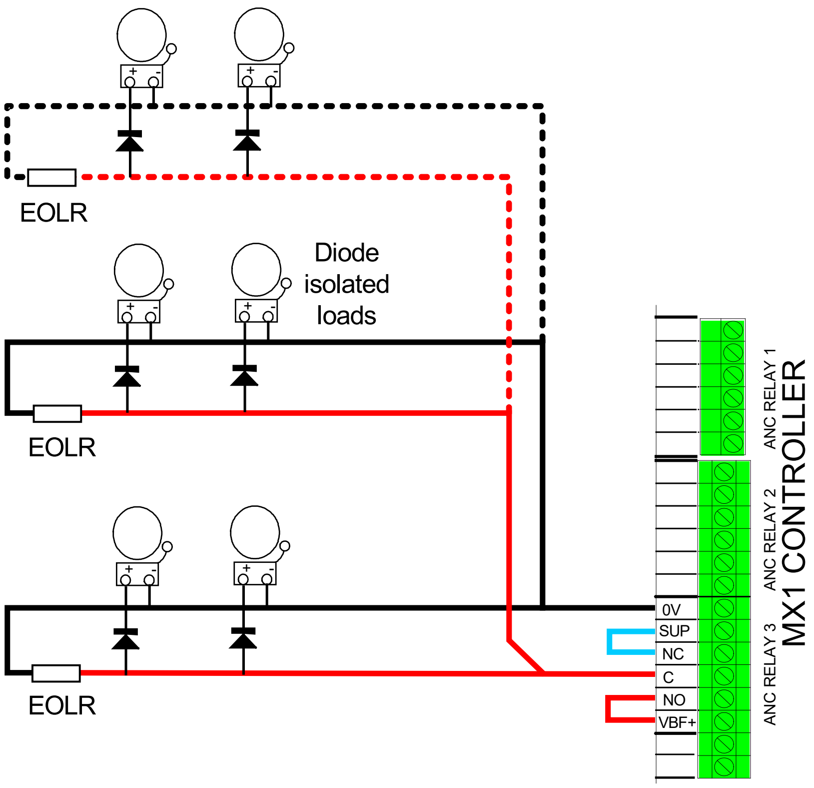


Figure 8.6 – Bells or other DC Sounder Wiring Details

8.5.2 Configuration

***MX1* Settings in SmartConfig**
If supervision is required, in the "Controller Points" window for "Ancillary Relay 3" set the supervision mode to "ANC 3". Otherwise, set the supervision mode to "None".

For ANC3 point set the O/P Control setting to $ALARM_DEVICES_ON.

8.5.3 Using *MX* Modules

The LPS800, SNM800 and QMO850 *MX* Modules provide supervised switched outputs suitable for driving 24V powered VADs, bells, sounders, strobes or other annunciation devices. Details are covered in Sections 6.7.8, 6.7.12 and 6.7.13.

8.6 Detector Sounder Bases

Sounder bases can be used with detectors on the *MX1* detector loop to provide local alerting for alarms on an individual zone or parts of zones, e.g., residential units. NZS 4512:2021 Clauses 4.6.5, 4.6.7 and 4.6.11 detail where sounder bases may be used.

Note the locking mechanism on the 80DSB or P80SB must be fitted so that the detector cannot be easily removed from the sounder base.

Wiring
There are no special wiring requirements for sounder bases. Make sure that the *MX* Loop loading calculation includes the maximum number of sounder bases that are present and turned on at the same time. MX1COST can do this and check the result.

Example Configuration
In this example, two 850PH smoke and heat detectors at addresses 2 and 3 are fitted to sounder bases in an apartment. The requirement is for activation of any smoke sensor to sound both sounder bases but not the alarm devices and not call the brigade, whereas activation of a heat sensor is to sound the alarm devices for general evacuation and call the brigade. The smoke sensor and sounder bases must return to normal automatically when the smoke clears. The detector LED must go out when smoke clears, but remain latched on for a heat alarm.

In this excerpt from SmartConfig for point 2 (point 3 is the same except for the point text):

- The detector point as a whole is programmed to map to Zone 2 for the purposes of fault indication.
- The heat sensor sub-point is mapped to Zone 2 for alarm indication. Zone 2 is mapped to the brigade for alarm and fault, and will activate the alarm devices, e.g., it uses the Std Detection G1 profile.
- The smoke sensor sub-point is mapped to Zone 5. Zone 5 is non-latching, is not mapped to the brigade and will not activate the alarm devices, e.g., it uses a Residential non-LCD profile.
- Each detector's internal and remote LED indicator sub-points are set to operate when the point is in alarm (from either sensor). The default latching setting for the LED sub-point must be not ticked so that the LEDs will go out when the smoke clears from the smoke sensor.

  The default un-ticked latching setting for the heat sensor must be ticked so that the alarm state from the heat sensor will latch until the zone is reset, thereby causing the LED sub-points to remain indicating.
- The functional base output sub-point is mapped to Zone 5 and is controlled by the Zone 5 (operate state). Zone 5 operate state has been programmed to be controlled by the Zone 5 Alarm state. This requires the Output Control setting in the appropriate zone type profile for Zone 5 being changed to Alarm. A zone type profile called Residential LCD or Residential non-LCD provides this functionality.

Point	Point Type	Zones	Pt Text	Alarm Type Text	Latching	Can be Disabled	Profile	Night Profile	Delay Profile	Output Control
2	850PH	2	Room 203			Yes				
2.1	Smoke	5	Room 203	Smoke	No	Yes	*FASTLOGIC* Low	*FASTLOGIC* Low	No Delays	
2.2	Heat	2	Room 203	Heat	Yes	Yes	Type B	Type B	No Delays	
2.3	LED		Room		No	No				Pt

			203							Alarm
2.4	Rem LED		Room 203		No	No				Pt Alarm
2.5	Func Output	5	Room 203			Yes				Zone

8.7 Visual Indicators

8.7.1 MX VAD Wiring

The P80AVB, P81AVB, P80AVR and P80AVW provide bright flashing white LEDs controllable by the MX1 via the MX addressable loops and include a short-circuit isolator.

Each device has its own MX address, so reduces the number of other MX devices that may be connected to the loop. Also, the current consumption is significantly higher than the other MX devices, so the quantity that may be turned on at the same time is limited.

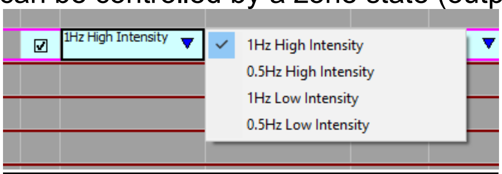
Wiring for the P80AVB and P81AVB is as per a base, with the detector remote LED output accessible. The P80AVR and P80AVW are wall mount units and have separate MX loop in and out terminals.

These devices also include audible warning functions, which are permitted for local alerting only, as per NZS 4512:2021 Clauses 4.6.5, 4.6.7 and 4.6.11.

NZS 4512:2021 Clauses 2.18.4 and 2.18.5(b) require the VAD/AAD to be coloured safety red or include suitable labelling on or adjacent to the device with the word “FIRE”. For the white-coloured P80AVW a suitable label is the JCI EA0348 tag plate. This adhesive-backed label has “FIRE” in 15mm high text on a red label.

Configuration

The visual and audible functions are separately configured in SmartConfig. For the visual indication there is a choice of two flash rates and two flash intensities. Reducing the flash rate and the intensity reduces the current consumption and allows more to be turned on at the same time. The output can be controlled by a zone state (output active) or from logic.



Note the Sounder sub-point **O/P Control** field should be set to **None** unless the sounder is used for local alerting.

8.7.2 Conventional VAD Wiring

The Solista range of conventional visual alarm devices may be controlled from:

- the ANC3 output of the MX1 (refer s8.5.1),
- the powered output of the LPS800 (refer s6.7.8),
- or the switched supervised outputs of the SNM800 and QMO800 (refer s6.7.12 and 6.7.13).

Using the unsupervised outputs of the MIO800, RIM800, SIO800, QIO800, and QRM800 is not compliant with NZS 4512.

These VADs include a series diode. Use the separate in and out terminals on the VADs and fit the EOL resistor on the out terminals of the last VAD on the circuit.

8.7.3 AVI Wiring

The Audio Visual Indicator Mk2 (AVI) can be used with *MX1* to give single or dual stage operation, with or without supervision.

If supervision is required, the AVI(s) must be controlled from the Ancillary Relay 3 output of the *MX1* Controller. Figure 8.7 shows the wiring for two wire single stage operation with supervision. If supervision is not required, the link from the NC contact to the SUP input of Ancillary Relay 3 can be omitted.

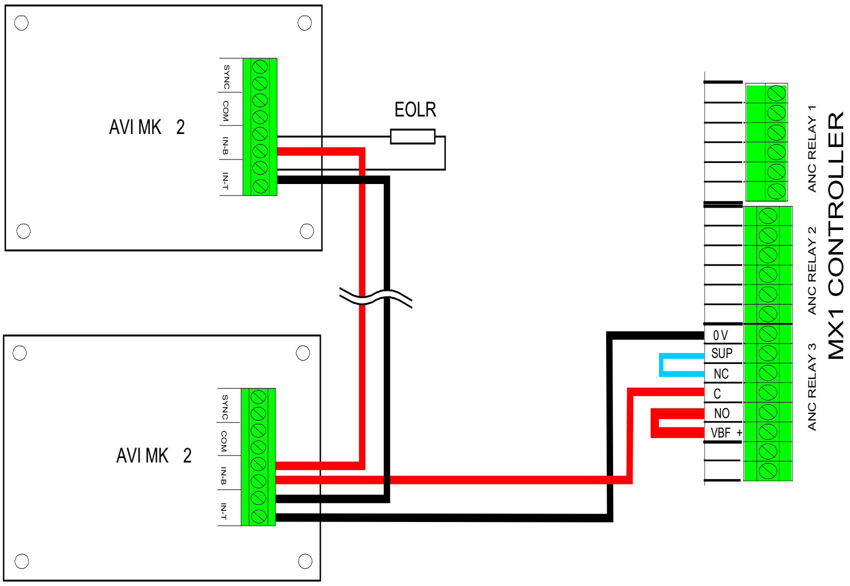


Figure 8.7 – Single Stage AVI Mk2 Operation with Supervision

The EOLR value for this circuit should be 9.1kΩ, as supplied with the *MX1*.

The AVI can be used in single stage operation in conjunction with other multi-branch loads such as Mini-Gen or bells or strobes, controlled by the Ancillary Relay 3.

For two wire, dual stage operation of AVI, an additional relay must be connected to the Ancillary Relay 3 contacts and one of the GP Outputs as shown in Figure 8.8.

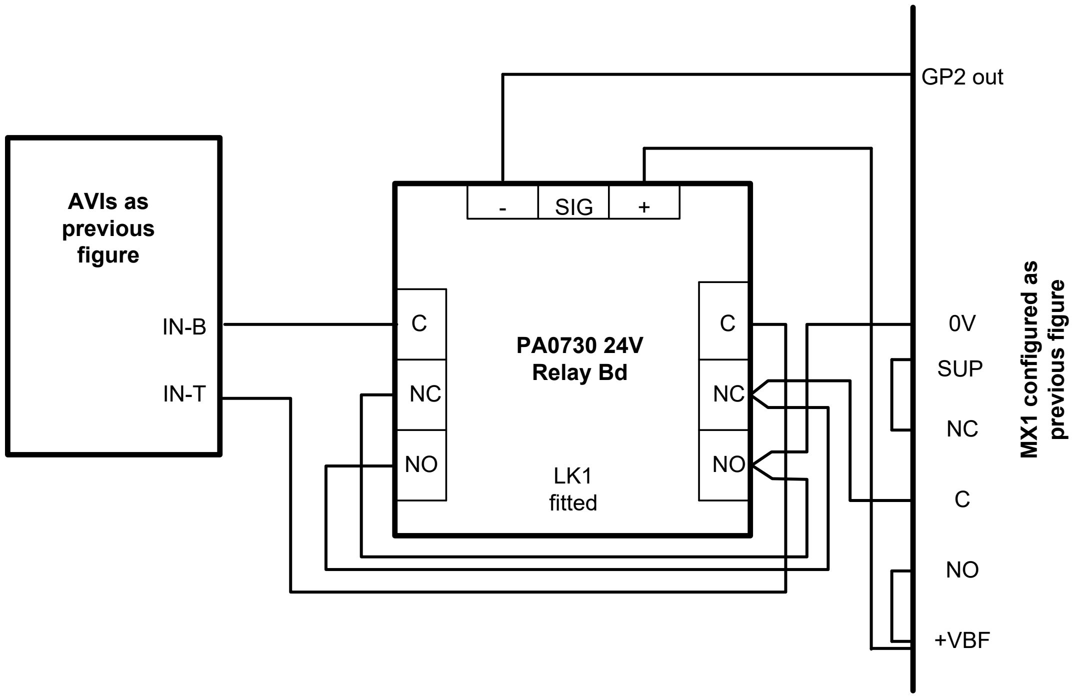


Figure 8.8 – Additional Relay for AVI Dual Stage Operation

With the wiring in Figure 8.8, IN-T will be at +24V and IN-B will be at 0V when Ancillary Relay 3 is operated and GP2 OUT is not activated, giving Stage 1. When GP2 OUT is activated, the voltages at IN-B and IN-T are reversed, giving Stage 2.

8.7.4 Configuration

AVI

Refer to the AVI Installation Instructions (LT0299) for details of setting the links in the AVI to select tone and light combinations.

***MX1* Settings in SmartConfig**

Single Stage Operation

If supervision is required, in the "Controller Points" window for "Anc3 Supervision" point (ANC3S) set the supervision mode to "ANC3". Otherwise, set the supervision mode to "None".

In user logic, the point for Ancillary Relay 3 being used to control the AVI should be set to follow the Alarm Devices token. This token already incorporates the effects of disablements, alarms silencing, and direct drive of alarm devices, so these do not have to be allowed for.

Most template files will already have a line in the "User Logic" window of the form: `$ANC3_RELAY = $ALARM_DEVICES_ON` which does what is required.

Dual Stage Operation

The settings are the same as the single stage operation, but an additional logic equation must be added to activate the GP Output controlling the changeover relay when the Stage 2 conditions are true, i.e. when the zone(s) controlling Stage 2 are in alarm.

Example of Dual Stage Operation

Stage 1 is any alarm present (with Alarm Devices on), but Stage 2 is only when Zones 5 and 6 are both in alarm (with Alarm Devices on). The GP2 Output is used to control the changeover relay.

Logic for this would be:

```
$ANC3_RELAY = $ALARM_DEVICES_ON
$GP2_OUTPUT = $ALARM_DEVICES_ON AND (Z5AL AND Z6AL)
```

8.8 Bell Monitor Board

8.8.1 Introduction

The Bell Monitor Board (PA0494 1864-32-2) can be used to provide an additional 5 amp switched and 3-branch supervised output to external devices (VADs, bells, sounders, etc.)

This could be used for when:

- A load between 3 and 5 amps needs to be switched, and the *MX1* Ancillary Relay 3 is already being used.
- An externally powered load, e.g., from a 12V supply, needs to be controlled.
- Additional branches of loads need to be controlled and supervised.

Note: Only PA0494 circuit revisions REV 3 or higher can be used with *MX1*.

Warning
If the load is greater than 3A an external power supply MUST be used. The *MX1*'s onboard +VBF terminals are limited to 3A maximum.

8.8.2 Mounting

The Bell Monitor PCB can be mounted on the gearplate in the *MX1*, either using the adhesive-based plastic standoffs supplied, or the gearplate can be removed and drilled to mount conventional standoffs to hold the PCB.

8.8.3 Wiring

The Bell Monitor can be wired into any of the *MX1* Ancillary Relays 1 or 2. There is little advantage in using Ancillary Relay 3 to drive the Bell Monitor, since it already provides multi-branch supervision.

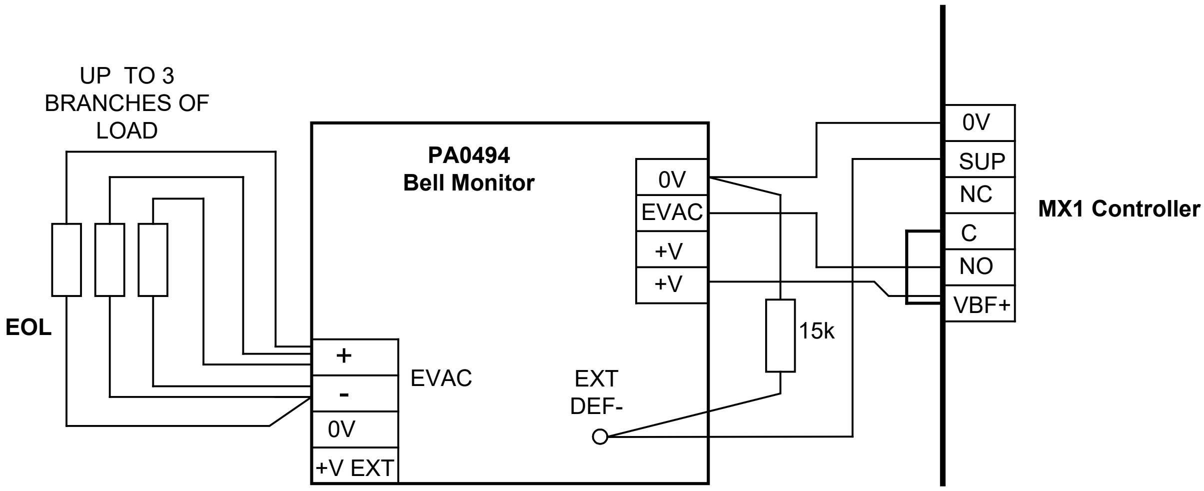


Figure 8.9 – 24V Bell Monitor Wiring Details

The Bell Monitor can supervise up to three branches, with a total load of 5A. The EOLR values are:

- 1 branch 10kΩ
- 2 branches 18kΩ x 2
- 3 branches 27kΩ x 3

Refer to the Bell Monitor Instructions (LT0190) for details on modifying the board for external isolated power supplies.

In SmartConfig, the *MX1* Ancillary Relay being used to control the Bell Monitor should be set for a Supervision mode of “Load”.

8.9 QE90

MX1 can be used to activate a QE90 EWIS in one of several ways:

- Single relay output for all evacuate.
- Multiple relay outputs, one for each zone activation.
- RZDU high level link for individual zone activations.
- Network connection for individual zone activations.

The RZDU method will be described as it is the usual interface. The other methods can be derived by using clean-contact relay outputs from *MX1* and supervising the QE90 for fault using a GP Input as shown in Figure 8.10.

RZDU Wiring

Refer to Figure 8.10.

Using the RZDU output is allowed only when the QE90 and *MX1* are co-located, since a single fault on the RZDU wiring will stop all zone alarm signals from working. With this setup the RZDU wiring must not extend beyond the *MX1*/QE90 cabinets (i.e., externally to other RZDU products like NSA or IO-NET) as a short circuit on the external wiring could stop the alarm signalling to the QE90. Section 13.2.4 describes a method to overcome this.

The GP Input EOLR is any value between 1.5kΩ and 3.3kΩ.

Refer to the QE90 Installation Manual (LT0088) for details of how to provide the RZDU input in QE90 with a PA0481 Interface. The *MX1*'s RZDU TX and 0V outputs are wired to the RX and 0V inputs on the PA0481.

The QE90's general fault relay (normally energised) C and NC terminals are wired to an *MX1*'s GP input for fault supervision as shown in Figure 8.10. The *MX1* GP Input must be set up as an external fault input as described in Section 10.5.

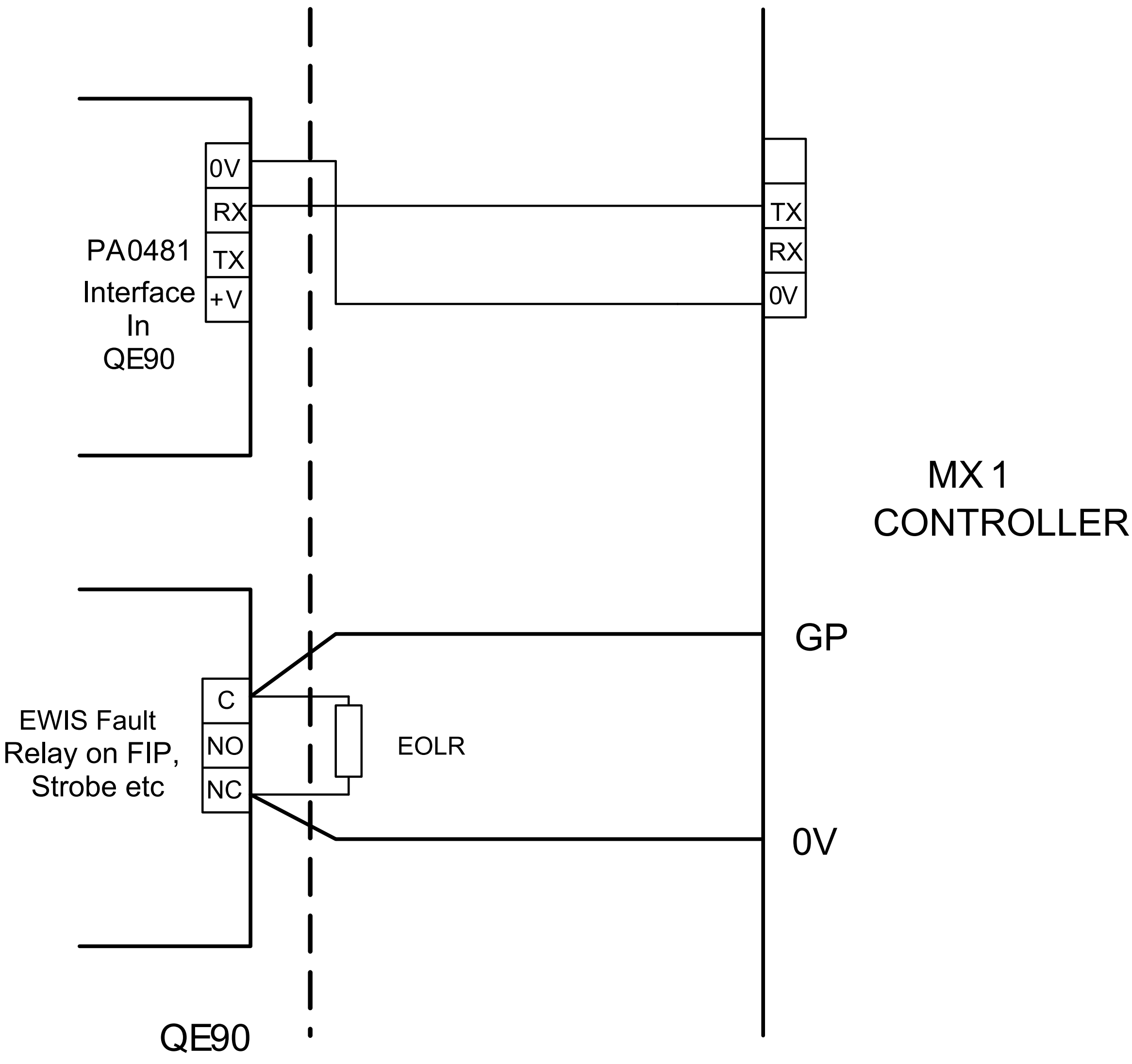


Figure 8.10 – *MX1* to QE90 Wiring Using RZDU and EWIS Fault Relay

RZDU Configuration

With other fire panels the usual method to convey alarm information to a QE90 via the RZDU link is to create ACZs and a write logic equation for each ACZ that combines the alarm states of the appropriate fire zones together with the Alarm devices being on. Similarly with *MX1*, except that some extra steps are needed. First, create zones with ACZ profiles (say zone 301 up) for the QE90's evacuation zones. Then write the logic equations. For example:

```
;create "zones" for QE90 to look at
Z301OP = Z1AL AND $ALARM_DEVICES_ON
Z302OP = Z2AL AND $ALARM_DEVICES_ON
Z303OP = Z3AL AND $ALARM_DEVICES_ON
Z304OP = Z4AL AND $ALARM_DEVICES_ON
```

Note that each alarm zone's profile needs to activate the alerting devices in order for this logic to work. By including the alerting devices it allows them to be disabled to stop an alarm from triggering the QE90, e.g., during testing. Note though that this will not STOP the QE90 once it has triggered as the inputs latch within the QE90.

MX1 software pre-V1.20 does not map the operate states of these zones to the corresponding RZDU alarm LED, so the following equations would also need to be included. These are not required with *MX1* V1.20 software as the operate state of the (ACZ) zone is automatically mapped through to the alarm state of the RZDU LEDs.

```
;now drive RZDU with these states
LEDR301 = Z_LED_ALM AND Z301OP
LEDR302 = Z_LED_ALM AND Z302OP
LEDR303 = Z_LED_ALM AND Z303OP
LEDR304 = Z_LED_ALM AND Z304OP
```

Finally, on the System Page set the Maximum Zones of Information value in the RZDU section to the highest zone number to be sent to an RZDU device (RDU, QE90 or whatever is connected to the RZDU data connection).

Network QE90 Connection

If a QE90 and *MX1* panel are connected to the same Panel-Link network, they can be configured so that the *MX1* can activate evacuation zones on the QE90.

The standard method to convey alarm information to a QE90 via a Panel-Link network is to create ACZs and write a logic equation for each ACZ that combines the alarm states of the appropriate fire zones together with the Alarm devices being on. First, create zones with the **QE90 Status Transfer** profile (say zone 301 up) for the QE90's evacuation zones. Then write the logic equations. For example,

```
;create "zones" for QE90 to look at
Z301OP = Z1AL AND $ALARM_DEVICES_ON
Z302OP = Z2AL AND $ALARM_DEVICES_ON
Z303OP = Z3AL AND $ALARM_DEVICES_ON
Z304OP = Z4AL AND $ALARM_DEVICES_ON
```

Note that each alarm zone's profile needs to activate the alarm devices in order for this logic to work. By including the alarm devices it allows them to be disabled to stop an alarm from triggering the QE90, e.g., during testing. Note though that this will not STOP the QE90 once it has triggered as the inputs latch within the QE90.

The *MX1* has to be configured to broadcast the status of its zones out on to the network (the default network operation), and the QE90 has to be configured to map the *MX1* panel's QE90 Status zones to its Evacuation zones.

Note the QE90's Fault relay output may need to be wired to an input of the MX1 to generate a fault condition, as shown in Figure 8.10.

For further details please refer to:

LT0564 *MX1* Network Design manual
LT0088 QE90 Installation and Commissioning manual

8.10 T-Gen2

MX1 can be used to activate a T-Gen2 using a variety of methods:

- Single relay output for all evacuate (refer section 8.2).
- Multiple relay outputs, one for each zone activation. This could be achieved using the 16 open collector outputs on the LCD/Keyboard. See section 10.16.
- RZDU high level link for individual zone activations.

The RZDU method will be described here.

RZDU Communication Wiring (4-way cable)

Using the RZDU output of the MX1 to trigger the T-Gen2 is allowed only when the MX1 and T-Gen2 cabinets are co-located, since a single fault on the RZDU field wiring will stop all zone alarm signals from working. The T-Gen2 HLI Module (FP1143) is mounted in either the MX1 and T-Gen2 cabinet and the MX1 RZDU output is wired to the RZDU FIP terminals (J3) on the HLI Board – see figure 8.11.
Any RZDU field devices must be wired to J4 of the HLI board so that a short circuit does not stop any communication between the T-Gen2 and *MX1* panel.

The *MX1's* RZDU +V and 0V outputs are wired to the +V and 0V inputs on the HLI Module. The TX and RX wires are cross-over connected. The TX and RX outputs of the HLI board to the RZDU FIELD devices are cross-over connected to the first device as well.

A 10-way FRC cable connects the HLI Module J2 to the T-Gen2 MX1 Comms connector J29.

Links Lk1-4 on the HLI Board need to be set to the RZDU positions.

MX1 Direct Communication (10-way ribbon cable)

When there are no field RZDU devices to be connected to the MX1 and the MX1 and T-Gen2 cabinets are adjacent then the T-Gen2 can be connected directly to the MX1 panel using a 10-way ribbon cable between J29 (T-Gen2) and any free available serial port (2, 3, 4) on the *MX1* panel.

Configure the RZDU Hardware interface Equipment 244 for MX1 in SmartConfig to use the selected Serial Port.

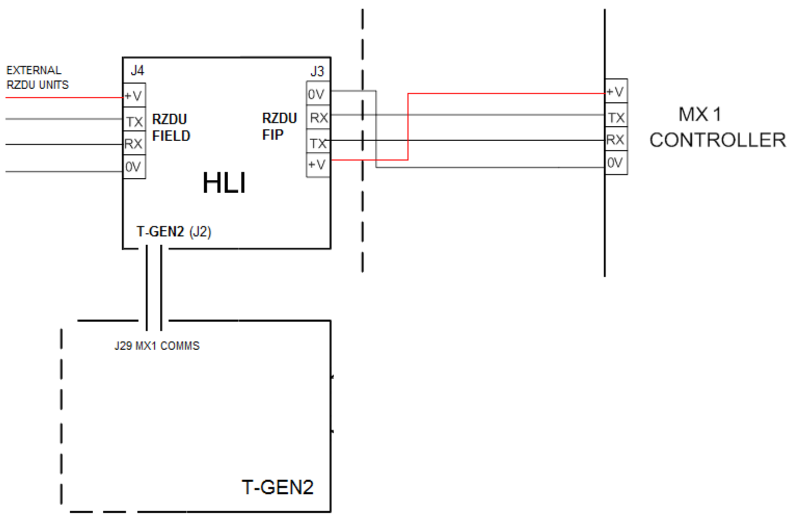


Figure 8.11 – *MX1* to T-Gen2 Wiring Using RZDU and HLI (FP1143)

Configuration for HLI

To configure the MX1 panel for the HLI RZDU setup, the following is required:

1) Enable an RZDU device for the T-Gen2.
2) Select a range of 32 zones to be used to convey the alarm information to the T-Gen2. For example zones 301 up.
3) Select the Zone Type Profile for these zones to be ACZ.
4) Enter valid logic equations for each of the zone outputs to collect the MX1 states required to trigger the T-Gen zone input.

Program the Logic Equations in the MX1 panel. For example.

Z301OP = (Z1AL + Z2AL + ADT).^ADS

This equates to Zone 1 Alarm or Zone 2 Alarm or Warning System Test, and not Warning System Silence (isolated). It will be sent to the T-Gen2 as an alarm on Zone 301.

An example to play a message on the T-Gen2 when an MX1 input is activated (not controlled by Alarm Devices).

Z302OP = P1/1/1AL

Also, the T-Gen2 needs to be configured.

On the General Table of SmartConfig select the **Vigilant RZDU** High Level Link option, set the **Start FIP Zone / Point** to 301 (or the first zone selected in the MX1 to convey the T-Gen2 triggers), and set **RZDU / Slave Address** to the RZDU address enabled for the T-Gen2 in the *MX1* Panel. Tick **Reply to FIP**, to ensure the T-Gen2 sends its status to the *MX1*. Usually the Alarm State will have **Latching** not ticked, so the *MX1* Warning System state controls the T-Gen2.

For mapping the *MX1* RZDU signals to specific functions on the T-Gen2, a separate **HLL Inputs** table is provided within SmartConfig. Each of the 32 HLI Inputs can be given one of the T-Gen2 built-in functions: None, Alarm Trigger, AIE, Play Signal, Paging Line 1, Paging Line 2, EXT Power FLT, EXT Mains FLT or EXT Audio FLT. For example, to trigger alarm on a T-Gen2 zone, select Alarm Trigger and enter the T-Gen2 zone number. Continuing the above example, on the row for Zone 301 select Alarm Trigger and enter Zone 1.

8.11 QE20

MX1 can activate a QE20 EWS using a variety of methods:

- Single relay output for all evacuate.
- Multiple relay outputs, one for each zone activation.
- RZDU high level link for individual zone activations.
- Network connection for individual zone activations.

Single Relay for ALL Evacuate

The *MX1* ANC1 relay and supervision input (or ANC2) can be used for all evacuate if the *MX1* and QE20 are co-located (adjacent panels or a combo). Figure 8.12 shows the wiring.

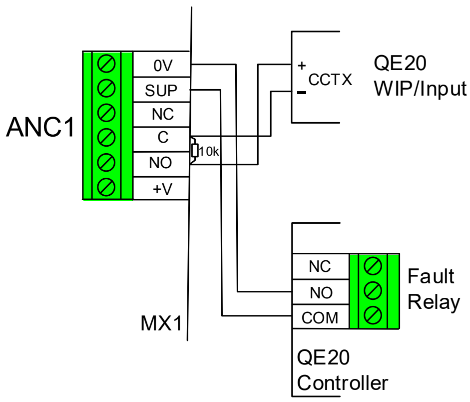


Figure 8.12 – Wiring MX1 ANC1 to QE20

Multiple Relays, One for Each QE20 Zone

If the *MX1* and QE20 are not co-located, or multiple zone inputs to the QE20 are required, then separate relays must be used for each QE20 evacuation zone alarm and a supervised fault input is needed on the *MX1*.

A 16-way relay board can be fitted to the *MX1* to provide multiple relay outputs (refer Section 10.16.3). The GP1 or GP2 input needs to be configured for Ext Fault (see Section 10.5). Figure 8.13 shows the wiring between the MX1 and QE20.

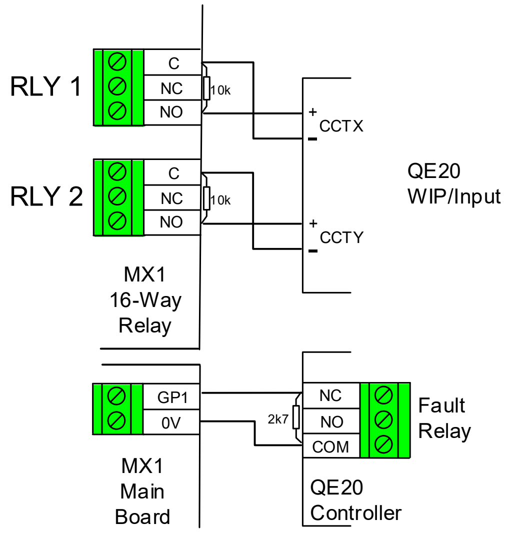


Figure 8.13 – Multiple *MX1* Relays to QE20

RZDU High Level Link for Individual QE20 Zones

The RZDU output can be used only when the QE20 and *MX1* are co-located, since a single fault on the RZDU wiring will stop all zone alarm signals from working. With this setup the RZDU wiring must not extend beyond the *MX1*/QE20 cabinets (i.e., externally to other RZDU products like NSA or IO-NET) as a short circuit on the external wiring could stop the alarm signalling to the QE20.

If RZDU wiring to field devices is required, then the FP1143 HLI Interface Module needs to be added to provide a short-circuit isolated field RZDU connection.

Refer to drawing 1976-181 Sheet 139 in LT0442 for the wiring details. Note a connection is not required from the QE20 Fault relay, as the *MX1* RZDU communications will create a fault if the QE20 powers down, is disconnected, or is in the fault condition.

MX1 Configuration

First, in SmartConfig create zones with **ACZ** profiles (say zone 301 up) for the QE20’s evacuation zones. Then write the logic equations to activate each ACZ when the required *MX1* zone(s) is in alarm and the Alarm Devices are on.

```
;create "zones" for QE20 to look at
Z301OP = Z1AL AND $ALARM_DEVICES_ON
Z302OP = Z2AL AND $ALARM_DEVICES_ON
Z303OP = Z3AL AND $ALARM_DEVICES_ON
Z304OP = Z4AL AND $ALARM_DEVICES_ON
```

Note that each alarm zone’s profile needs to activate the alarm devices in order for this logic to work. By including the alarm devices it allows them to be disabled to stop an alarm from triggering the QE20, e.g., during testing. Note though, that this will not STOP the QE20 once it has been triggered as the alarm inputs latch within the QE20.

On the System Page enable the RZDU number that will be assigned to the QE20 and set the Maximum Zones of Information value in the RZDU section to the highest zone number to be sent to an RZDU device (RDU, QE20 or whatever is connected to the RZDU data bus).

The QE20 will need to be configured using QEConfig for RZDU HLL Inputs; enter the assigned RZDU number (address) and map each *MX1* ACZ zone to the required emergency zone FIP input using Hx, where x is the *MX1* ACZ number.

Network QE20 Connection

If a QE20 and *MX1* panel are connected to the same Panel-Link network, they can be configured so that the *MX1* can activate evacuation zones on the QE20 and monitor the fault state of the QE20 over the network.

The standard method to convey alarm information to a QE20 via a Panel-Link network is to create ACZs and write a logic equation for each ACZ that combines the alarm states of the appropriate fire zones together with the Alarm devices being on.

First, in SmartConfig, create zones with the **QE90 Status Transfer** profile (say zone 301 up) for the QE20's evacuation zones. Then write the logic equations. For example,

```
;create "zones" for QE20 to look at
Z301OP = Z1AL AND $ALARM_DEVICES_ON
Z302OP = Z2AL AND $ALARM_DEVICES_ON
Z303OP = Z3AL AND $ALARM_DEVICES_ON
Z304OP = Z4AL AND $ALARM_DEVICES_ON
```

Note that each alarm zone's profile needs to activate the alarm devices in order for this logic to work. By including the alarm devices it allows them to be disabled to stop an alarm from triggering the QE20, e.g., during testing. Note though, that this will not STOP the QE20 once it has been triggered as the alarm inputs latch within the QE20.

The *MX1* has to be configured for networking and to broadcast the status of its zones out on to the network (the default network operation).

On the SID Points page the SID number assigned to the QE20 needs to be set to a Type of **QE90**, and the SID Config Profile set to **QE90**. This will make the MX1 generate a fault if the QE20 does not respond over the network, or if the QE20 sends a MAF Status message with Fault present. Wiring of the QE20 Fault relay to the *MX1* is thus not required.

The QE20 will need to be configured for networking, and each *MX1* ACZ zone entered as the FIP input using Hx.y (where x = MX1 SID, y = ACZ number) for each QE20 emergency zone.

For further details refer to:
LT0564 *MX1* Network Design Manual
LT0726 QE20 Design Manual.

9 Application - AZM800 *MX* Apartment Module

9.1 General

9.1.1 AZM800 *MX* Apartment Zone Module

The AZM800 is an *MX* addressable module which integrates many of the key functions required for Type 5 fire alarm systems as defined in the NZ Building Code Compliance Documents. These are typically used for apartments or other residential occupancies. These functions include:

- Switching and supervision of a 100V speaker line spur
- Built-in addressable loop short circuit isolator (SCI)
- (optional) connection of conventional heat/smoke/MCP detector circuit
- (optional) smoke alarm silence hush button – integrated or remote
- (optional) local control relay output (unsupervised)

Figure 9.1 shows a representative schematic of various Type 5 system arrangements in a typical apartment complex, using AZM800 Apartment Zone Modules.

This shows the flexibility of the arrangements. In particular, the use of conventional and/or analogue addressable detectors, and the centralised 100V line tone generator which is controlled globally by the fire panel (2 tones) and selectively switched by AZM800s to individual apartments (and common areas) as required.

9.1.2 Typical Apartment Systems

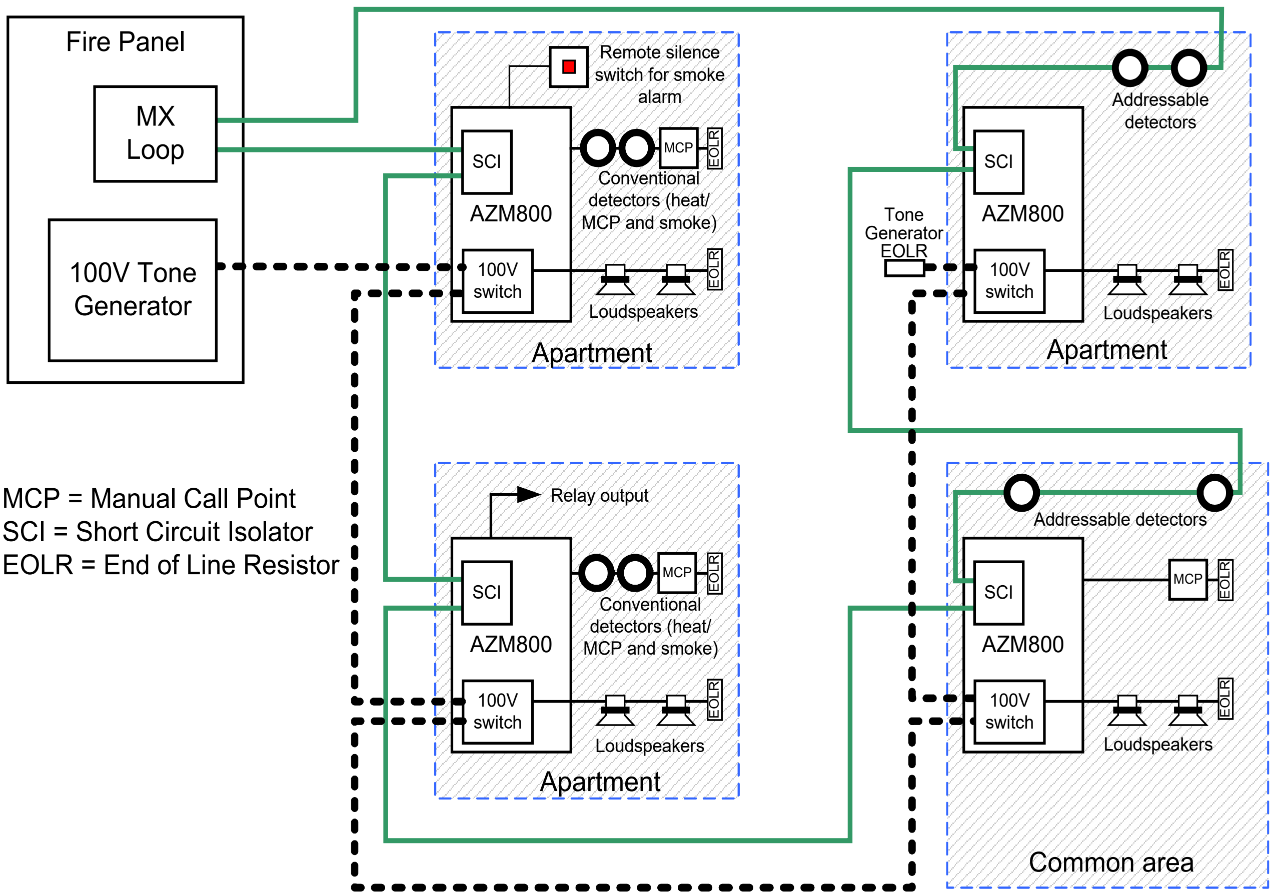


Figure 9.1 – Representative Wiring Using AZM800s in an Apartment Complex

The following “typical” apartment systems are suitable for AZM800s with *MX1*. Common areas count as apartments for this calculation:

- Up to ~60 apartments with 3 *MX* addressable smoke detectors per apartment and conventional smoke and/or heat/MCPs. Each apartment uses 4 *MX* loop addresses.
- Up to ~80 apartments with 2 *MX* addressable smoke detectors per apartment and conventional smoke and conventional heat/MCPs. Each apartment uses 3 *MX* loop addresses.
- Up to ~120 apartments with one *MX* addressable smoke detector per apartment and conventional smoke and conventional heat/MCPs. Each apartment uses 2 *MX* loop addresses.
- Up to ~160 apartments with just conventional smoke and conventional heat/MCPs connected to AZM800 local circuits. Each apartment uses one *MX* loop address.

9.1.3 Other Uses

The AZM800 can also be used as a general purpose detector input module, similar to the DIM800, with these advantages:

- an in-built short circuit isolator,
- being completely loop powered,
- able to use standard smoke and heat detectors and indicating MCPs in an NZS 4512:2010 compliant system.

Section 9.10 describes some of these uses in more detail.

9.2 Loop Loading

9.2.1 Loop Current

Each AZM800 in the non-alarm state draws 3-4mA from the *MX* loop, depending on the number of conventional detectors connected to its detector circuit.

If a conventional detector on an AZM800 is activated, the AZM800 will draw up to 20mA from the *MX* loop. Activation of an addressable detector mapped to the same zone as an AZM800 does not affect the AZM800’s current draw.

If too many conventional detectors on AZM800s are activated at the same time, the *MX* loop could become overloaded.

9.2.2 Power Save Facility

SmartConfig versions V1.6.2 and later have in-built support for AZM800, and include configuration templates which provide a facility to limit the loop current drawn by AZM800s to prevent overload.

Based on the number of AZM800s, SmartConfig calculates how many of these can safely support activated conventional detectors, and automatically creates logic equations that control AZM800 detector circuits once this number of AZM800s are in alarm. This calculation assumes an allowance of about 200mA reserve loop current to power other *MX* devices on the loop.

This limit number appears in the Logic Substitutions table of SmartConfig as `$AZM_MAX_ALM`, and is locked by default. If you need to, you can unlock this setting and change it. However an inappropriate setting can result in *MX* loop overloads and faulty operation of devices during alarm conditions so you need to be careful.

MX1CAL should be used to calculate a recommended limiting value for AZM800s in alarm which takes into account any unusual loop currents drawn by other devices on the *MX* loop. This number can be entered against `$AZM_MAX_ALM` in SmartConfig to override its calculation, if necessary.

The effects of this power save operation are:

- If fewer than the limit number of AZM800s are in alarm, there is no effect. All AZM800 conventional detector circuits are live.
- Once the limit number of AZM800s in alarm is reached, the power save signal is sent out:
    - The AZM800 detector circuits already in alarm are not affected. Detector LEDs will remain illuminated.
    - The AZM800 detector circuits that are still Normal are powered down. Conventional detectors on these circuits will not activate.
    - Addressable detector operation is not affected.
- Once the AZM800s in alarm are isolated or the alarms are reset, the power save signal is turned off:
    - All AZM800 detector circuits are powered up again, and conventional detectors on these circuits can again activate.
    - If there are activated conventional detectors on isolated AZM800s, these will continue to draw higher current from the *MX* loop (and illuminate their LEDs) until they are reset.
- Only heat detector/MCP alarms on AZM800 are summed in this way. Local smoke alarms are not included, since these are continually being reset, and draw much less current than a latched heat detector or MCP.

In a practical situation, a building should be in the process of evacuation with the fire brigade summoned well before the power save facility is activated. If continued detection is required beyond this extent, then the number of AZM800s on the *MX* loop must be re-evaluated.

9.3 Configuring Apartment Zones

9.3.1 Templates

SmartConfig versions 1.6.2 and later have in-built support for AZM800, and include standard configuration templates with zone profiles and system logic to make AZM800 configuration straightforward. The following section assumes that one of these templates is being used.

9.3.2 Apartment Zones – Heat/MCP plus Local Smoke Alarm systems

Define two zones for each apartment:

1. Heat detector/MCP zone with the zone profile “AZM800 Std Detection G1” which is latching, activates the warning system and is brigade calling.
2. Local smoke zone with zone profile “AZM800 Residential, LCD, Alerting" or "AZM800 Residential, non-LCD, Alerting”, depending on whether a smoke alarm should show on the LCD or not (recommended not to show). This zone is non-latching, activates the alerting tone, and is not brigade calling.

These zone types apply whether addressable or conventional detectors or MCPs are used.

For operating convenience, the zone numbering should make it easy to see which zones are paired, e.g., Apartment 1 has Zone 1 for the MCP/heat detectors and Zone 101 for the smoke alarm.

9.3.3 Apartment Zones – Local Smoke Alarm only systems

If the apartments have only smoke detectors (no heat detectors or MCPs), define a single zone for each apartment:

- Local smoke zone with zone profile "AZM800 Residential, LCD, Alerting" or "AZM800 Residential, non-LCD, Alerting", depending on whether a smoke alarm should show on the LCD or not (recommended not to). This zone is non-latching, activates the alerting tone, and is not brigade calling.

For apartments that also have MCPs, define a MCP/heat zone as well, as described in section 9.3.2 above.

9.3.4 Recommended Mappings

In the *MX* Points table of SmartConfig, enter an AZM800 for each apartment to look something like the example in Figure 9.2:

Point type	Zones	Pt Text	Alarm Type Text	Profile	O/P Control	
AZM800		**Apartment 1**				
Input 1	**101**	Apartment 1	Smoke	AZM800		
Input 2	**1**	Apartment 1	Heat	AZM800		
Input 3 Not Used						
Output 1		Apartment 1			Logic	$AZM_PWR_DWN or Z101AL
Output 2	**990**	Apartment 1			Zone	
Output 3		Apartment 1			Logic	$AZM_TEST or Z1RE
Output 4		Apartment 1			Logic	
LED Not Used						

Figure 9.2 – Typical AZM800 Configuration in SmartConfig
(some columns omitted for clarity)

The bold zone mapping and point text in Figure 9.2 must be entered explicitly for each AZM800 since there is no default for these settings. The key aspects to note are:

1. Input 1 is mapped to the smoke zone (zone 101 in this example) for this apartment, so that (conventional) smoke detector operation is registered in this zone.
2. Input 2 is mapped to the MCP/heat zone for this apartment (zone 1 in this example), so that heat or MCP operation is registered correctly.
3. Output 1 is controlled by user logic which is automatically created by SmartConfig. Operation is from either an alarm in the smoke zone mapped to by Input 1, or from a global power save signal. This automatic logic is created by SmartConfig in the User Logic table as part of a Check Tables command, and should not be altered.
4. Output 2 is mapped to Zone 990 which is pre-defined in the template as a general alarm zone, so that the local speaker circuit will be switched to sound any Evacuation tone coming from the *MX1*. The template contains logic to activate this zone for a brigade alarm, and since all AZM800s are mapped to this zone, all apartments will get the Evacuation tone.
5. Output 3 is controlled by user logic which is automatically created by SmartConfig, so that a circuit reset signal is sent to the AZM800 whenever the MCP/heat zone is reset.

This automatic logic is created by SmartConfig in the User Logic table as part of a Check Tables command, and should not be altered.

6. Output 4 controls the ancillary relay output, which is discussed in the section below. There is no default mapping or logic for this output.

These mappings are all that is necessary to set up each AZM800 correctly in the *MX1* configuration for a typical installation.

If addressable smoke detectors are being used in an apartment, these should be mapped in SmartConfig to the apartment's smoke zone (zone 101 in this example), and set to be non-latching. Figure 9.3 shows an example to go with the AZM800 in Figure 9.2.

Point type	Zones	Pt Text	Alarm Type Text	Latching	Profile	O/P Control
850P	**101**	**Apartment 1**		☐		
Smoke	101	Apartment 1	Smoke	☐	FastLogic Med	
LED		Apartment 1		☐		Pt Alarm
Rem LED Not Used						
Func Output Not Used						

Figure 9.3 – Typical Apartment Addressable Detector Configuration in SmartConfig
(some columns omitted for clarity)

9.3.5 Common Areas

As well as individual suites, residential applications will often have common areas such as hallways, stairwells, or service areas. These may have heat detectors or call points, and will almost certainly have loudspeakers for evacuation warning.

An AZM800 in the common area can be used with conventional indicating heat detectors or indicating call points.

If the common area has heat detectors or call points, define a Heat detector/MCP zone with the zone profile "AZM800 Std Detection G1" which is latching, activates the warning system and is brigade calling. Map Input 2 of the AZM800 to this zone.

If smoke detectors are not used in the common area, Input 1 should not be mapped to a zone, and could even be set to Not Used. Faults in the AZM800 will still be correctly reported via the Input 2 sub-point.

There are two ways of driving the loudspeakers in the common area:

1. AZM800 controls a local loudspeaker circuit – this uses a common control of all tone generators in the *MX1*. Each tone generator drives a "backbone" feeder around the area that it serves, and AZM800s connect their local loudspeaker circuits to this feeder when commanded to by the *MX1*. An AZM800 can control up to 10W of loudspeaker load on its local circuit. This control method is the default provided by the *MX1* configuration template in SmartConfig.

2. Common area loudspeakers are permanently connected to a dedicated tone generator, which is separately controlled at the *MX1*. This tone generator is only

used for evacuation warnings and is not used to provide Alerting tone for local smoke alarms. This tone generator must have separate wiring from the *MX1* from the tone generator(s) used for the AZM800s.

This control method requires extra logic equations in the *MX1* to control the dedicated common area tone generator.

9.3.6 Ancillary Control with AZM800

AZM800 has no internal default action for the ancillary relay. Its polarity (normally-closed or normally-open) is individually programmed into each AZM800. The relay will not change its state during a loop power break, and will resume tracking the *MX1*'s control signal about 5 seconds after power is restored to the AZM800. This output is not supervised by the AZM800.

All relay control required must be configured at the *MX1*, usually by means of individual logic equations.

Example 1: the ancillary relays on a group of AZM800s must all switch in common when a given condition is true.

- Define an ACZ to control this group of relays.
- Control the Operate state of this ACZ from the given condition, with a single logic equation.
- Map the relay point Output 4 to this ACZ for all the AZM800s in this group, and set the O/P Control to Zone instead of Logic.

Figure 9.4 shows an example of SmartConfig settings for this, using Zone 992 as the ACZ, and the operate condition is any brigade alarm with the Brigade Services Restore keyswitch not operated.

```
Z992OP = BRALM and not BSR
```

Point type	Zones	Pt Text		O/P Control	
AZM800		**Apartment 1**			
…					
Output 4	**992**	Apartment 1		**Zone**	

Figure 9.4 – Example AZM800 Output 4 Settings for Common Control from an ACZ
(some columns and rows omitted for clarity)

9.4 Tone Generators

AZM800 is compatible with any common audio tone generator or PA system using 25V, 70V or 100V line voltages. This section describes using Mini-Gen, T-Gen2 or T-GEN 50 as the 100V tone generator. Section 9.7 describes using QE20 or QE90 EWIS as the tone generator.

For any but small systems, the total power requirement to drive all the loudspeakers will be more than a single T-Gen2, T-GEN 50 or Mini-Gen can provide. The total power requirement should be calculated as follows:

Total power = (speaker power per apartment + 0.2W*) x (number of apartments)
+ (total speaker power in common areas)

(* the EOLR on each apartment's loudspeaker circuit draws 0.2W when the circuit is live)
From this estimate of total power, the required number of T-Gen2s (60 or 120 watt), Mini-Gens or T-GEN 50s can be determined. When dividing the total speaker load between the various T-Gen2s, Mini-Gens or T-GEN 50s, make sure that none of these is loaded to more than 80% of its rated capacity. This allows for some cable loss and for the inevitable extra speakers or load that will need to be added over the building life.

With T-Gen2, T-GEN 50 or Mini-Gen 100V tone generation the *MX1* power supply capacity will need to include the power drawn by these devices. With a QE20 or QE90, the *MX1* power supply capacity does not need to allow for 100V tone generation. Refer to the QE20 System Design Manual LT0726, QE90 Technical Manual (LT9002) or use the QECOST tool to determine the necessary battery and power supply capacity in the QE20 or QE90.

Tone generator "rules of thumb":

- Each Mini-Gen can drive up to 24 apartments, each with 2 x 0.33W speakers, or 16 apartments, each with 3 x 0.33W speakers.
- Each T-GEN 50 can drive up to 60 apartments, each with 2 x 0.33W speakers, or 40 apartments, each with 3 x 0.33W speakers.
- Each T-Gen 60 can drive 70 apartments each, with 2 x 0.33W speakers, or 50 apartments, each with 3 x 0.33W speakers.
- Each T-Gen 120 can drive 140 apartments, each with 2 x 0.33A speakers, or 100 apartments, each with 3 x 0.33W speakers.

9.4.1 Mini-Gen

MX1 can control up to three Mini-Gens connected to the ANC3 relay output for a total of 60W output. If more power than this is required, then the T-Gen2 is a better choice.

The standard SmartConfig *MX1* template V1.21 or later has logic equations for control of multiple Mini-Gens via the ANC3 relay, with Alert/Evac switching done via GPOUT1. The final equations for Mini-Gen should look like this:

```
; Operate ANC3 relay for Alarm or Alert conditions
$ANC3_RELAY = $ALARM_DEVICES_ON or $ALERT_ZONES_ONLY
; Control Mini-Gen via GP Out 1 for Alert/Evac control
$EVAC_TONE_SELECT = $ALERT_ZONES_ONLY and not $ALARM_DEVICES_ON
…
$ALARM_DEVICES_FAULT = ($ANC1_SUPERVSN_FAULT OR $ANC3_SUPERVSN_FAULT)
```

See Chapter 8 for details of Mini-Gen wiring for *MX1* control of the Alert and Evacuation tones.

9.4.2 T-Gen2

See Chapter 8 for details of wiring for *MX1* control of the Alert and Evacuations tone, and specifically section 8.2.5 for the *MX1* configuration changes to have T-Gen2 be used with AZM800.

The wiring from GPOUT1 to the T-Gen2 AIE input must be fitted.

The standard T-Gen2 does not have a voice message in the Alert signal, thus no additional configuration is required.

If set up according to those instructions and diagrams, all the wiring between the tone generators is supervised as necessary, so that mounting these in several adjacent cabinets is acceptable.

MX1 can control up to 10 of T-Gen2s. The first T-Gen2 is configured as a master and is controlled by the *MX1*. All the other T-Gen2s are wired and configured as slaves, as per LT0667 T-Gen2 Installation & Operating Instructions.

If more than 250W of tone generation is required, it is probably worth considering using a QE20 or QE90 EWIS, since this will have its own power supply and batteries, properly integrated in a cabinet.

9.4.3 T-GEN 50

MX1 can control any practical number of T-GEN 50s. The first T-GEN 50 is configured as a master and is controlled by the *MX1*. All the other T-GEN 50s are configured as slaves controlled by the master tone generator.

The standard SmartConfig *MX1* template V1.21 or later has logic equations for control of T-GEN 50 via the ANC1 relay, with Alert/Evac switching done via GPOUT1. The final equations for T-GEN 50 should look like this:

```
; Operate ANC1 relay for Alarm or Alert conditions
$ANC1_RELAY = $ALARM_DEVICES_ON or $ALERT_ZONES_ONLY
; Control T-GEN 50 via GP Out 1 for Alert/Evac control
$EVAC_TONE_SELECT = $ALARM_DEVICES_ON
…
; List the Alarm Devices Fault conditions here.
; If using T-GEN 50 with MX1 control of Alert/Evac tone via GP Out 1,
uncomment this line
$ALARM_DEVICES_FAULT = ($ANC1_SUPERVSN_FAULT OR $GP1_SUPERVSN_FAULT OR
$ANC3_SUPERVSN_FAULT
```

In addition, in the Controller Points table, enable GPOUT1 supervision with the profile "T-GEN 50 Evac Activate". This supervises the connection from GP Out1 to the T-GEN 50 A/I/E input.

The standard T-GEN 50 has a voice message in the Alert message. For a local smoke alarm, this message is not very applicable and could be confusing. The simplest solution is to erase the Alert message, as follows (extracted for information from the "recording messages" instructions of LT0186, subject to future change):

- The T-GEN 50 must not be in alarm or evacuate or test mode.
- Fit link LK3 - REC EN on the PCB (borrow the jumper off Link 7 FAULT = DEF-/RELAY). This enables the recording and playback of messages.
- Set DIP switch 2 (T1) to ON to select the Alert message. Check this, or otherwise the Evac message will be wiped, with no simple way of reloading it other than swapping out the T-GEN 50.
- Locate the 4 way connector J1 on the T-GEN 50 near the heatsink. With a small screwdriver or other metal object, briefly connect pins 3 and 4. The red RECORD LED on the T-GEN 50 will light briefly.
- Re-set DIP switch T1 to its original position. Remove Link LK3 to disable the record function, and put it back where it came from.
- If possible, check that the Evacuation message is untouched, using Trial Evac or similar facility.

See Chapter 8 for details of wiring for *MX1* control of T-GEN 50 Alerting and Evacuation tone. If set up according to these diagrams, all the wiring between the tone generators is supervised, so that mounting these in several adjacent cabinets is acceptable.

If more than five T-GEN 50s are required, it is probably worth considering using a QE20 or QE90 EWIS, since this will have its own power supply and batteries, properly integrated in a cabinet.

9.5 Apartment Wiring

9.5.1 General

Each apartment will usually have a local conventional detector circuit and a local loudspeaker circuit connected to the AZM800. There may also be a circuit for the Remote Hush Unit, if this is used. Figure 9.5 shows a typical layout.

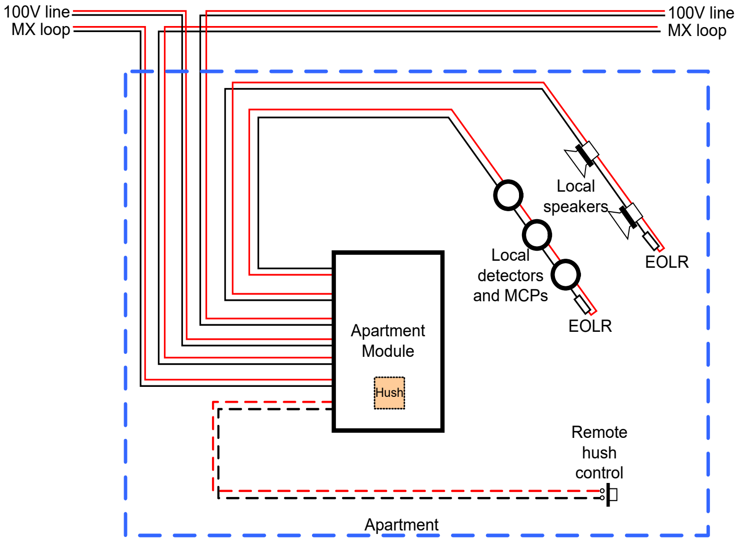


Figure 9.5 – Typical Apartment Wiring (conventional detectors)

See section 6.7.7 for more details about connection of this apartment wiring to the AZM800, and the compatible types of conventional detector.

9.5.2 *MX* Loop and 100V Wiring

The *MX* loop cable and the 100V feeder cable will usually have to be run close together for considerable distances around the site. If unscreened cable is used for both of these, there will be significant crosstalk from the 100V cable to the *MX* loop cable, which may seriously disrupt *MX* loop operation when the 100V tone generator is active. There is no practical fix that can be applied after installation to prevent this.

Running screened twin cable for the 100V feeder is very strongly recommended. The screen must be linked through wherever the cable is broken, e.g., at each AZM800. The screen should be earthed in one place only, preferably at the beginning of the feeder at the *MX1*.

The local speaker circuit in each apartment is relatively short, and will usually be separated from the *MX* loop cable. Screened cable is not a requirement for the local speaker circuit, but it will not do any harm. Any local screen used should be linked to the 100V feeder cable's screen at the AZM800.

Product Bulletin PBG0113 has more general information about good cabling practices.

9.5.3 AZM800 Location

There are several possibilities for location:

1. AZM800 located inside the apartment, Remote Hush Unit not used – this is the simplest arrangement. Local smoke alarms can be hushed using the pushbutton on the AZM800, or the pushbutton can be disabled and the blank cover fitted (see the AZM800 Installation Guide LT0459) in which case smoke alarms can't be hushed.

Since the AZM800 is inside the apartment, access for maintenance will be more difficult, although the analogue value of the AZM800 input can be viewed at the *MX1* and used for remote diagnosis of wiring faults.

2. AZM800 and Remote Hush Unit located inside the apartment – local smoke alarms in the apartment can be hushed using the pushbutton on either the AZM800 or the Remote Hush Unit. Since the AZM800 is inside the apartment, access for maintenance may be a problem, as in the previous option.

3. AZM800 located outside the apartment, Remote Hush Unit located inside the apartment – the AZM800 would have its pushbutton disabled and the blank cover plate fitted. This arrangement allows ready access to the AZM800 for maintenance. Local smoke alarms in the apartment can be hushed using the pushbutton on the Remote Hush Unit.

4. AZM800 located outside the apartment, Remote Hush Unit not used – the AZM800 would have its pushbutton disabled and the blank cover plate fitted. This arrangement allows ready access to the AZM800 for maintenance. There is no option for local smoke alarms in the apartment to be hushed, which is likely to contravene the requirements of the NZ Building code Compliance Documents Acceptable Solution so the building consent will need to be checked to see if this arrangement is permitted.

9.5.4 *MX* Loop Short Circuit Isolation

In apartment buildings, each apartment is a separate zone. NZS 4512 requires that a wiring defect in the addressable loop or detector wiring will not affect more than one zone. Short circuit isolators are required on the *MX* loop to meet this requirement.

The AZM800 contains an integral short circuit isolator, which can provide much of this necessary protection, and greatly reduces the need for additional isolator bases or isolator modules.

However, some care must be taken when connecting addressable detectors, otherwise this fault protection will be degraded and compliance with NZS 4512 compromised.

In the example of an addressable loop shown in Figure 9.6, there are a mixture of apartment zones with AZM800s and addressable detectors, and other detection zones with addressable detectors.

In Zones 1 and 2, the addressable detectors in each apartment are “downstream” from the AZM800, and any short circuit on the *MX* loop in these zones affects only one zone. Zone 3 has its detectors upstream from the AZM800, but there is still isolation between zones 2 and 3 from the 5BI Isolator base in zone 2.

Zone 5 has detectors on both sides of the AZM800, which means that it cannot isolate this zone from shorts in Zone 4 or Zone 6. This situation could be fixed by rearranging Zone 5 wiring so that the AZM800 was the first or last device in the zone, and then putting an isolator module or base at the other end of the zone.

Zones 7 and 8 (not apartment zones) have adequate isolation via the 5BI Isolator bases.

A good working rule is to have the AZM800 consistently as the first or last device on a section of the *MX* loop wiring as it passes through an apartment zone. If this is done, there is generally no need for additional isolators between adjacent apartment zones.

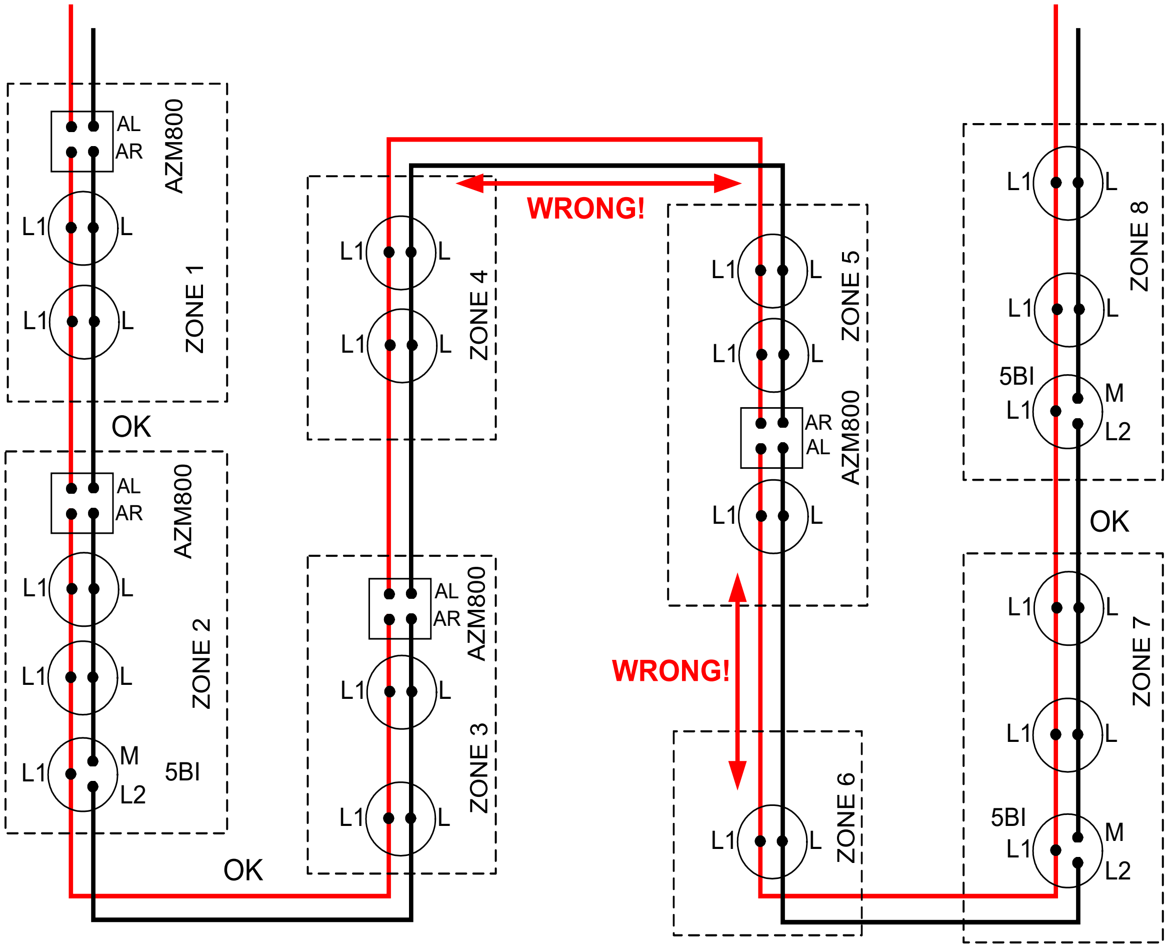


Figure 9.6 – Arranging Short Circuit Isolators for Correct Protection

9.6 Mechanical Aspects

9.6.1 Mounting AZM800

Each AZM800 will have at least three and possibly as many as 8 twin cables connected to its terminals. This means that care must be taken to provide sufficient space behind the AZM800 when it is fitted, to avoid overcrowding and excessive pressure from bunched wires on the circuit board.

WARNING: a standard single gang electrical flush box is NOT large enough to hold all this wiring. The mounting MUST be either a deep flush box or an open-clip style which uses the whole wall cavity.

This aspect must be considered quite early in a project, when ordering these parts in preparation for pre-wiring the building. A poor choice of flush box or mounting plate is not easy to fix at fit-out time after the building walls are lined. Any requirements for fire rating of the wall and fire rating of the penetration for the AZM800 need also to be considered.

Here is a list of commercial electrical products (current at time of publication) which are believed to give a reasonable amount of room for field wiring:

Table 9-1 - Suitable Mounting Hardware for the AZM800

Brand	Model	Comment
Clipsal	154	Wall Board Mounting Clip (up to 12mm plasterboard) – open back
Clipsal	155VFN	Metal Mounting Bracket – open back
Clipsal	156/1	Metal Mounting Bracket, fixes to side or front of timber stud
HPM	143	Standard Stud Bracket – open back
HPM	712	Standard Wall Clip (10mm plasterboard) – open back
HPM	953	Plaster bracket – open back
PDL	141C	Flush/Wall box, concrete installation, 1-gang, 92mm deep, metal
PDL	144MT	Flush/Wall box, metal thread, 1-gang, 92mm deep, moulded plastic
PDL	149	Flush/Wall box, 2-gang, 55mm deep, metal

All these products suit a plate size 116 x 72mm, with a wall opening of 76 x 51mm.

9.6.2 *MX1* Cabinet Requirements

An apartment fire alarm system will have a larger non-alarm current than many other systems, since the AZM800 draws more current than many other *MX* modules. In order to meet the stand-by requirements, the batteries will generally need to be larger as well.

Since the battery requirements are likely to be 33Ah or more for anything more than small brigade-connected systems, the *MX1* will require a sufficiently large cabinet to hold these batteries, along with the tone generators.

Refer to Chapter 11 for details of power supply and battery design.

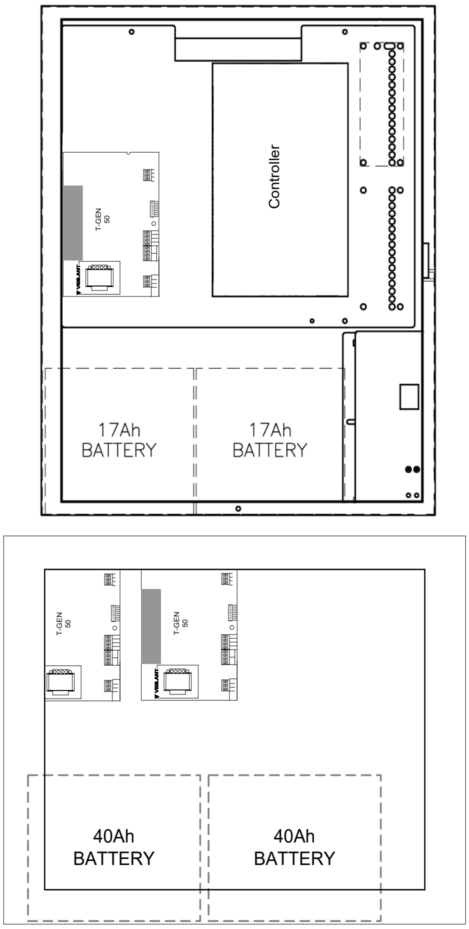
The recommended method is to use MX1COST to calculate necessary battery and power supply requirements for every *MX1* system except very simple ones.

Some practical cabinet and battery configurations are as follows:

Table 9-2 – Some Practical Cabinet and Battery Combinations for *MX1* Systems

Cabinet Combination	Battery	Tone Generators	Application
MX1 in standard Slimline cabinet	17Ah	2 x Mini-Gen or 1 x T-GEN 50 or 1 x T-Gen 60	Up to 30 apartments, brigade-connected
MX1 in standard Slimline cabinet + FP0944 empty Slimline cabinet adjacent	17Ah in each cabinet (34Ah total)	2 x T-GEN 50 or 2 x T-Gen 60 (one in each cabinet)	Up to 90 apartments, brigade-connected
MX1 in Slimline cabinet + FP0576 8U cabinet adjacent	40Ah in 8U cabinet	3 x T-GEN 50 or 3 x T-Gen 60 with fuse board (one in Slimline, 2 in 8U)	Up to 110 apartments, brigade-connected
MX1 in Slimline cabinet + FP0576 8U cabinet adjacent	17Ah in Slimline + 40Ah in 8U cabinet	3 x T-GEN 50 or 3 x T-Gen 60 with fuse board (one in Slimline, 2 in 8U)	Up to 160 apartments, brigade-connected
MX1 in Slimline cabinet + FP0944 empty Slimline cabinet adjacent	17Ah in each cabinet (34Ah total)	1 or 2 x Mini-Gen or 1 x T-GEN 50 or 1 x T-Gen 60	Up to 23 apartments, non brigade-connected
MX1 in Slimline cabinet + FP0576 8U cabinet adjacent	40Ah in 8U cabinet	1 x T-GEN 50 or 1 x T-Gen 60	Up to 30 apartments, non brigade-connected
MX1 in Slimline cabinet + FP0576 8U cabinet adjacent	17Ah in Slimline + 40Ah in 8U cabinet	1 or 2 x T-GEN 50 or 1 or 2 x T-Gen 60 or 1 x T-Gen 120	Up to 50 apartments, non brigade-connected
MX1 in Slimline cabinet + 2 x FP0576 8U cabinets adjacent	120Ah in one 8U cabinet	3 x T-GEN 50 or 3 x T-Gen 60 with fuse board (1 in Slimline, 2 in one 8U)	Up to 100 apartments, non brigade-connected

This table assumes that there is little or no load on the system other than the AZM800 modules and associated addressable smoke detectors.



The FP0576 cabinet has hole patterns in the rear of the cabinet suitable for T-Gen2 or T-GEN 50 mounting on plastic standoffs in the positions shown.

Each T-Gen2 and T-GEN 50 will need to be earthed to the cabinet and the cabinet itself must be earthed to the *MX1* cabinet for electrical safety and noise suppression.

Figure 9.7
Internal Layout of T-Gen2s, T-GEN 50s and Batteries in Slimline and 8U Cabinet Pair

If none of these cabinet options is suitable, custom assembly into a suitably sized 19” rack cabinet may be required. This is available as factory build-to-order for *MX1* systems.

9.7 Using QE20 or QE90 as Tone Generator

This is the best choice of tone generator for when staged evacuation of a large building complex is required. However, the system configuration is more involved than for T-Gen2, T-GEN 50 or Mini-Gen systems, and requires more care.

For assistance with this configuration, please contact Johnson Controls.

9.8 Management Response

NZS 4512 section 406.11 and the (November 2008) F7 Building Code Compliance Documents both require Type 5 smoke detector operation to be communicated to building management, where a management response is available.

In its simplest form, this could be a buzzer and LEDs programmed to announce local smoke alarm activation. However, practically, an RDU or ADU connected to the *MX1*’s RZDU output is likely to be the best option for all but the smallest of systems.

Note that, if RDU indication of local smoke alarms is required, the RZDU LED numbers for the smoke zones must not be set to 0 in SmartConfig, and these LED numbers must correspond to the *MX1* zone numbers.
Note that, if the local smoke zones have a zone profile that does not display these on the *MX1* LCD (recommended), then the *MX1* will not transmit LCD text for these zones on the RZDU bus. Any LCD text required for these zones at the RDU(s) must be programmed into the RDU directly.

Refer to the Remote Display Unit Installation & Programming Manual (LT0148) for details of configuring the RDU.

9.9 Brigade Index and LCD

9.9.1 Zone Requirements

NZS 4512 section 401.2.4 requires every apartment to be a separate zone, with a separate LED on the brigade index.

However, this requirement has been relaxed by SANZ Formal Interpretation FI-002 to allow larger multi-apartment zones (theoretically up to 2000m^2 on one floor), provided that individually-identifiable, i.e., addressable, detectors and MCPs are used, and displayed near the brigade attendance point, i.e., on the *MX1*'s LCD, or an RDU or LED-RZDU.

A conventional MCP connected to the AZM800's local circuit effectively takes on the AZM800 address, so satisfies the requirement for identification.
See Chapter 12 for more about zone displays and Chapter 13 for remote zone displays.

9.9.2 Display of Local Smoke Alarms

NZS 4512 section 402.8.2 (m) apparently requires separate brigade index LEDs for the smoke component of a Type 5 system, labelled "NOT CONNECTED TO FIRE SERVICE". However, section 204.1 (d) makes this optional for Type 5 smoke detectors that only generate a local alarm.

It is a good idea that the local smoke alarms of a Type 5 system do NOT indicate on the brigade index, as this can cause confusion to passers-by when red indicators come and go but no general evacuation or brigade call are initiated.

If the *MX1* is located in a public area, it probably better that the local smoke alarms do not display on the LCD either, since this may also cause concern or confusion to passers-by. This is done by using the "AZM800 Res. Non-LCD" zone profile for these zones.

9.10 Other Uses for AZM800

9.10.1 Addressable Detector Module

The AZM800 is directly compatible with the Indi-V*IGIL* indicating heat detector, the 1841 indicating manual call point and the PA1022 indicating contact conversion module. Therefore, it can be used to connect these devices to an NZS 4512:2010-compliant *MX1* system, without the need for a separate 24V DC supply to each module and without the need to fit resistors or zener diodes to each detector (both of which are required with the DIM800).

This is particularly useful where encapsulated heat detectors must be used, since there is no equivalent in an addressable device. It is also useful for providing cost-effective heat detection in concealed spaces.

Up to a total of 35 Indi-V*IGIL* detectors or indicating MCPs (VNCPI or indicating 1841) can be connected to each AZM800 in normal current mode, or up to a total of 8 in low current mode.

Note that the AZM800 is not directly compatible with clean contact devices such as high temperature detectors (white dot V*IGIL* or a duct probe). To connect a single clean contact device to the *MX* loop, it is probably more convenient to use a MIM801, with the LED output of the MIM801 used with a remote indicator to meet the indication requirement. See section 10.4.1 (Using a CIM800 or MIM800) for input wiring details.

If there is a circuit of clean contact devices to be connected to the *MX1* loop for some reason, then the AZM800 must be used (not a MIM801). The clean contact devices must be individually connected to the AZM800's detector circuit via a PA1022 indicating conversion module, as described in the *Vigilant Technical Manual* Volume 1, section 1.1.15.

The AZM800s used in the ways described above require some configuration, as follows:

- (optionally) Configure the AZM800 for latching smoke alarm. Refer to the AZM800 Installation Guide (LT0459) for details of how to do this. If you are sure that the circuit will never have conventional smoke detectors connected to it, this step could be omitted.
- The (unused) remote hush circuit of the AZM800 will need a 9k1Ω normalising resistor fitted (supplied with each AZM800).
- The (unused) 100V spur circuit of the AZM800 will need a 56kΩ normalising resistor fitted (supplied with each AZM800). This assumes that selective switching of a 100V warning system is not required.
- The integral hush button should be disabled and a blank cover fitted, as described in LT0459 AZM800 Installation Guide.

9.10.2 System Retrofit or Connecting Conventional Smoke Detectors

The AZM800 can be used as a loop-powered detector input module to interface some existing conventional detector circuits in a retrofit application. This avoids the need for a separate 24V DC supply for the detector circuits (which is necessary for a DIM800).

The conventional detector circuit on each AZM800 can support only 0.7mA of detector quiescent current, which is rather less than detector circuits on most other panels. This may mean that some existing detector circuits with many detectors need to be divided into smaller sections with fewer detectors, with one AZM800 connected to each section.

Some conventional detectors are not compatible with AZM800. Check with the list of compatible detectors in section 6.7.7.

AZM800 is not directly compatible with clean-contact devices. If there are clean contact heat detectors or manual call points, these either need to be replaced with Indi-*VIGIL* detectors and indicating 1841 call points or need to have PA1022 indicating conversion modules fitted to each device as described in the *Vigilant Technical Manual* Volume 1, section 1.1.15.

The AZM800s used in this way require some configuration, as follows:

- Configure the AZM800 for latching smoke alarm. Refer to the AZM800 Installation Guide (LT0459) for details of how to do this.
- The (unused) remote hush circuit of the AZM800 will need a 9k1Ω normalising resistor fitted (supplied with each AZM800).

- The (unused) 100V spur circuit of the AZM800 will need a 56kΩ normalising resistor fitted (supplied with each AZM800). This assumes that selective switching of a 100V warning system is not required.
- The integral hush button should be disabled and a blank cover fitted, as described in LT0459.

10 Miscellaneous Applications

10.1 General

As well as the usual detector and alarm devices configurations, many installations will require other miscellaneous functions which are specific to that installation.

These functions require changes or extensions to the common or default processing in the *MX1*. These extensions can be readily made by using the flexibility of the *MX1*'s configuration.

This flexibility arises from the ability to change aspects such as the designations of the input voltage bands on devices and Controller inputs, select different modes of supervision on outputs, and the boolean logic equations which control much of the *MX1*'s internal operation.

In the following examples, fragments of SmartConfig tables and logic equations are used to show the form of the requirements. To use these in any particular installation, the table entries and equations must be adjusted as required to match the specific aspects of the particular installation and configuration.

10.2 Cabinet Options

10.2.1 Slimline Cabinet

The FP0893 *MX1* panel is supplied in a Slimline cabinet suitable for window mounting (rear service) or wall mounting (front service). In both orientations it can support up to 31 zones of LED indication plus a brigade index.

The internal gearplate can support in the bottom left corner 1 x T-Gen 60 Tone Generator or 1 x T-GEN50 Tone Generator or 2 Mini-Gens or 2 x *MX* Modules, or 3 PA0730 GP Relay Boards, and in the top left corner 1 GP SGD or 1 Mini-Gen or 1 *MX* Module or 1 *MX* Loop Card. One *MX* Loop Card can be mounted on the right hand side inside wall of the cabinet.

10.2.2 19" Rack Cabinet Options

The FP1010 15U 19" rack cabinet panel provides options for mounting equipment internally on the gearplate and on the 19" rack. This panel is wall mounting (front service) only, and it does not support a brigade index directly. Various options are available – see Sections 12 and 13.

Mounting holes are provided on the gearplate for many standard modules such as T-Gen2, 100V Splitter Board, 100V Switching Board, T-GEN 50, Mini-Gen, *MX* Loop card, *MX* modules, I-HUB (ECM), PIB, GP Relay Board and Fuse Board, etc. Drawings 1982-71 sheets 140, 141, 142, 143, 144, 148, 149 and 169 show various mounting arrangements. Note that not all combinations are possible due to overlapping positioning.

The 19" rack may be fitted with a number of different modules, but there are physical limits as to which modules may be mounted in each position. What modules are mounted on the gearplate affects what items can be mounted on the 19" rack (or vice versa), so not all combinations of equipment are compatible. Table 10.1 shows some possibilities (not all relevant for NZ), plus some of the conflicts between modules. The X/X/X possibilities indicate if the module can be fitted with: no *MX* Loop Card (or other modules) on brackets on the gear plate/any in the top positions/any in the bottom positions on the gearplate. This assumes all 3 positions are occupied.

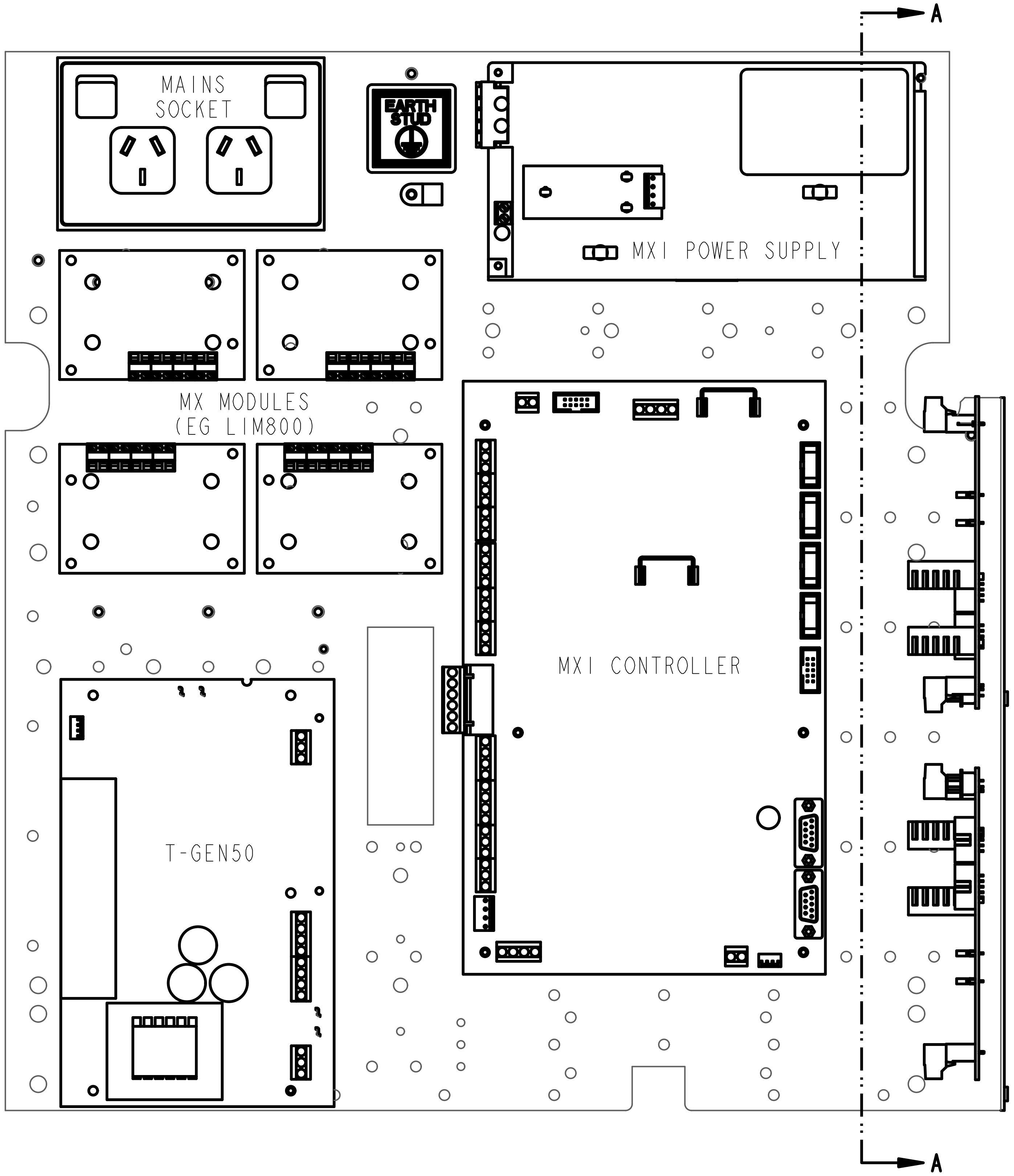
There are also matching 15U expansion cabinets, such as FP1030, FP1031 and FP1084, that can be used for extra equipment. Other possibilities are available with BTO (build-to-order) systems. Consult the relevant *MX1* BTO documentation for information.

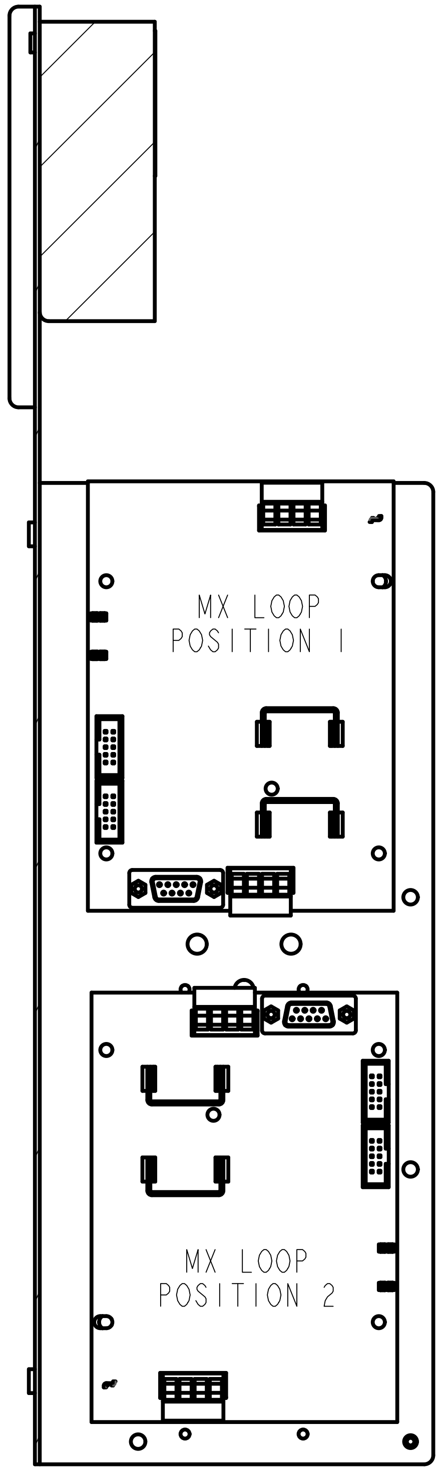
Table 10.2 – *MX1* 15U Cabinet Rack Mounting Possibilities

U Position (Top)	4U *MX1* LCD Display Door (ME0462)	4U 5 x 16 Zone Display Door (ME0457)	3U T-GEN 50 Door (FP0698) 3U T-Gen2 Grade 3 UI Door (FP1121)	3U 12 x AS1668 Door (FP1056) 3U T-Gen2 Grade 3 UI Door (FP1122)	3U T-Gen2 Grade 2 UI Door (FP1124)	3U ASE Door (KT0199)	3U 2 x V-Modem Door (KT0212)	3U QLD/WA ASE Door (Cube) FZ9028	3U QLD/WA Door (WA ASE) (FZ9028)	1U Doc Tray (135 Deep) (ME0258)	1U T-GEN50 Control Panel (ME0289)	Various Blank Panels
1	**Y**	Y	Y/N/Y	Y	Y	Y	Y/N/Y	Y	N	N	Y	Y
2	**Y**	Y	Y/N/Y	Y	Y	Y	Y/N/Y	Y	N	N	Y	Y
3	**Y**	Y	Y/N/Y	Y	Y	Y	Y/N/Y	Y	Y	Y/N/Y	Y	Y
4	**Y**	Y	Y/Y/Y	Y	Y	Y	Y/N/Y	Y	Y	Y/N/Y	Y	Y
5	Y	**Y**	Y/Y/N	**Y**	**Y**	**Y**	Y/N/N	**Y**	**Y**	Y/N/Y	**Y**	Y
6	Y	**Y**	Y/Y/N	**Y**	**Y**	**Y**	Y/Y/N	**Y**	**Y**	Y/Y/Y#	**Y**	Y
7	Y	**Y**	Y/Y/N	**Y**	**Y**	**Y**	Y/Y/N	**Y**	**Y**	Y/Y/N#	**Y**	Y
8	Y	**Y**	Y/Y/N	**Y**	**Y**	**Y**	Y/Y/N	**Y**	**Y**	Y/Y/N#	**Y**	Y
9	Y	Y	Y/Y/Y	**Y**	**Y**	**Y**	Y/Y/N	**Y**	**Y**	Y/Y/N#	**Y**	Y
10	Y*	Y	Y/Y/Y	**Y**	**Y**	**Y**	Y/Y/N	**Y**	**Y**	Y/Y/N#	**Y**	Y
11	Y*	Y	Y^	**Y**	**Y**	**Y^**	Y^	**Y^**	**Y^**	**Y**	**Y**	Y
12	Y*	Y	Y^	**Y^**	**Y^**	**Y^**	Y^	**Y^**	**Y^**	**Y**	**Y**	Y
13	-	-	Y^	Y*	Y*	Y^	Y^	Y^	Y^	N	Y*	Y
14	-	-	-	Y*	Y*	-	-	-	-	N	Y*	Y
15	-	-	-	-	-	-	-	-	-	N	N	Y

Key

Y	Bold letters indicate preferred position in cabinet
X/X/X	Possibility, depending on whether any *MX* Loop brackets, 100V Switch/Splitter Boards, T-Gen 120 (or other boards) are mounted on Loop Card brackets on the gearplate in positions: None/top/bottom.
#	Not available if T-Gen2, T-GEN 50 or Mini-Gen boards fitted to gear plate
*	Not available if 40Ah Batteries fitted in bottom of cabinet
^	If fitted, battery space limited to 17Ah
-	Not possible to fit top of module here!





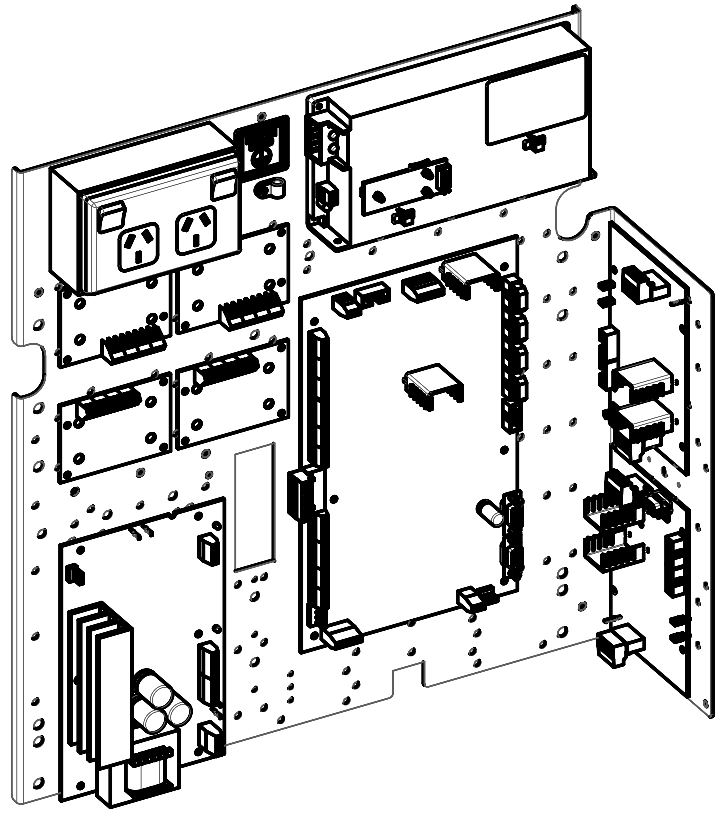
SECTION A-A

NOTES:

1. MOUNT T-GEN 50 USING 5 PLASTIC STAND-OFFS (HW0130) AND 1 OFF M3 X12 SCREW (SC0177). CENTRE LEFT PLASTIC STAND-OFF WILL NEED ITS RETAINING CLIP REMOVED. STAND-OFFS FACTORY FITTED FROM GEAR PLATE REAR.

2. MOUNT MX LOOP CARD USING 4 PLASTIC DOUBLE BARB STAND-OFFS (HW0052) SUPPLIED IN KIT. STAND-OFFS FITTED FROM GEAR PLATE FRONT.

3. MOUNT MX MODULES USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) FITTED FROM FRONT OF GEAR PLATE.



ISOMETRIC VIEW
SCALE 0.200

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
B	UPDATED FOR NEW REV GEAR PLATE.	4167	KJS	LSC	RC	DP	20-08-10

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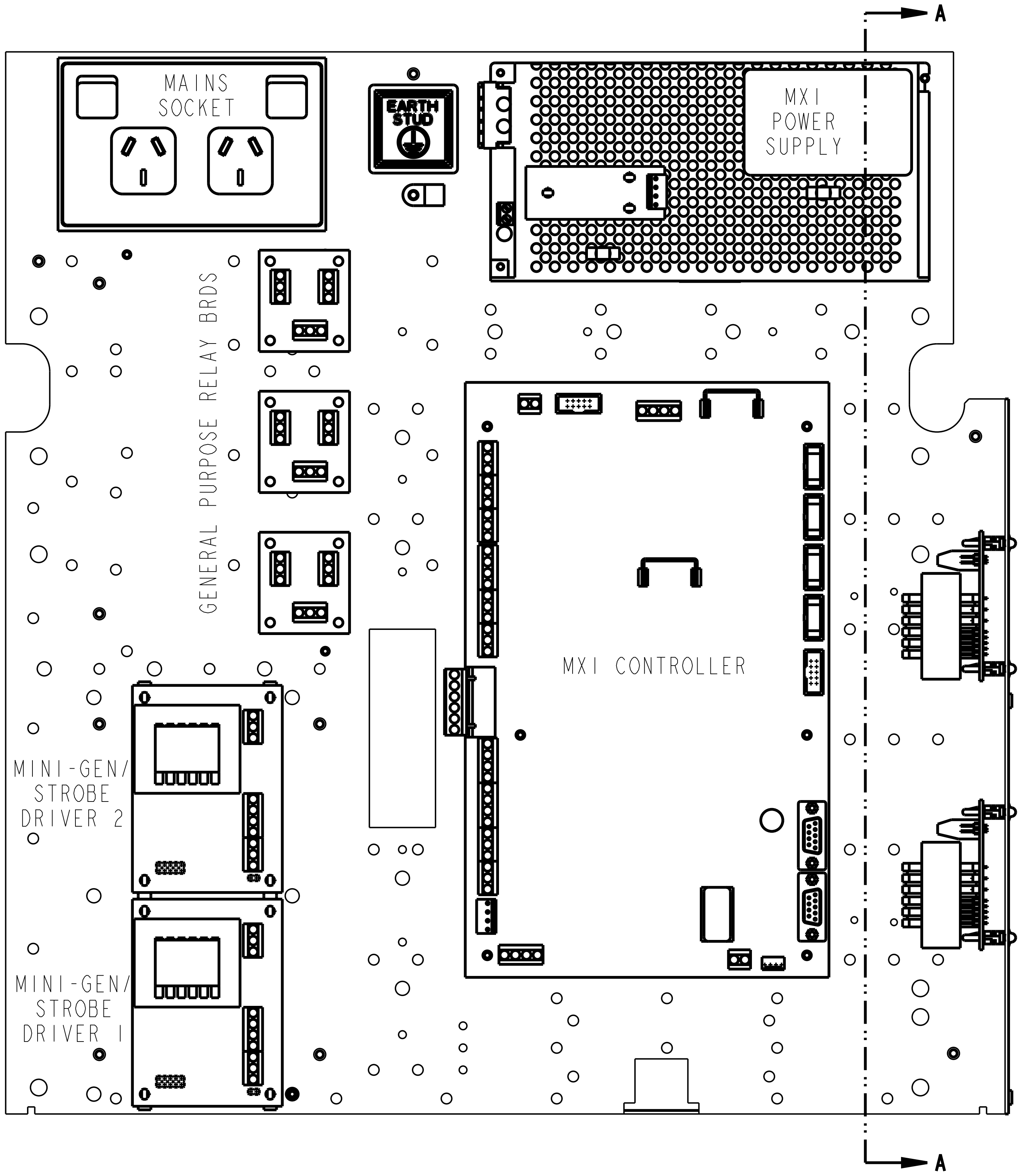
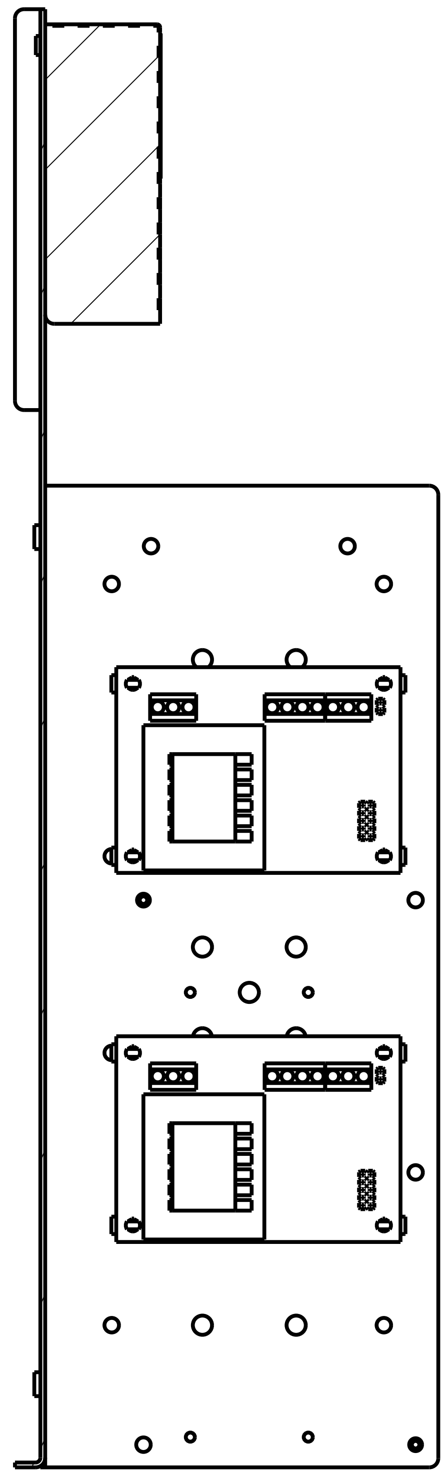
MX1
T-GEN50, MX MODULES, MX LOOP GEARPLATE POSITIONS

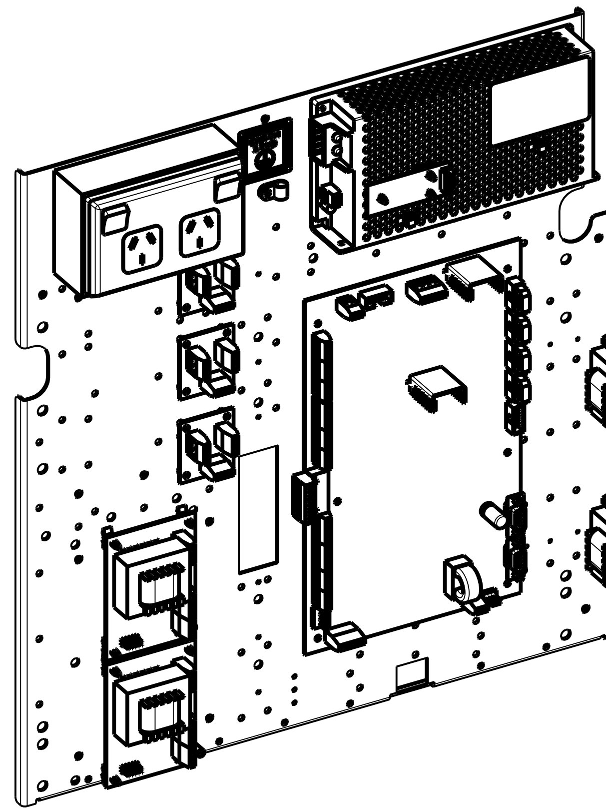
DRAWING No: 1982-71 SHEET 140 of N

A3 | ISS/REV B | PART No:





SECTION A-A



ISOMETRIC VIEW
SCALE 0.200

NOTES:

1. MOUNT MINI-GEN OR STROBE DRIVER USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) FITTED FROM FRONT OF GEAR PLATE.

2. MOUNT GENERAL PURPOSE RELAY BOARDS USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) PER BOARD, FITTED FROM FRONT OF GEAR PLATE.

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
B	UPDATED FOR NEW REV GEAR PLATE.	4167	KJS	LSC	RC	DP	20-08-10
C	GP RELAY BRDS WERE ON SHEET 149.	-	KJS	RC	RC	DP	11-4-13

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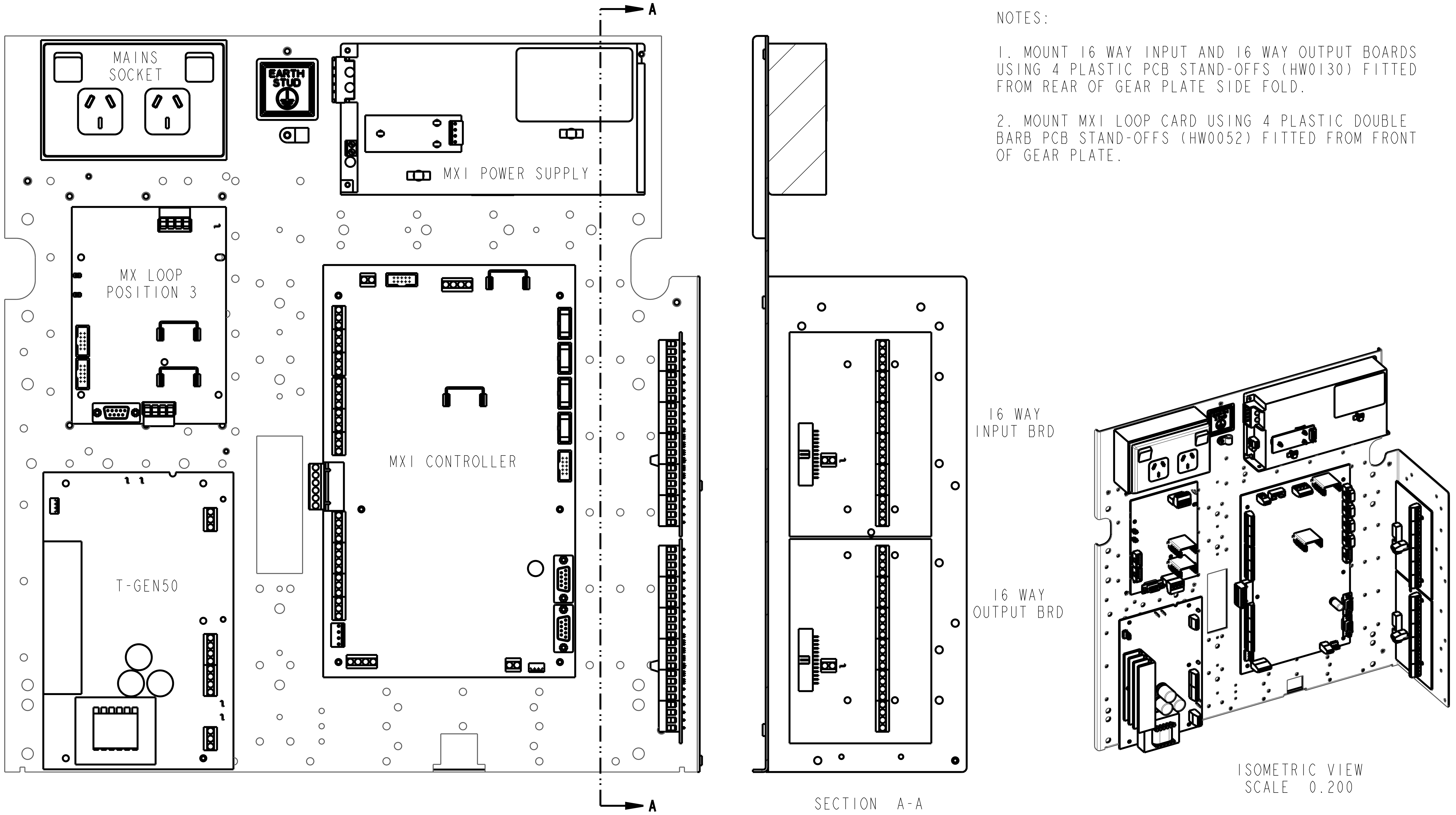
MX1
MINI-GEN / STROBE DR / GP RELAY GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 141 of N

A3 ISS/REV C PART No:



NOTES:

1. MOUNT 16 WAY INPUT AND 16 WAY OUTPUT BOARDS USING 4 PLASTIC PCB STAND-OFFS (HW0130) FITTED FROM REAR OF GEAR PLATE SIDE FOLD.

2. MOUNT MXI LOOP CARD USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) FITTED FROM FRONT OF GEAR PLATE.

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
B	UPDATED FOR NEW REV GEAR PLATE.	4167	KJS	LSC	RC	DP	20-08-10

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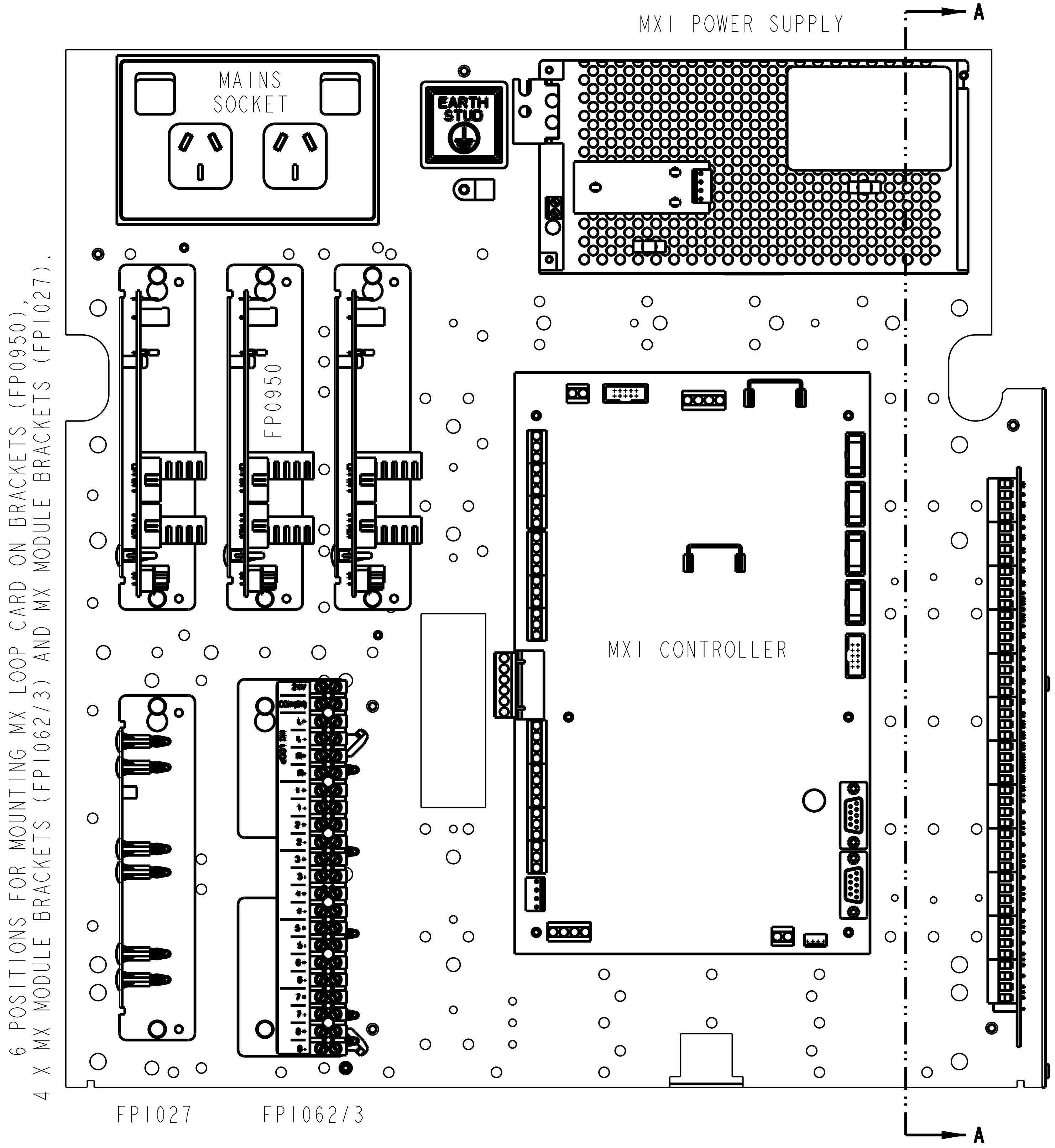
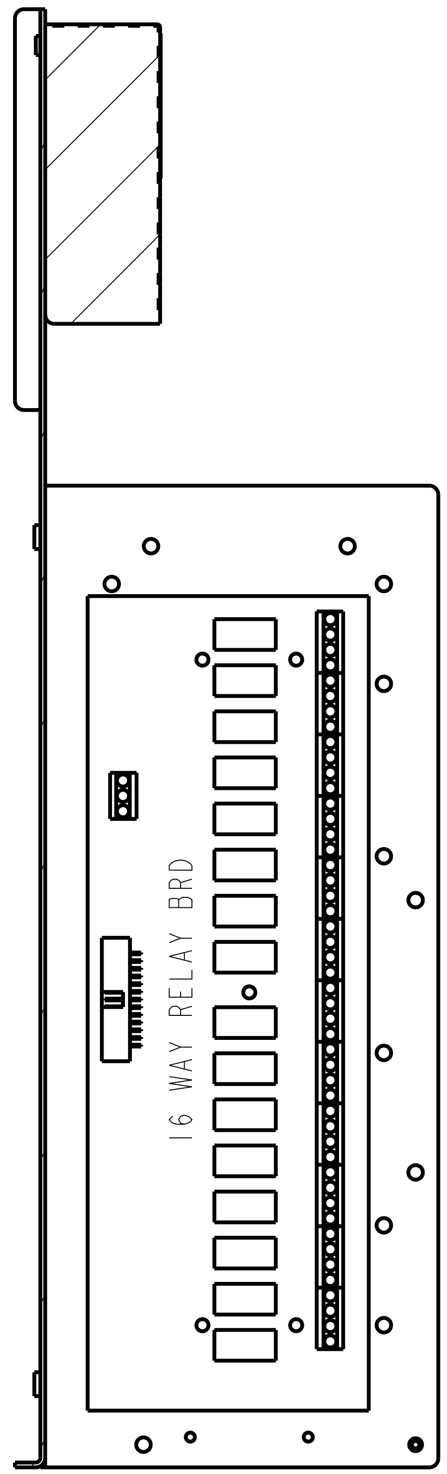
MX1
16 INPUT, 16 OUTPUT, MX LOOP CARD GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 142 of N

A3 ISS/REV B PART No:





SECTION A-A

NOTES:

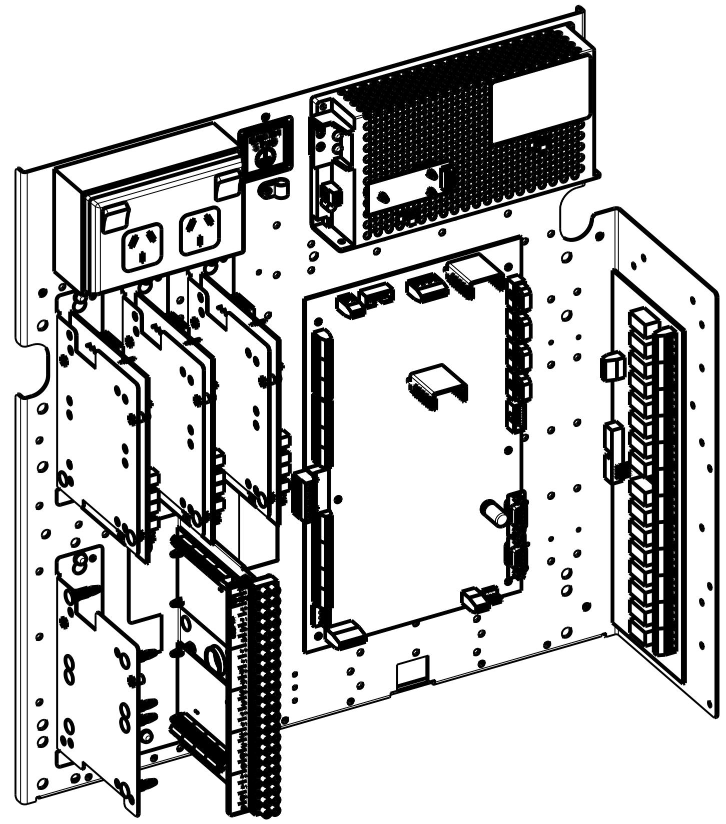
1. MOUNT 16-WAY RELAY BOARD ON GEAR PLATE USING 5 PLASTIC STAND-OFFS (HW0130) FITTED FROM REAR OF GEAR PLATE SIDE FOLD.

2. MOUNT EACH BRACKET MOUNTED MX LOOP CARD WITH 2 OFF M4 X 10 SCREWS (SC0176). SCREWS FITTED FROM GEAR PLATE FRONT.

3. MOUNT EACH MX MODULE MOUNTING BRACKET (FP1027, FP1062, FP1063) WITH 2 OFF M4 X 10 SCREWS (SC0176). SCREWS FITTED FROM GEAR PLATE FRONT.

4. MOUNT MX MODULES ON FP1027 BRACKET USING 4 PLASTIC PCB STAND-OFFS (HW0131) PROVIDED WITH BRACKET.

5. MOUNT MX MODULES ON FP1062 BRACKET USING 4 PLASTIC PCB STAND-OFFS (HW0209) PROVIDED WITH BRACKET.



ISOMETRIC VIEW
SCALE 0.200

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
B	UPDATED FOR NEW REV GEAR PLATE.	4167	KJS	LSC	RC	DP	20-08-10
C	NOTES UPDATED.	ECS1604	KJS	RC	RC	DP	21-11-11
D	FP1063 AND FP1027 MTG ADDED.	-	KJS	RC	RC	DP	22-1-15

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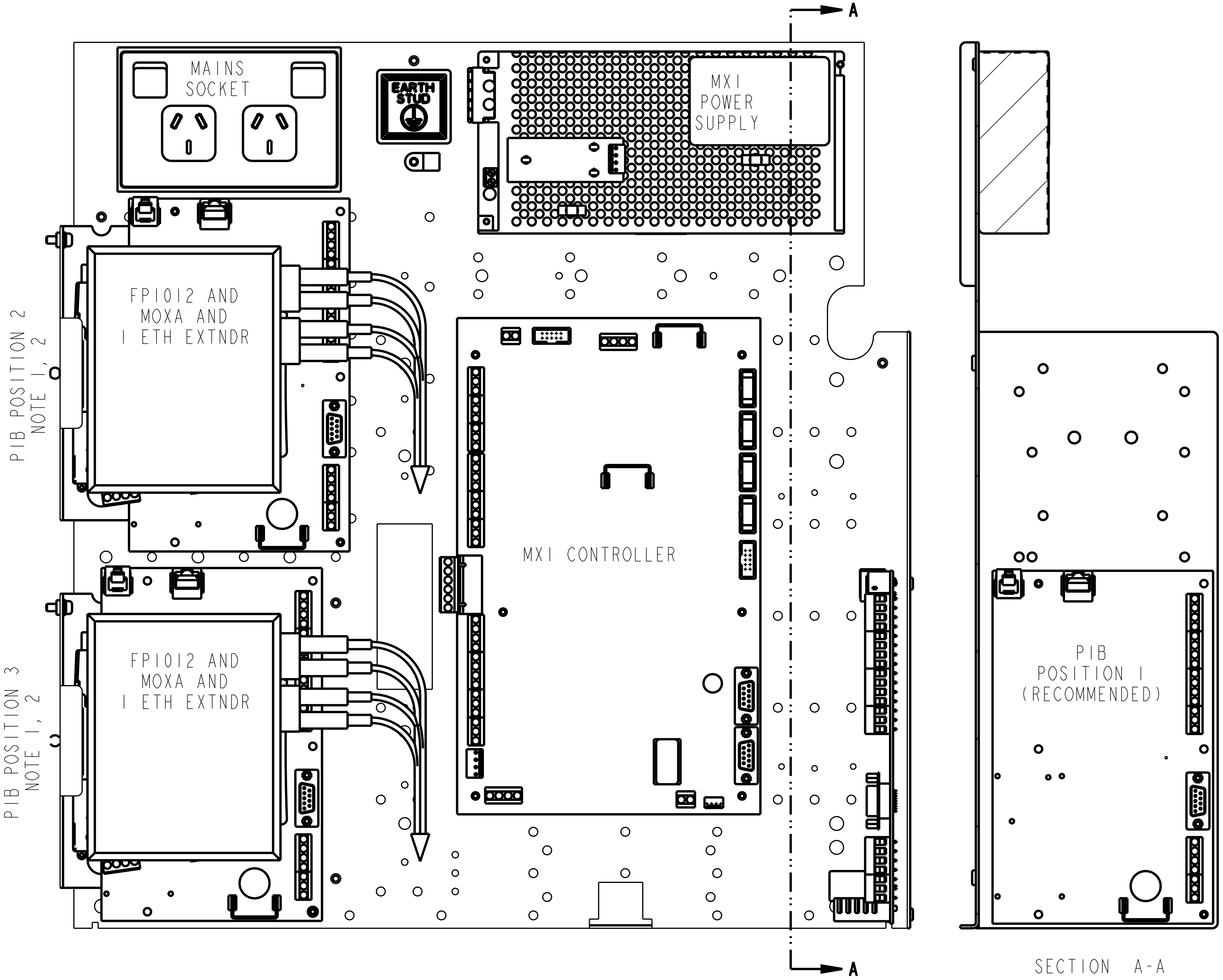
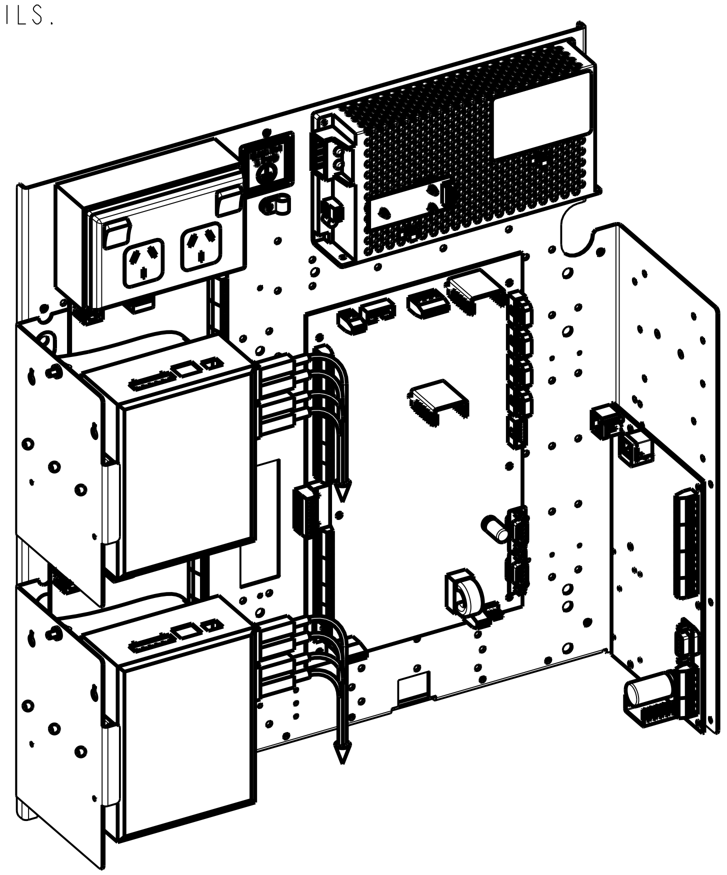
MX1
16 WAY RELAY BRD, MX LOOP BRKTS GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 143 of N

A3 ISS/REV D PART No:





ISOMETRIC VIEW SCALE 0.200

NOTES:

1. MOUNT PIB IN POSITION 1 OR 2 USING 2 OFF M3 M/F BARREL NUTS (FA2552) AND 2 OFF M3 X 6 SCREWS (SC0172) FITTED TO J17 AND J19. 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) ARE FITTED TO THE 4 REMAINING HOLES. BARREL NUTS AND PLASTIC DOUBLE BARB PCB STAND-OFFS ARE FITTED FROM GEAR PLATE FRONT.

MOUNT PIB IN POSITION 3 (NON-PREFERED) USING 5 OFF PLASTIC PCB STAND-OFFS PRE-FITTED TO THE GEAR PLATE AND 1 OFF M3 SCREW FITTED TO J17 ON THE BOTTOM RH METAL STAND-OFF.

2. MOUNTING THE PIB IN THE SAME POSITION AS THE FP1012 BRACKET IS A COMPROMISE. ONLY THE MOXA SWITCH OR 1 ETHERNET EXTENDER MAY BE ON THE FP1012 BRACKET, AND THE PIB LEDS ARE NOT VISIBLE.

3. THE MOXA SWITCH AND ETHERNET EXTENDER CLIP ONTO THE DIN RAIL ON THE FP1012 BRACKET. LEAVE A 10mm GAP EACH SIDE OF ETH EXTENDER FOR COOLING. CONNECT THE MOXA EARTH SCREW TO THE GEAR PLATE.

4. REFER TO INSTALLATION INSTRUCTIONS FOR FULL MOUNTING AND EARTHING DETAILS.

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
B	UPDATED FOR NEW REV GEAR PLATE.	4167	KJS	LSC	RC	DP	20-08-10
C	NOTES UPDATED, IP NETWORK EQUIP ADDED.	-	KJS	HW	RC	DP	12-4-13

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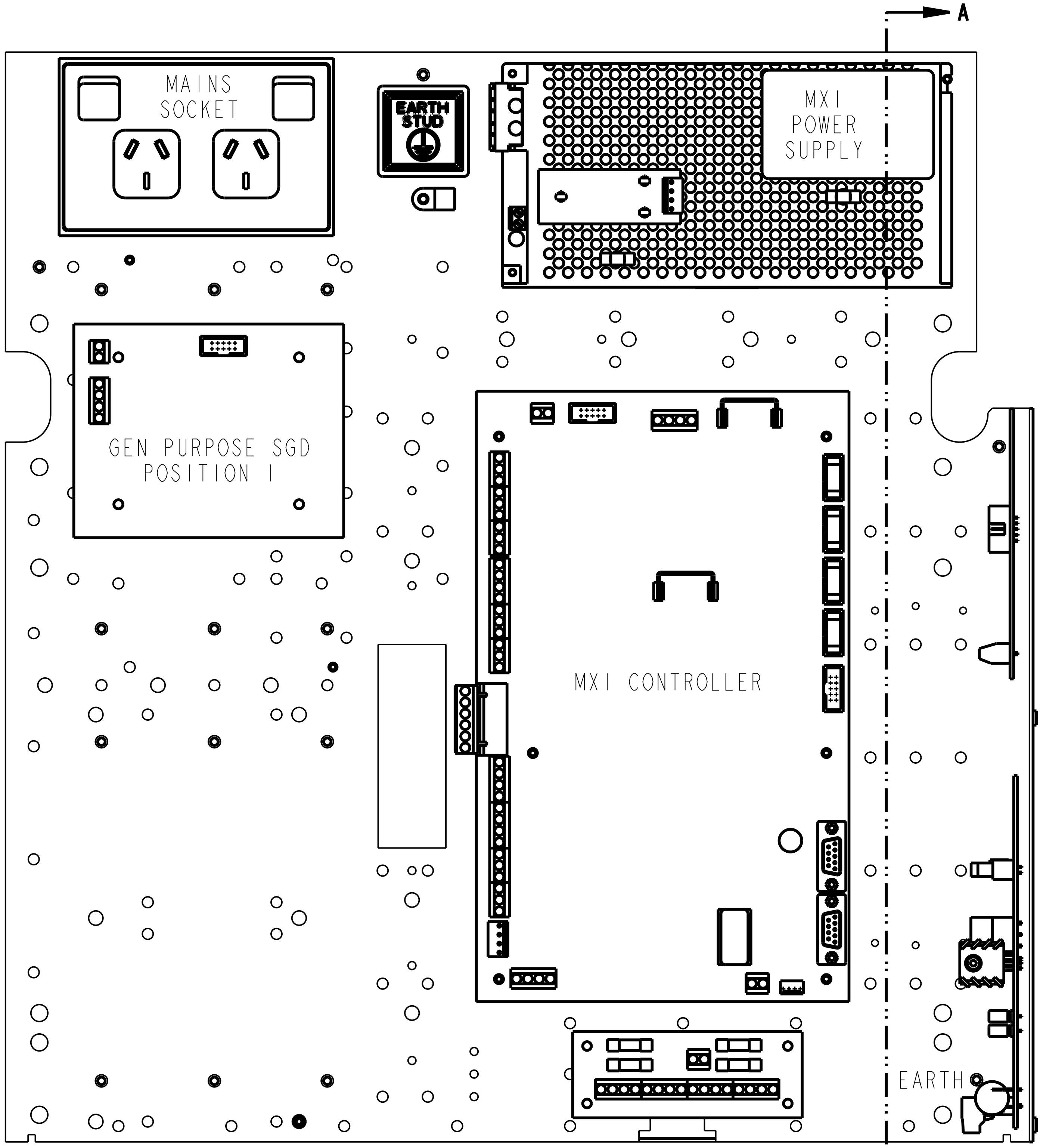
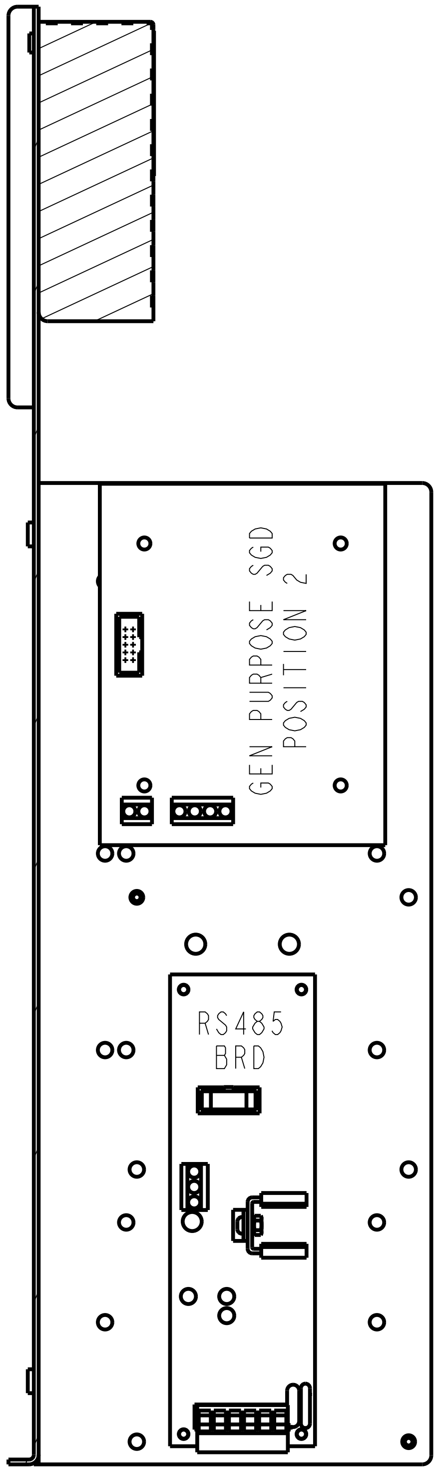
MX1 PIB / IP NETWORK EQUIP GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 144 of N

A3 | ISS/REV C | PART No:



FUSE BRD



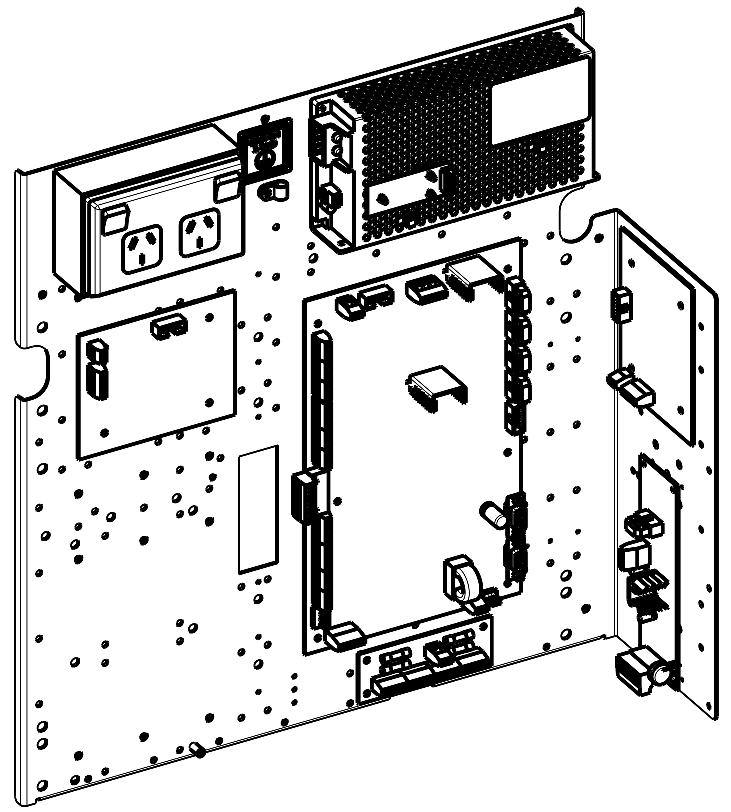
SECTION A-A

NOTES:

1. MOUNT RS485 BOARD USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0303) FITTED FROM GEAR PLATE FRONT. EARTH TO M4 SCREW IN BOTTOM RH CORNER.

2. MOUNT A GENERAL PURPOSE SGD (PA0862) USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0053) FITTED FROM GEAR PLATE FRONT.

3. MOUNT FUSE BOARD USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) FITTED FROM FRONT OF GEAR PLATE.



ISOMETRIC VIEW
SCALE 0.200

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
A	ORIGINAL	4167	KJS	LSC	RC	DP	20-08-10
B	SGD IN POSITION 1 ROTATED 180°	ECS1604	KJS	RC	RC	DP	22-11-11
C	FUSE BRD ADDED.	-	KJS	RC	RC	DP	12-4-13

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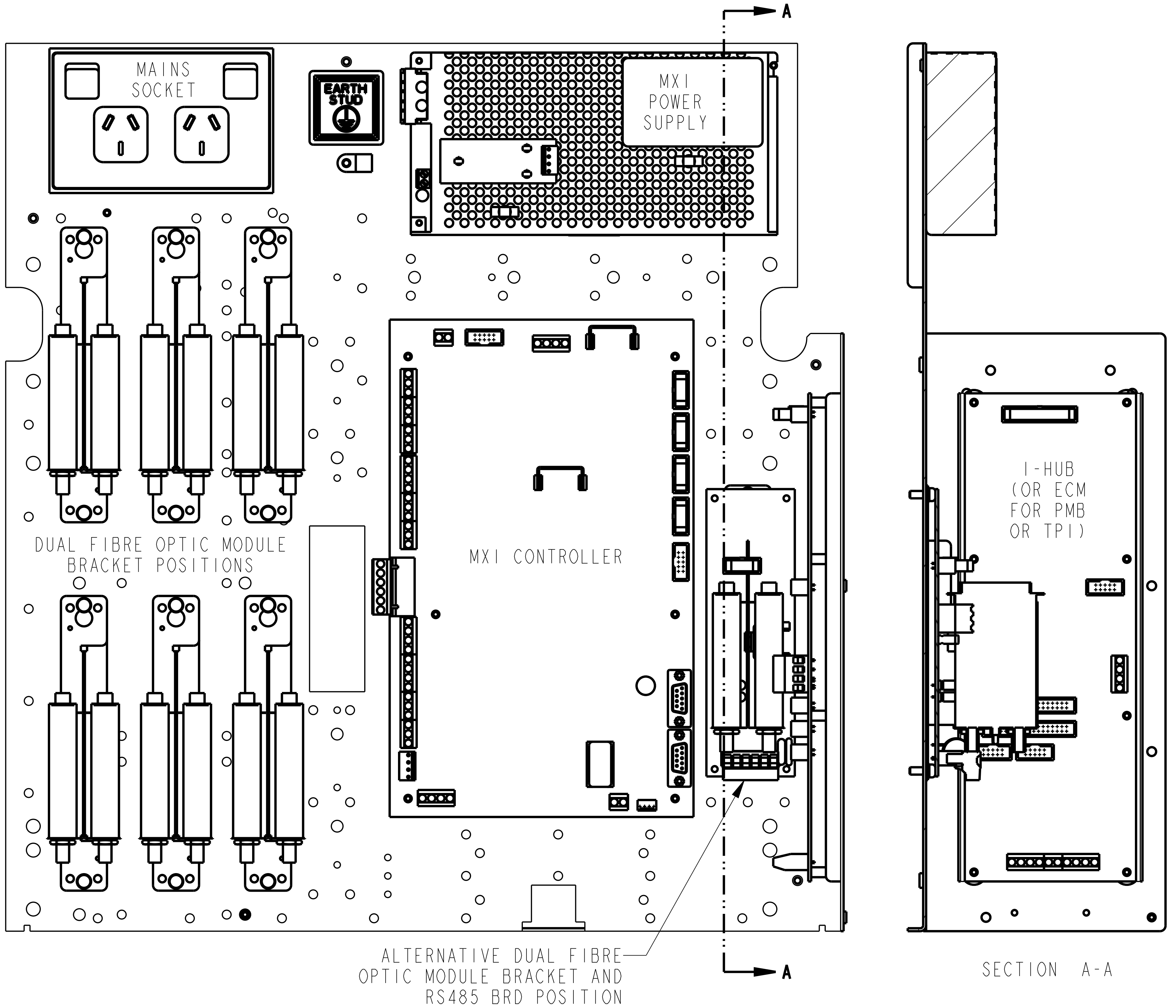
MX1
RS485 BRD, SGD, FUSE BRD GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 148 of N

A3 | ISS/REV C | PART No:

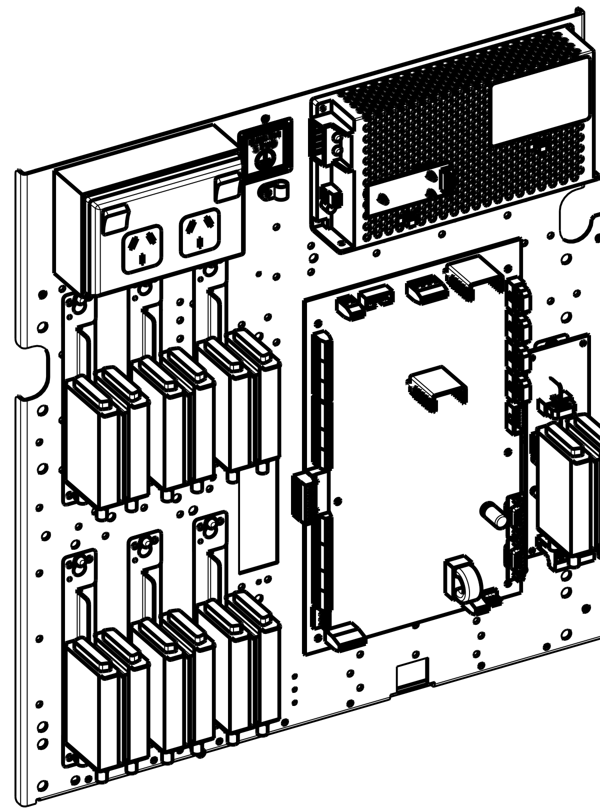


NOTES:

1. MOUNT THE I-HUB ON THE MOUNTING PLATE (FA2083) WITH 8 OFF M3 X 6 SCREWS (SC0172). MOUNT THE ECM MOUNTING PLATE ON THE GEAR PLATE SIDE FOLD USING 4 OFF M4 X 10 SCREWS (SC0176). M4 SCREWS FITTED FROM REAR OF GEAR PLATE SIDE FOLD.

2. MOUNT RS485 BOARD USING 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0303) FITTED FROM GEAR PLATE FRONT. EARTH TO M4 SCREW IN BOTTOM RH CORNER.

3. MOUNT THE DUAL OSD139 FIBRE OPTIC MODEM MOUNTING BRACKET (FP1032) IN 6 LH POSITIONS WITH 2 OFF M4 X 10 SCREWS (SC0176) SUPPLIED WITH BRACKET. ALTERNATIVELY AN FP1032 CAN BE MOUNTED IN THE RH POSITION WITH 2 OFF PK 6 X 3/8" SCREWS (SC0090) USING 2 OFF Ø3.00 HOLES PROVIDED IN GEAR PLATE.



ISOMETRIC VIEW
SCALE 0.200

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
A	ORIGINAL	4167	KJS	LSC	RC	DP	20-08-10
B	3 X GENERAL PURPOSE RELAY BOARDS ADDED.	4270	KJS	GEL	LSC	DP	19-05-11
C	3 X G P RELAY BRDS REMOVED, 7 X FIBRE OPTIC MODEMS ADDED	-	KJS	HW	RC	DP	11-4-13

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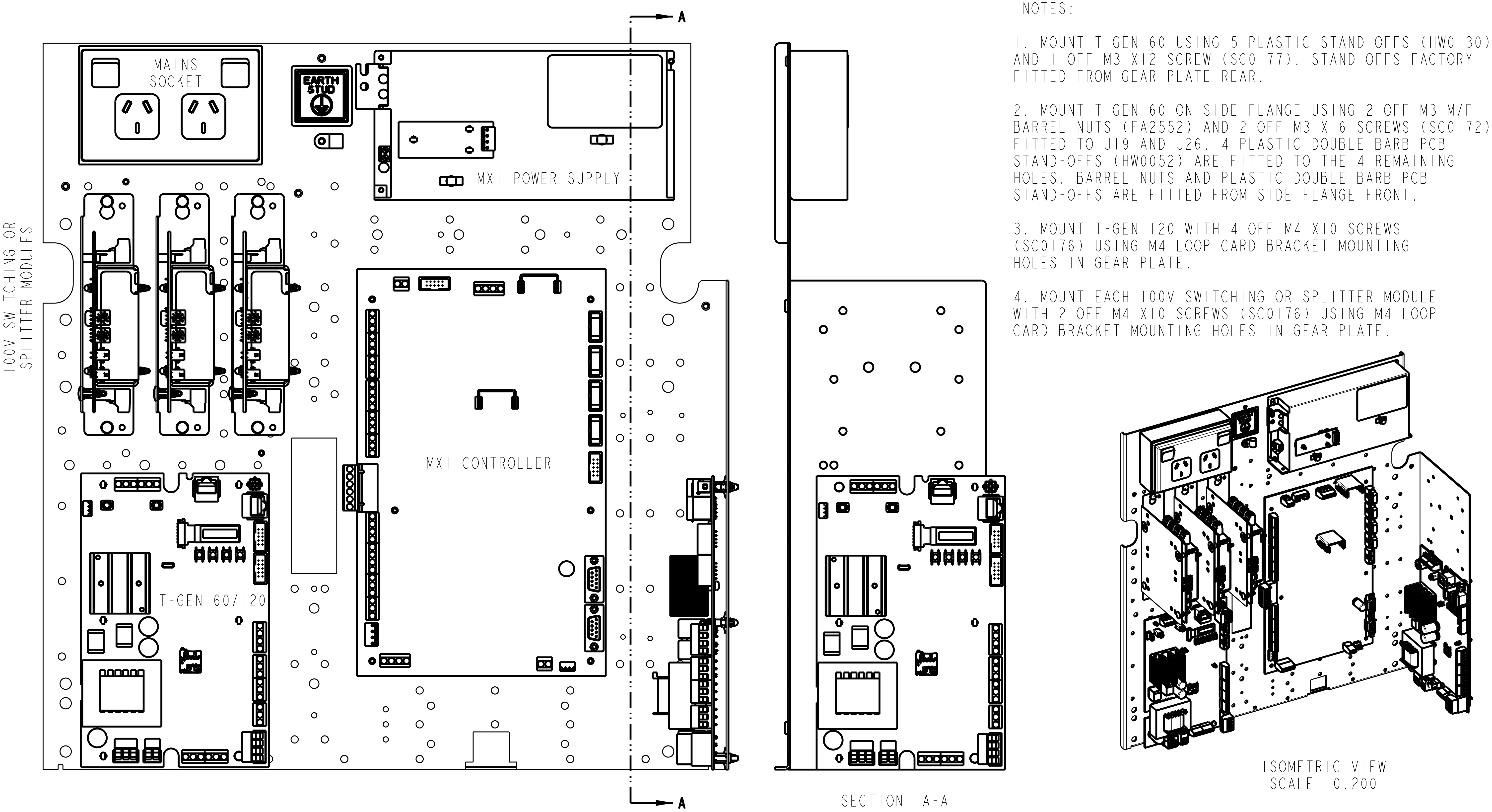
MX1 I-HUB / FIBRE OPTIC MODEMS GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 149 of N

A3 ISS/REV C PART No:



NOTES:

1. MOUNT T-GEN 60 USING 5 PLASTIC STAND-OFFS (HW0130) AND 1 OFF M3 X12 SCREW (SC0177). STAND-OFFS FACTORY FITTED FROM GEAR PLATE REAR.

2. MOUNT T-GEN 60 ON SIDE FLANGE USING 2 OFF M3 M/F BARREL NUTS (FA2552) AND 2 OFF M3 X 6 SCREWS (SC0172) FITTED TO J19 AND J26. 4 PLASTIC DOUBLE BARB PCB STAND-OFFS (HW0052) ARE FITTED TO THE 4 REMAINING HOLES. BARREL NUTS AND PLASTIC DOUBLE BARB PCB STAND-OFFS ARE FITTED FROM SIDE FLANGE FRONT.

3. MOUNT T-GEN 120 WITH 4 OFF M4 X10 SCREWS (SC0176) USING M4 LOOP CARD BRACKET MOUNTING HOLES IN GEAR PLATE.

4. MOUNT EACH 100V SWITCHING OR SPLITTER MODULE WITH 2 OFF M4 X10 SCREWS (SC0176) USING M4 LOOP CARD BRACKET MOUNTING HOLES IN GEAR PLATE.

UNLESS OTHERWISE STATED: ALL DIMENSIONS IN MILLIMETRES. DO NOT SCALE. TOLERANCES ARE TO BE: 1 DECIMAL PLACE ±0.5, 2 DECIMAL PLACES ±0.3, 3 DECIMAL PLACES ±0.1

3rd ANGLE PROJECTION

ISS/REV	AMENDMENTS	ECO	DRN	CHKD	AUTH	APVD	DATE
A	ORIGINAL	5053	KJS	RC	RC	DC	9-8-17
B	T-GEN 60 SIDE FOLD MTG ADDED.	5142	KJS	PV	RC	DC	15-10-18

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MX1
T-GEN2, 100V SWITCH/SPLITTER
GEARPLATE POSITIONS

DRAWING No: 1982-71 SHEET 169 of N

A3 ISS/REV B PART No:

10.3 *MX* Loop Card

One *MX* loop card can be mounted on the top right of the Slimline cabinet. Multiple *MX* Loop cards (FP0950) can be mounted inside the 15U *MX1* cabinet to provide additional loops of up to 250 *MX* devices each. Drawings 1982-71 sheets 140, 142 and 143 show some possible mounting positions.

The cards must be connected to the appropriate Serial Port Connectors on the *MX1* Controller to match the SmartConfig configuration.

Details on mounting the card and connecting it to the Controller for communication and power are detailed in the *MX* Loop Card Installation Guide (LT0443).

10.4 Application – Evacuation Input from Sprinkler System

A sprinkler system may be connected to an *MX1* for the purpose of activating the *MX1*'s alarm devices when the sprinkler system is activated. In general, since the sprinkler system will have a separate brigade signalling connection, this input should not be brigade calling.

10.4.1 Using a CIM800 or MIM800

Wiring

The alarm device output from the sprinkler system can be wired directly to the input module as shown in Figure 10.1. The CIM800 or MIM800 must be located adjacent to the sprinkler switch. For the CIM800 refer to Figure 6.5, using the circuit configuration and profile appropriate to the sprinkler output (normally open or normally closed). The EOLR for both the MIM800 and CIM800 is 200Ω.

"NO" and "NC" refers to the state of the switch when the system is normal.

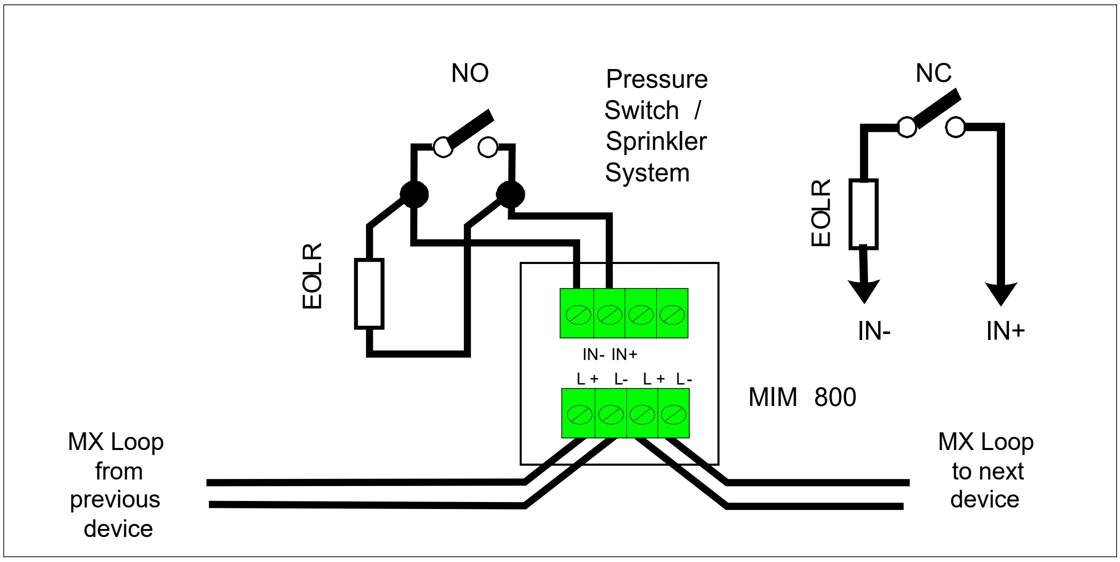


Figure 10.1 – Wiring of MIM800 to Sprinkler System

Configuration
Define a zone for the sprinkler input module which is to be alerting only.

- Latch Alarms - No
- Latch Faults - No
- Activate Alarm/Alerting Devices – No (ref. 10.4.3 for Alarm Device Activation)
- Route Alarms - No
- Route Faults - Yes
- Route Disables - Yes

A standard profile with these characteristics named "Sprinkler FBA/DBA" is supplied in the NZ Template.

Map the Input point to this zone. This sample shows typical settings for a MIM800:

- Point text – "Sprinkler"
- Alarm type text – "PSW" or "FSW" depending on source of activation
- Latching – No
- Can be disabled – Yes
- Profile – "N/O SC Alm OC Flt" for NO contact from sprinkler system, or
  "N/C SC FLT OC Alm" for NC contact.
- Delay Profile – none if the sprinkler system is already debounced (e.g. input from FBA/DBA Pressure Switch).
  - FS15 or similar input delay profile, if directly monitoring a flow switch.

See Section 10.4.3 for including the zone in the $DBA_INPUT_ACTIVE definition.

10.4.2 Using a General Purpose Input for a Sprinkler System Connection

Wiring
The alarm output from the sprinkler system can be wired to an *MX1* GP Input as shown in Figure 10.2. The EOLR can be any value between 1.5kΩ and 3.3kΩ. 2.7kΩ EOLRs are provided with the *MX1*.

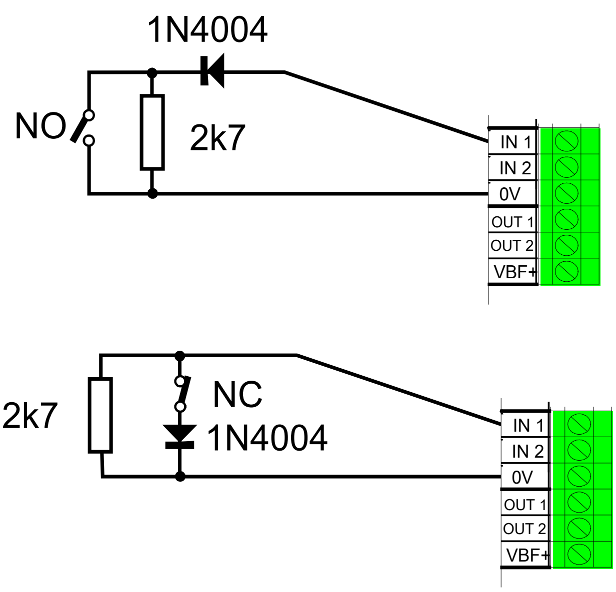


Figure 10.2 – Sprinkler System Connection to *MX1* via GP Input 1

Configuration
Define a zone for the sprinkler input which is to be alerting only, with these settings.

- Latch Alarms – No
- Latch Faults – No
- Activate Alarm/Alerting Devices – No (ref. 10.4.3 for Alarm Device Activation)
- Route Alarms – No
- Route Faults – Yes

A standard profile with these characteristics named "Sprinkler FBA/DBA" is supplied in the NZ Template.

Map the GP Input to this zone. This sample excerpt from the "Controller Points" window of SmartConfig shows settings for the GP Input 1 point:

- Type – GPIN1
- Subpoint Desc – Input
- Zones – zzz as required
- Pt Text – Sprinkler
- Alarm Type Text – FSW or PSW as appropriate
- Can be Disabled – Yes
- Supervision Mode – Evac Input (NO) or Evac Input (NC)

Note: if a General Purpose Input is connected to a sprinkler system in this way, there are no significant debouncing delays to mask the effect of waterhammer, etc., so the output from the sprinkler system must already be debounced.

If a GP Input is used to directly monitor a flow switch and it has no built-in delay, then a logic equation should be used to provide a suitable delay into alarm, as follows:

```
;delay the activation by 15 seconds
TSnnn (15,1)FO = P241/2/0AI
;use the timer to create a pseudo point alarm
PP242/pppAL = TSnnn
```

The pseudo point ppp must be mapped to the sprinkler zone, and have an Alarm Type Text of "FSW" for correct display on the front panel.

See Section 10.4.3 for including the zone in the $DBA_INPUT_ACTIVE definition.

10.4.3 Alarm Devices Activation by a NZ Sprinkler System

In New Zealand, the zone controlled by the sprinkler system input must not be able to be silenced by the Fire Alarm Panel. This will not be achieved simply by mapping the zone to the Alarm Devices, since these can be disabled or silenced from the front panel. This requirement is met by additional logic to directly control the alarm device relay(s). In the NZ templates there will already be an equation in the System Logic window, of the form:

```
;  If a Sprinkler FBA/DBA is used, change the definition of
$DBA_INPUT_ACTIVE in the Logic Substitutions
V983 = ( ( ADO OR TEV OR $DBA_INPUT_ACTIVE OR . . .
```

For configurations based on NZ Template v1.0 to v1.20:

- In the user logic window, change the equation for $DBA_INPUT_ACTIVE to:
  $DBA_INPUT_ACTIVE = ZxxxAL - where zzz is the sprinkler zone, as defined earlier.

For configurations based on NZ Template v1.21 and later:

- Zone Group 3 is allocated to sprinkler system operation. Create a zone for indication and assign zone profile “Sprinkler FBA/DBA” to this zone. Map the input device(s) to this zone.

10.5 Application - External fault input

Fault outputs from ancillary equipment can be connected by several methods to the *MX1* to generate a fault signal and indication, and fault routing, if required.

Wiring

The fault output can be connected to the *MX1* via one of the General Purpose Inputs or an input module on the *MX* Loop. In either case, the wiring to the ancillary fault output can be supervised for open circuit fault as well.

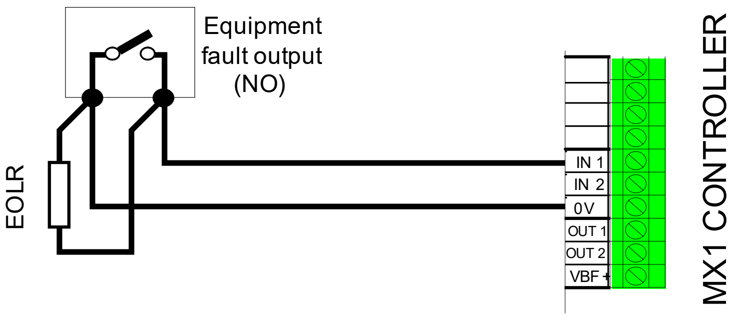


Figure 10.3 – Ancillary Equipment Fault Output Connection to *MX1* via GP Input 1

The EOLR for the GP Input can be any value between 1.5kΩ and 3.3kΩ. 2.7kΩ EOLRs are provided with the *MX1*.

The GP Input is directly compatible with an NPN type open-collector output from the ancillary equipment. However, this means that the *MX1* 0V and the ancillary equipment 0V are directly connected together. If the *MX1* and the ancillary equipment are not located close together, this may lead to harmful noise pickup from other electrical equipment leading to faults or damage of the *MX1* or ancillary equipment.

This can be avoided by using a separate relay at the remote ancillary equipment controlled from the open collector output and with the NO contacts connected to the *MX1* GP Input.

An isolating relay must also be used if an input module is to be used with an open collector fault output from the ancillary equipment.

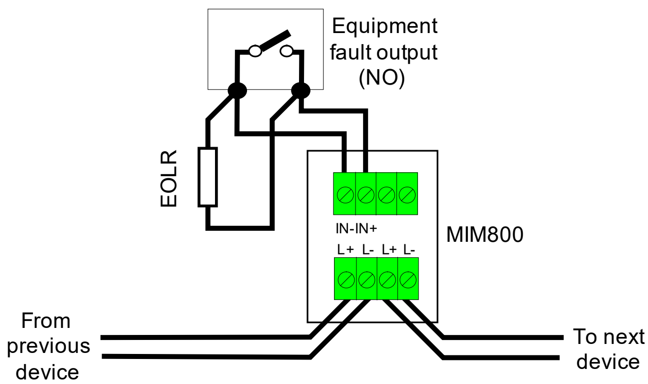


Figure 10.4 – Ancillary Equipment Fault Output Connection to *MX1* via MIM800

The EOLR value for the MIM800 is 200Ω.

Optional Zone Configuration
If indication of the fault is required on a zone indicator, define a zone for the fault input which is to route faults only, with a profile like this:

	Latch Alarms	Latch Faults	Activate Alarm/ Alerting Devices	Route Alarms	Route Faults		Add to Alarms List		Alarm Testable	Map To Fault Buzzer	Map To Alarm Buzzer	Sil Alarms Restore Disable
…	No	No	No	No	Yes	…	No	…	No	...	No	No

Map the zone to the LED.

Point Configuration
If using a GP Input then assign a profile of “Ext Fault” to the input.

If using an input module the input point should be configured with a profile with short circuit as fault and open circuit as fault, such as N/O SC FLT OC FLT.

If zone LED indication is required, map the input to the zone configured in the previous section. Otherwise, just change the “Point Flags” profile of the point to “Map Fault to Brigade”.

10.6 Application - Remote Buzzer Output

The *MX1* buzzer can be configured to sound if there is a fault in the system. In non-brigade-connected situations where this buzzer would not be sufficiently loud to attract attention, an external fault sounder can be connected and sited where it will be heard.

The buzzer should be located where staff are able to hear it and it should be clearly labelled “FIRE ALARM FAULT BUZZER, ADVISE FIRE ALARM SERVICE COMPANY” or equivalent approved legend.
A suitable 24V buzzer type is Murata PKB6-540 (SN0001) or OBO 54-35C1 (SN0017).

See Section 10.7 for configuration of a fault buzzer cancel switch input.

The NZ Local system profile automatically configures the brigade Disable/ISO relay for an external defect sounder.

Wiring
The external fault buzzer can be controlled from the Brigade Disable/ISO relay as shown in Figure 10.5. Note that in local mode this relay is normally de-energised, and is energised when there is a defect.

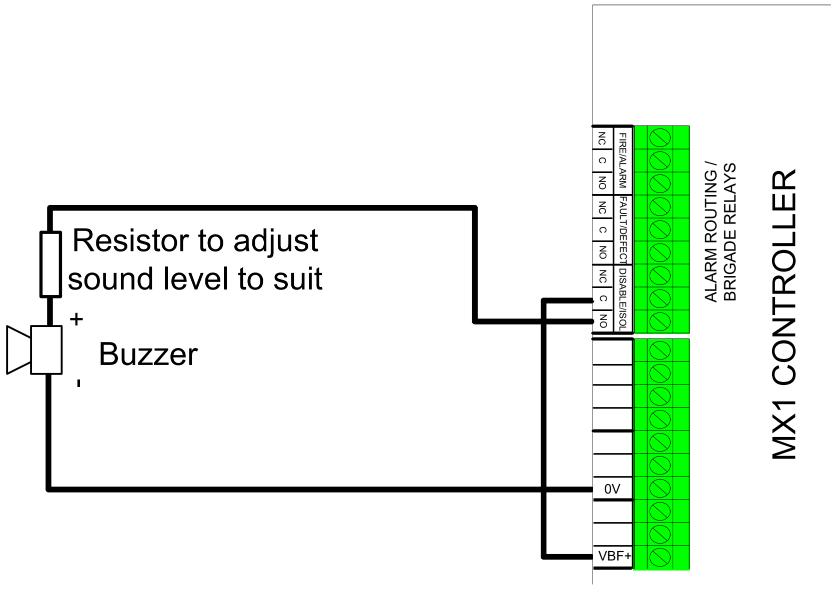


Figure 10.5 – External Fault Sounder Wiring Details

For external fault buzzer control, the Disable/ISO relay should operate briefly at 30 second intervals to minimise unnecessary nuisance to staff working near the buzzer. This is done automatically by the NZ Local system profile.

10.7 Application - Fault Buzzer Cancel Input

In installations using a remote fault buzzer (see 10.6), it may be desirable to have provision for staff to acknowledge it and cancel the sounder operation. In general, local standards require that this buzzer cancel facility be self-resetting, i.e., if the fault clears and then recurs, the buzzer will start sounding again.

Wiring
A push button to cancel the fault buzzer should be mounted in a location accessible by staff authorised to use it, but away from access by unauthorised staff. This control is a simple normally-open momentary contact, wired to one of the GP Inputs on the *MX1* Controller. The following assumes that GP Input 1 has been used, but applies equally to using GP Input 2 instead or other input devices such as a MIM800.

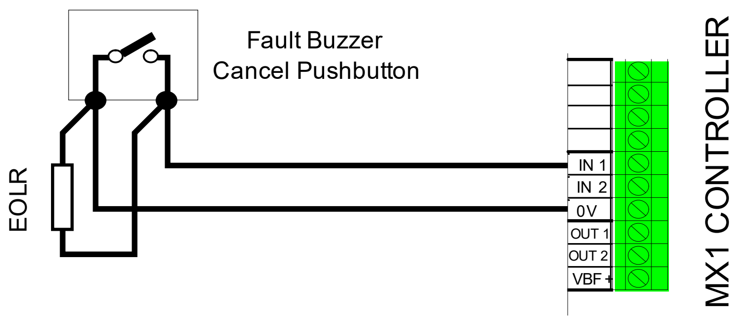


Figure 10.6 – Fault Buzzer Cancel Pushbutton Connection to *MX1* via GP Input 1

The EOLR for the GP input can be any value between 1.5kΩ and 3.3kΩ. 2.7kΩ EOLRs are provided with the *MX1*. The GP Input profile must select Band 1 and Band 2 as Active, Band 3 as Normal and Band 4 as Fault. For template V1.30 or later, the “GPIn Fault Buzzer Cancel” profile can be used.

Configuration
The GP Input's active state is entered into the $LOCAL_DEFECT_CANCEL equation.

10.8 Application – Non-Brigade-Connected Operation

The simplest way to produce a non-brigade connected configuration is to use the NZ Local system profile, which automatically disables the brigade signalling, configures external defect sounder and adjusts the operation of the keypad and keypad sounder to suit.

This method cannot be used for *MX1* with V1.00 Controller Firmware.

10.9 Application – Door Holder Control

Door holders for smoke stop doors are normally powered from the non-battery-backed supply. During non-alarm conditions, the door holders are energised, being released on alarm conditions.

Wiring
The wiring to achieve this using the Ancillary Relay 2 on the Controller, with supervision for open circuit of both positive and negative wiring, is shown in Figure 10.7. Ancillary Relay 1 could equally well be used.

Ancillary Relay 3 could also be used, but does not have an appropriate supervision mode.

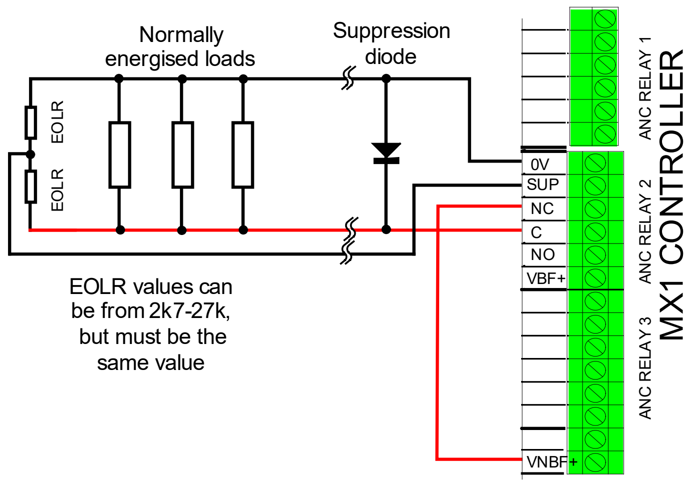


Figure 10.7 – Door Holder Wiring to Ancillary Relay 2 with Supervision

The EOLR resistors for the door holder chain can use the EOLRs supplied with the *MX1* that are not otherwise used. There will almost always be a pair of 18kΩ or 27kΩ resistors left over.

Configuration
In the "Controller Points" window, for the "Anc2 Supervision" point (ANC2S), select supervision mode as "Door Holder".

In user logic, the "Ancillary Relay 2" point should be set to follow the alarm devices token. This token already incorporates the effects of disablements, alarms silencing, and direct drive of alarm devices, so these do not have to be allowed for.

A logic equation is required to control Ancillary Relay 2 of the form:
`$ANC2_RELAY = $ALARM_DEVICES_ON`
so that Ancillary Relay 2 operates on alarm and de-energises the door holders.

10.10 Application – Event Logging Printer

During its operation, *MX1* generates event messages when the states of internal elements change. These messages are held in non-volatile storage and can be viewed on the front panel display, but only the most recent 900 events are retained, with older messages being lost.

A printer can be connected to the *MX1* to capture all these event messages as hard copy print out.

The MX4428 thermal printer, part number FP0546, is suitable, and can be powered from the system 24V supply with Printer option Kit FP0545. Note that a serial crossover cable (LM0076) will also be required for use with *MX1*. Note also, that this printer has a standby current draw of 100mA which must be included separately in the battery calculations.

Other serial-input mains-powered printers may also be used – refer to 'Wiring' and 'Configuration' below.

Events which are printed include:

- Zone and Point Events, e.g. Alarm, Fault;
- Zone and Point Commands, e.g. Reset, Isolate;
- System events, e.g. communication failures, battery faults, etc.

Zones and point events can be individually configured to be logged to the internal event history or to the event printer, or to both. This is controlled via the Logging Profile assigned to the zone or point.

The event printout includes the time and date, the cause of the event, and the event type. Events and commands for zones and points that have a text name programmed also have the name printed. *MX1* is able to store at least 900 events for printing, being the first 900 events to occur.

As events are printed, more events are able to be put into the list. If events cannot be put into the list because it is full, the *MX1* keeps a count of those events it has had to discard.

When the *MX1* is next able to put more events into the list, it prints out the number of events it had to discard.

Wiring

The printer's serial input port is connected to the Serial Port 1 connector (J23) on the *MX1* Controller. The connecting cable must be a "crossover" or "null modem" type with female DB9 connectors at both ends. Part number LM0076 is a suitable cable for this.

Many printers have serial ports with the Signal Ground connected to the incoming mains earth lead. Connecting such a printer to *MX1* will cause an Earth Fault, since it will also earth the 0V of the *MX1*. This can be dealt with in one of several ways:

- Ignore it – if Earth Fault monitoring can be ignored without sacrificing the reliability and serviceability of the *MX1* system, then the Earth Fault point can be configured in SmartConfig to be hidden and not logged. Most templates will have suitable

Points Flags and Logging profiles for this.

- Use an isolating transformer to power the printer. A rating of 250VA is typically the smallest size of isolating transformer available, and this should be sufficient for almost any small dot matrix or inkjet printer.

- Use a serial isolating device on the serial connection between the printer and the *MX1*. There are a number of commercial units which could be used for this purpose. Note that this option will be no less expensive than the isolating transformer option, and may not be any more compact. Isolating transformers are generally much more readily available than these serial isolation devices.

Configuration

MX1
In the “System” window of SmartConfig,

- Select a baud rate to match the printer. In general, there is no advantage in a higher rate than the actual printing can keep up with, so in most cases, a rate of 1200 bps will be quite adequate.
- Select the number of lines per page. For A4 sized paper, the default of 60 lines is usually acceptable.
- Check or uncheck the selection boxes for the other printer options, as required.

Event messages are always sent to Serial Port 1 whether there is any device connected to it or not. There is no need to enable the output of event messages.

Printer
Referring to the printer’s documentation,

- Select a baud rate to match the setting in *MX1*. If there are several ports on the printer, select the one that is connected to the *MX1*.
- Select the data format to be 8 bit characters, with no parity checking.
- Set the printer to a page length matching the paper being used, e.g., 11 inches for Letter size, 11.7 inches/297mm for A4 size.

10.11 Application – Avoiding Relay “Chatter”

Logic equations are used directly or indirectly to control most of the relay outputs in an *MX1* system. The complete set of logic equations is processed by the *MX1* Controller several times per second. Therefore, it is possible that an equation controlling a relay using an input that was unstable or unfiltered could result in the relay chattering, i.e., operating and releasing several times a second, in time with the logic equation processing.

This is not harmful to the relays themselves, but if these relays are controlling large loads or heavy machinery such as lifts or air handling equipment, this rapid switching could result in overheating, overload, or other damage to this equipment.

When using relays for such purposes, it is good practice for the controlling logic equations to include timers to prevent rapid on-off switching of relays in response to rapidly changing inputs.

Wiring
There are no specific wiring requirements with this application.

Configuration
These equations use a variable and a pulse timer to limit the speed at which the output can change.

```
Veee = ((controlling_expression) AND NOT Tlll) OR (Veee AND Tlll)
TSlll(0,2)PU = VeeeE
Output_relay_point = Veee
```

If the controlling expression is simple, it can be incorporated directly in the first equation. If it is more complicated, it is preferable to use another variable to store the value and use this variable as the controlling expression in the first equation above.

The pulse timer is set every time the variable changes state, and the variable is held in its current state until the timer resets (in this example, after 2 seconds). Once the timer has reset, the variable follows the controlling equation again. This means that the variable will not change any more rapidly than one period of the pulse timer.

This “anti-chatter” method will respond immediately to an input change to operate the relay after a long period of being released. This can lead to false activations if the controlling expression includes input states that are not debounced or filtered. Any such inputs can be groomed by using a follow timer in this way:

```
TSfff(2,3)FO = noisy_input_point  ; 2 second ON filter, 3 second OFF filter
```

In this example, the timer output will not follow the state of the input point until this has been continuously TRUE for at least 2 seconds, or continuously FALSE for at least 3 seconds.

10.12 Application – Control and Isolation of Ancillary Outputs

10.12.1 Options for Control

When the *MX1* is serviced, critical ancillary outputs such as air conditioning, plant and machinery shutdown must be disabled to prevent unwanted operation. To assist with this, the *MX1* V1.2 onwards Template provides the following facilities and text substitutions that should be combined with the logic equations driving these outputs.

$DOOR_CLOSED: This text substitution is true when the *MX1* lock is turned to the fully clockwise (door and keypad locked) position. It may be used to enable ancillary outputs when the *MX1* door is closed (and locked) and disable them when the door is opened for service (or the keypad enabled).

Note:
(a) The door will need to be closed or the door micro switch temporarily operated, to test that the outputs *do* operate when required.
(b) Outputs controlled in this way will be automatically disabled when the keypad is enabled by turning the key in the lock, even if the door is not fully opened.

Zone 999 and $AI: Zone 999 is preconfigured in the NZ *MX1* Template V1.2 and later as an Ancillary Control Zone called 'Ancillary Outputs". If there is a single ancillary output, it may be mapped directly to this zone or if there are a number of different ancillary outputs, these may be driven by logic equations that reference the "disabled" state of this zone (Z999DIS). Either way, when Zone 999 is disabled, the ancillary outputs will be inhibited (refer example below). The preconfigured text substitution $AI may be used in a logic equation instead of "Z999DIS". The letters "AI" stand for **A**ncillary **I**solate.

Ancillary Groups: *MX1* V1.34 and later has 4 Ancillary Groups, which can be used in output logic to inhibit ancillary outputs in a manner similar to zone 999 (refer to Section 10.12.2).

BSR: This *MX1* logic token is true when the Services Restore Switch on the front of the *MX1* or at any RDU is operated. It should be used in logic equations to cause the Ancillary Outputs to restore to normal after a building has been cleared for reoccupation following a fire alarm, but before the fire alarm panel has been reset.

Application
In practice, all of the above facilities should be used in combination to control and isolate *MX1* Ancillary Outputs.

Use "$DOOR_CLOSED" in the Ancillary Relay equation to temporarily disable the output during short-term operations such as monthly testing.
Use Zone 999 and/or $AI and/or Ancillary Groups 0-3 to provide a more permanent method of disabling the outputs when the output is to be left non-functional while the system is unattended. Disable states of zones and points are stored in non-volatile memory and so are retained when the *MX1* is powered down. Disabling Zone 999 or any of the Ancillary Groups will cause the “Disables” indicator on the *MX1* control panel to turn on.

Use BSR to enable the outputs to be restored to normal after an alarm.

As of V1.70 disabling one of the Ancillary Groups (0, 1, or 2) will cause the door interlock sounder to operate.

Example of use
Ancillary Relay 2 is to be used to shut down the air conditioning in the building when the fire alarm system operates. However it is important that the air conditioning is not shut down during monthly or annual testing of the fire alarm system, except when this particular operation is being tested. After the building has been cleared for re-entry following a fire alarm, the air conditioning must be able to be restarted by operation of the Services Restore Switch at the fire alarm panel.

```
$ANC2_RELAY = BRALM AND $DOOR_CLOSED AND NOT BSR AND NOT $AI
```

10.12.2 Using Ancillary Groups

MX1 has 4 Ancillary Groups, easily accessible through the *MX1* user interface to enable or disable outputs. Using these, a system designer can program the *MX1* to have up to 4 separately controllable groups of building services.

Each group is able to be individually enabled and disabled, and this is equivalent to the enable/disable status of a controller status point. The disable status of the controller point can be used in output logic to control the building services. *MX1* templates provide logic substitutions which simplify the integration of the disabled status into output logic.

The 4 Ancillary Groups control points P241/31/0 through P241/31/3, named “Ancil Group 0” through “Ancil Group 3”, respectively. Each point should be given suitable point text to describe what the Ancillary Group will be used for. Each point has an associated logic substitution, $ANCDIS0 through $ANCDIS3. These substitutions are used in output logic to control the ancillary functions.

Note: As of the default V1.70 template disabling an Ancillary Group (0, 1, or 2) will cause the door interlock sounder to operate. To stop this for particular Ancillary Group(s) search for the $DOOR_INTERLOCK_EXTRAS assignment line in user logic and remove the terms for the Ancillary Groups that you don’t want the interlock sounder to activate for.

Note: The standard *MX1* NZ templates V1.30 or later predefine Ancil Group 3 (the fourth group) to be used for disabling the printer output. The use of Ancil Group 3 for this purpose is not mandatory, and its function can be re-assigned.

Examples of how to use Ancillary Groups are in Section 10.12.3.

10.12.3 Ancillary Groups Example

A simple method is to use the ancillary group point's disable status to stop outputs being operated.

```
$ANC1_RELAY = CZBRALM AND NOT $ANCDIS0    ; lifts shutdown
$ANC2_RELAY = CZBRALM AND NOT $ANCDIS1    ; air conditioning shutdown
```

Both relays turn on for a brigade alarm, unless the corresponding Ancillary Group is disabled. These equations could allow a technician to confirm operation of the lifts (Ancillary Group 0 enabled) while preventing the air conditioning from shutting down (Ancillary Group 1 disabled).

For a more complicated example, consider the use of Ancillary Group3 for disabling output from the printer, which is pre-programmed into the standard NZ template V1.30 or later. This shows how an Ancillary Group can be programmed with text and be integrated into output logic, including using output logic to update the Ancillary Group disable state.

The Printer Output point, P241/27/14, is programmed with a Point Text of **Printer Output** and has a logging profile of **Log All**, and a Point Flags profile of **Off normal Recall, no test**.

The Ancillary Group 3 Disable point, P241/31/3, is programmed with a Point Text of **Printer Output** and has a logging profile of **Log Nothing**, and a Point Flags profile of **No off normal, no test**.

Output from the *MX1* printer port is enabled when Point P241/27/14 Printer Output is not disabled. Instead of having to remember the correct point number to enable and disable, the following logic links Ancillary Disable 3 to the Printer Output point, such that the disable states of the two points are kept synchronised. Thus, a user can more easily stop printer output by disabling Ancillary Disable 3. This logic makes use of logic substitutions and concatenation of tokens (using #), and also shows how output logic can be used to update the Ancillary Disable status.

```
;  ==================================================================
; Printer Output Control
;   Ancillary Disable 3 is used to control the printer output.
;           Get current disable states for Printer Control and Ancillary Disable 3. Then see if have to change the other to match.

; get the disable status of the printer control status point
$PNT_PRINT_CONTROL_DIS = $PRINT_CONTROL_DIS
; disable Ancillary Group 3 if it is not disabled and the printer is disabled.
$ANCDIS3 = $PNT_PRINT_CONTROL_DIS#P and not $ANC_PRINT_CONTROL_DIS
; enable Ancillary Group 3 if it is disabled and the printer is not disabled
$ANCDIS3ENA =  $PNT_PRINT_CONTROL_DIS#N and $ANC_PRINT_CONTROL_DIS
; get the disable status of Ancillary Group 3
$ANC_PRINT_CONTROL_DIS = $ANCDIS3
; disable the printer if it is not disabled and Ancillary Group 3 is disabled
$PRINT_CONTROL_DIS = $ANC_PRINT_CONTROL_DIS#P  and not $PNT_PRINT_CONTROL_DIS
; enable the printer if it is disabled and Ancillary Group 3 is not disabled
$PRINT_CONTROL_ENABLE =  $ANC_PRINT_CONTROL_DIS#N and $PNT_PRINT_CONTROL_DIS
```

10.13 Application - Generating Alarms and Faults using Output Logic and Pseudo Points

There are some circumstances where it is desirable to generate an alarm condition from some combination of statuses that are not direct alarms from detectors, sensors or other field inputs. For example, generating a brigade calling alarm if a non-brigade calling alarm exists for more than, say 15 minutes, or generating an alarm for some combination of inputs not supported by zone processing.

One method to produce such an alarm is to have output logic operate an output that is wired back into an alarm generating input. However, this uses up system inputs and outputs unnecessarily.

MX1 allows for alarms, and faults, to be created from output logic equations by using pseudopoints, which removes the need for external I/O and wiring.

From the *MX1* perspective, pseudopoints are handled as real points able to be mapped to zones, can be disabled, have point flags profiles assigned, and so forth like other points in the system. They differ from other points in having no physical existence from which to generate alarm and fault conditions. Instead, a pseudopoint's alarm and fault status is determined by output logic equations. When the logic equation that determines a pseudopoint's alarm status goes TRUE, the pseudo point enters the alarm state, which is then processed as any other point alarm - events can be logged, mapped zones go into alarm, etc. When the logic equation that determines a pseudopoint's alarm status goes FALSE, the pseudo point exits the alarm state, any mapped zones can be reset, and so forth.

10.13.1 Examples

Example 1:
To call the brigade if a non-brigade calling zone, Zone 5, is in alarm for more than 20 minutes, using pseudopoint 1 mapping to Zone 1, which is a brigade calling zone.

a) Configure pseudo point 1, P242.1.0. Map the point to Zone 1, enter appropriate point text. Set its logging profile as desired. Set its Point Flags profile to **Standard**.

b) Configure the logic equation:

```
TM1(20,0) FO = Z5AL    ; Timer 1 goes true after zone 5 is in alarm for 20 minutes.
PP1/0AL = T1           ; PP 1 goes into alarm when the timer runs out.
```

When zone 5 goes into alarm, the timer starts. After 20 minutes the timer output goes TRUE, which makes pseudo point 1 go into the alarm state. The normal point to zone mapping process puts Zone 1 into alarm and calls the brigade.
Example 2:
To signal a fault if a user disables a specific zone, for example, Zone 12.

a) Configure pseudo point 2, P242.2.0. Enter appropriate point text. Set its logging profile as **Log All**. Set its Point Flags profile to **Map Fault to brigade, no test**.

b) Configure the logic equation:

```
PP2/0FA = Z12DIS            ; PP 2 goes into fault if zone 12 is disabled.
```

If Zone 12 is disabled, pseudo point 2 goes into fault and directly signals to the monitoring centre by activating the fault relay.

10.14 VIO800 Application for LaserPLUS or LaserSCANNER

For the VIO800 application the MIO800 is supplied on a mounting bracket ready for installation behind the left-hand cover of the LaserPLUS or LaserSCANNER.

The recommended wiring between the MIO800 and the LaserPLUS or LaserSCANNER is shown in Figure 10.8. With this arrangement the states transmitted by the MIO800 inputs and outputs are:

- Input #1 = Fire1 and Urgent Fault
- Input #2 = Action and Minor Fault
- Input #3 = Alert and PSU Fault
- Output#1 = Reset (optional)

These should be programmed in the *MX1* as required. A suitable MIO800 profile called "VIO800-LaserPLUS LaserSCANNER" is available in SmartConfig to set the input thresholds. The inputs should be mapped to appropriate zones as required, and output logic written for the reset output if required.

Wiring Details

The relays on the VESDA may be used in their default configuration subject to the following caution.

Caution: In the default configuration, isolating the VESDA unit will stop the VESDA creating any alarms or faults, but this is not indicated on the relay outputs wired to the MIO800. It is recommended that the VESDA unit be programmed so that Relay 3 drops out for Urgent Fault or Isolate. This way isolating the VESDA unit creates a fault on the *MX1*.

In their default configuration, the alarm relays on the VESDA are normally non-energised and latching and the fault relays are normally energised and latching. The following table provides full details.

Relay #	Default Signal	Default State	Latching	VIO800 – Standard Configuration
1	Isolate	non-energised	Not applicable.	NOT REPORTED *
2	Minor Fault	energised	Yes	Reported as S/C on I/P #2
3	Urgent Fault	energised	Yes	Reported as S/C on I/P #1
4	Alert	non-energised	Yes	Reported as alarm on I/P #3
5	Action	non-energised	Yes	Reported as alarm on I/P #2
6	Fire 1	non-energised	Yes	Reported as alarm on I/P #1
7	Fire 2	non-energised	Yes	NOT REPORTED

* See caution above

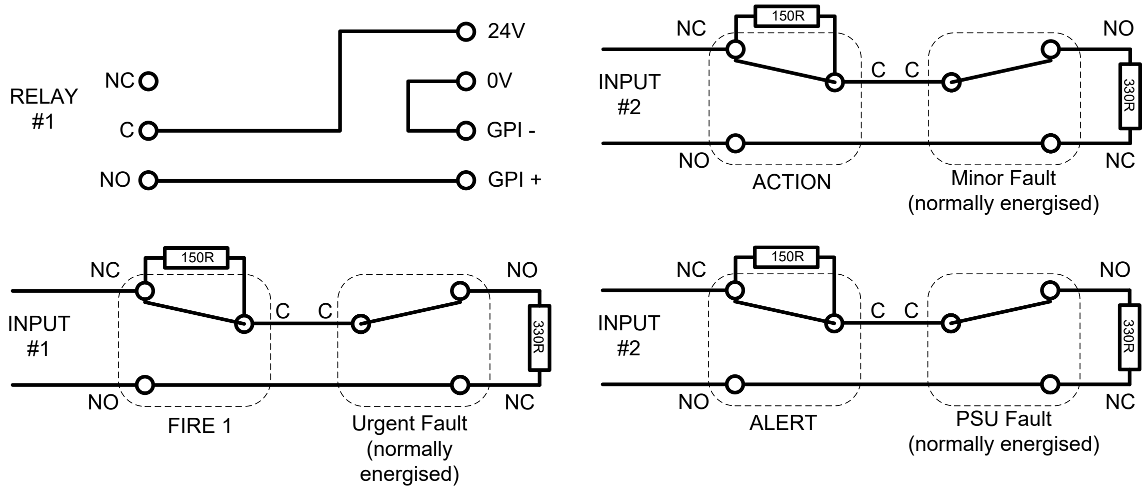


Figure 10.8 – Wiring of MIO800 to LaserPLUS and LaserSCANNER

10.15 USING THE GP OUTPUTS

10.15.1 General

The *MX1* Controller provides two general purpose open collector outputs, GPOut 1 and GPOut 2, that can have optional supervision of the load, or may be used as a supervised input if the output function is not required.

10.15.2 Outputs

The GP Outputs are rated at 500mA and +V max, so it is recommended any loads are powered from one of the +VBF terminals.

The output turns on when the corresponding output point is operated – as determined by the O/P Control setting. This allows the output to be controlled by a zone it's mapped to, or from user Logic, or a combination of both, or from one of the predefined output logic substitutions (e.g., $KEYPAD_FAULT_SOUNDER_ON).

10.15.3 Supervision Mode

The Supervision Mode of the corresponding supervision input point determines how the output is supervised. Suitable settings for outputs are:

None: Output/load is not supervised.

GP Out: Load is supervised for connection to +VBF – a fault is generated on open circuit, failure of the +VBF supply, or shorting the GP Out to 0V.

If the output function is not used the terminal can be used as a supervised input.

Figure 10.9 shows how a GP Out can be used for a supervised fault monitoring input (open or short is fault) to monitor normally-closed or normally-open fault contacts. Use the **Ext Fault Input- GP Out** profile, wire the 10k pull up to a +VBF terminal, and use a 2k7-4k7 end-of-line resistor.

By using a Points Flag Profile of **Map Fault to Brigade**, **No Test**, the fault state will be directly annunciated. Otherwise the point fault state could be used directly in User Logic, or via a suitably programmed pseudo point.

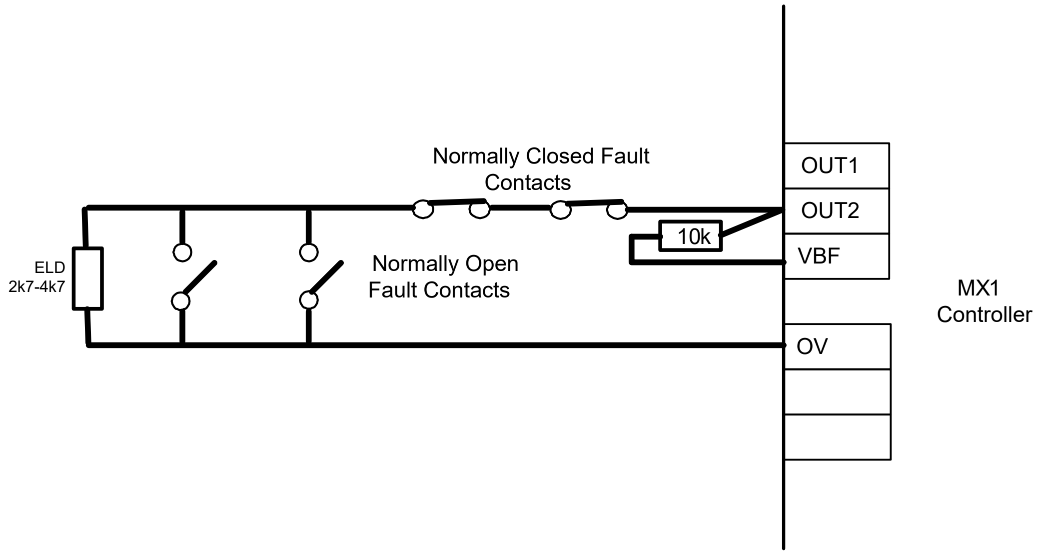


Figure 10.9 – Using GP Out Terminals for Supervised Fault Contact Inputs

10.16 USING THE LCD/KEYBOARD INPUTS & OUTPUTS

10.16.1 General

The LCD/keyboard provides 16 inputs and 16 open collector outputs that may be used for interfacing to other equipment.

The following sections provide more general details on using these inputs and outputs.

10.16.2 Inputs

The inputs are two state – Normal when open and ActiveInput when closed.

Although the input points can be mapped to zones, this may not be directly useful as this just sets the zone's ActiveInput state, which in most zone types does not have any significant effect.

Instead, the points' AI states can be used in User Logic to directly control outputs, or the points' AI states can be used to control the Alarm, Fault or Disable state of pseudo points.

The Inputs Connector J11 of the LCD/Keyboard may be wired to:

- A PA0479 16 Input Termination Board to provide protected input screw terminals, in which case the inputs may be cabled outside the cabinet.
- A PA0483 Unprotected Termination board for internal unprotected wiring.

10.16.3 Outputs

The 16 open collector outputs are normally off, turning on (< 100mA) according to the O/P control setting – allowing the outputs to be controlled by their mapped zone's Operate state, a logic equation, or a combination of these.

The Output connector J1 on the LCD/keyboard could be wired to:

- A PA0470 16 way Relay board to provide clean contact outputs;
- A PA0480 16 way Protected Output board to provide protected outputs (diode clamp to +V and capacitor suppression) suitable for external load wiring;
- Or a PA0483 Unprotected Termination board for internal unprotected wiring.

The Relay board could be used to drive multiple alarm signals from the MX1 to a Grade 2 T-Gen2. Configure each LCD/Keypad Open Collector Output Point for an O/P Control of Logic and enter the logic equation to activate the output. For example.

P243/20/0OP = (Z1AL + Z2AL + ADT).^ADS

10.17 Additional Fused Power Outputs

The *MX1* Controller provides 4 separately fused +24V battery-backed outputs - +VBF1, +VBF2, +VBF3 and +VRZDU. There is also a non-battery-backed output +VNBF. Each is fused at 3A and a fault is generated if the fuse blows or is removed.

If additional fused outputs are required there are two methods, both use the unprotected +24V Loop Interface Supply on J33:

1. By adding a fuse to J33 and wiring to loads (e.g., via LM0459) the Loop Interface Supply can be used to power Loop Cards, the Remote FBP, or networking equipment.

2. By adding a 4100-KT0448 (PA0915) fuse board, 4 separately fused outputs can be provided. Mounting is available on the 15U gearplate for this – see Drawing 1982-71 Sheet 144.

For both methods the maximum load current permitted will be less than 5A, as determined by the PSU/battery ratings less all other loads.

Additionally, these fuses will not be specifically supervised for rupture/removal, so it is necessary to power only devices that are otherwise supervised by the *MX1*. For example, *MX* Loop Cards, T-Gen2, T-GEN 50, Remote FBP, and networking equipment.

10.18 Fire Fan Control (AS 1668) Applications Using Pushbutton Fire Fan Controls

10.18.1 Introduction

The *MX1* can be used as an AS1668.1 Fire Fan Control Panel (FFCP) to control and indicate smoke control systems within a building. Up to 126 controls can be fitted per panel, when using the FP1056 Fan Control Door and FP1057 Fire Fan Expander Kits. QIO850 or MIO800 modules can be used to interface to the Mechanical Services Board (MSB).

Based on the Distributed Switch System (DSS) framework, fire fans can also be controlled and indicated across a Panel-Link network, providing replicated FFCP in security rooms, backup fire response stations, etc.

The *MX1* Fire Fan Controls have been assessed to the functional requirements of AS 4428.7-1999 Fire Detection, Warning, Control and Intercom Systems – Control and Indicating Equipment – Air-handling fire mode control panel.

Refer to Section 10.19 for AS 1668 Fire Fan Control applications using the obsolescent ME0472 controls and indicators.

Refer to Section 10.21 for more details of the DSS, which provides the framework for the *MX1* AS1668 Fire Fan Control application. This detail may be used for more advanced configurations.

10.18.2 Supported Fan Control Configurations

The *MX1* FFCP uses the FP1056 AS 1668 Fire Fan Control Door to provide up to 12 fan controls per door (Figure 10-10). Each FP1056 is 3U high, comes with 2 controls fitted, and up to 5 x FP1057 Fire Fan Expansion kits can be added (each kit providing an additional 2 controls) (Figure 10-11).

Additional FP1056 doors and FP1057 expansion kits can be added, up to a maximum of 126 controls per *MX1* panel.

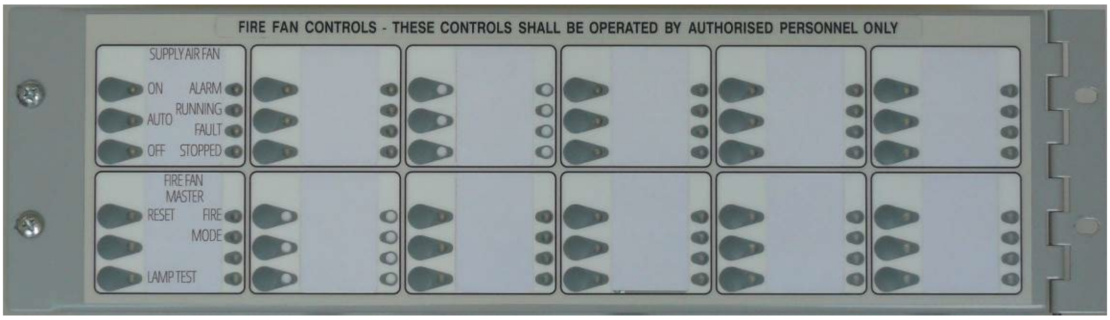


Figure 10.10 – *MX1* Fan Control Door

Figure 10.11 – *MX1* Fan Control Expansion Kit

Each control consists of:

- 3 buttons to control the fan or damper operation. Pushing a button selects its associated ON / AUTO / OFF or NON-FIRE / AUTO/ FIRE position, which is indicated by a corresponding green LED. The LED associated with the pressed button flashes briefly until the system has confirmed the new position.
- 4 Indicators - two red LEDS, one yellow LED and one green LED. One red indicator is available to indicate an alarm on the corresponding duct or compartment for Supply or Return Air fans. The remaining red, yellow and green indicators show the RUN, FAULT and STOP status of the fan, respectively. Dampers would not usually have a status indication.
- 8 programmable labels, one of which names the associated fan or damper, and 7 others which name the assigned function for each of the buttons and indicators.

In an FFCP one control must be designated as the Fire Mode Control. On this control the indicators are used to indicate that the FFCP is in Fire Mode, the buttons provide the mandatory Fire Mode Reset and Lamp Test controls, and one output can be assigned as the Fire Trip output. The configuration of this control is also necessary to integrate the *MX1* common fire alarm into the FFCP Fire Mode, to have Fire Mode indicate on the *MX1* keypad Smoke Control Activated indicator, and integrate any fire fan faults and fire fan main power faults into the *MX1* for annunciation.

Otherwise, each control is freely assignable as to its function. Any fitted control may be a fan, a damper, or the Fire Mode control. This allows for flexibility in placement of the controls on the front panel to suit the specific installation. Non-fire fan functions may also be configured, but care must be taken to ensure segregation between fire fan and non-fire fan controls. Refer to Section 10.21.

Labelling of the fan controls is provided by slip-in labels, which may be printed directly from SmartConfig, or from a Word label template (LT0590). The default text height of 5mm meets the requirements of AS 1668.1. The name of each fan control can be programmed, and each button and indicator has default names programmed which can be adjusted as required.

All physical fan controls for an *MX1* panel must be located in one or adjacent cabinets. An FFCP cannot be remotely wired to its *MX1* as the FFCP cabling is not designed for this purpose.

If an FFCP must be located remotely from the *MX1* driving the mechanical services board (MSB), then another *MX1* panel is required to drive the remote, duplicate FFCP and the *MX1* panels are networked together using Panel-link. When duplicate controls are used on a network, having physical controls on the panel connected to the MSB is usual, but not mandatory.

This technique also allows duplicate/replicated fan controls or installations where the FFCP is located separately from the *MX1* that interfaces to the MSB.

Interfacing to a fan unit requires half of a QIO850 module, or one MIO800 module. These modules must be mounted inside, or co-located beside the MSB cabinet. This ensures the supervision via the *MX* Loop extends up to the MSB interface.

The QIO850 provides 4 clean contact inputs and 4 relay outputs, and can interface with 2 fan units. The ‘alarm’ status of a pair of inputs is suitable for sensing one fan’s Run status and Fault status (if provided). A pair of outputs is suitable for driving one fan’s Run and Stop control inputs.

The MIO800 provides 3 clean contact inputs, the ‘alarm’ status of each is suitable for sensing the fan’s Run status and Fault status (if provided). It also provides 2 relay outputs, suitable for driving the fan’s Run and Stop control inputs.

Other suitable input modules, such as the MIM800 or CIM800, may be used, for example to interface to the equipment monitoring the fan power status.

Note that wiring faults on the *MX* loop or in the wiring between the I/O modules and the MSB will be annunciated on the *MX1* panel and not on a fan control fault indicator.

As the FFCP and fan control system is expected to operate during a fire, it is necessary that the detection and control wiring complies with the requirements of AS1668.1. This will usually require fire resistant cabling, often using a second loop card to separate detection wiring from fire fan control and detection wiring.

For specialised applications, the FFCP may be configured to use zones, logic variables or network variables for fan I/O functions, however care is required to ensure a robust design. Consideration must be made for any delays, multiple sources of faults, effect of network delays and network faults, for example.

The standard *MX1* Templates contain predefined Output Logic and Logic Substitutions to make it easier to create AS1668 Fan Controls.

The new Fan Control Logic Blocks provided in SmartConfig simplify creation of different types of fan controls, and will, as necessary, automatically disable any existing System Logic used for the ME0472 Fan Control Solution.

10.18.3 FFCP Hardware Configuration

In most situations a 15U or other rack cabinet based *MX1* panel will have physical controls based on FP1056 doors (comes with 2 controls fitted, 12 controls maximum) and additional FP1057 expansion kits (adds another 2 controls).

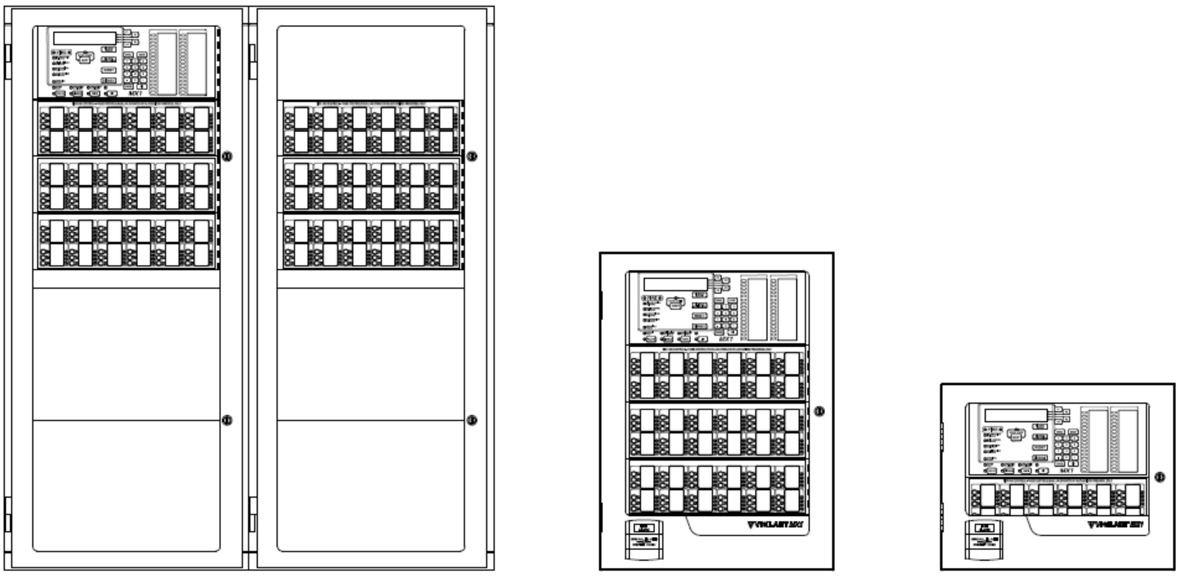
The number of fans and dampers required will be derived from the installation drawings and any fan control matrix specified.

One additional control is required for the Fire Mode Control, and this may be on the same control PCB as a fan control.

Once the number of fan controls and doors are known, the cabinet configuration must be considered to ensure sufficient rack space is available.

Although an 8U *MX1* cabinet can mount a 3U door with 12 controls fitted, only the top row of 6 controls is visible through the door window. See Figure 10-12.

A 15U *MX1* panel with a keypad can mount up to 3 doors (36 controls maximum). If more controls are required, additional cabinets or larger cabinets can be used. For example, an empty 15U cabinet could house up to 48 controls, and a 40U cabinet with an *MX1* keyboard and ASE door can have up to 72 controls fitted, or an empty 40U cabinet can house 96 controls (see Figure 10-13).



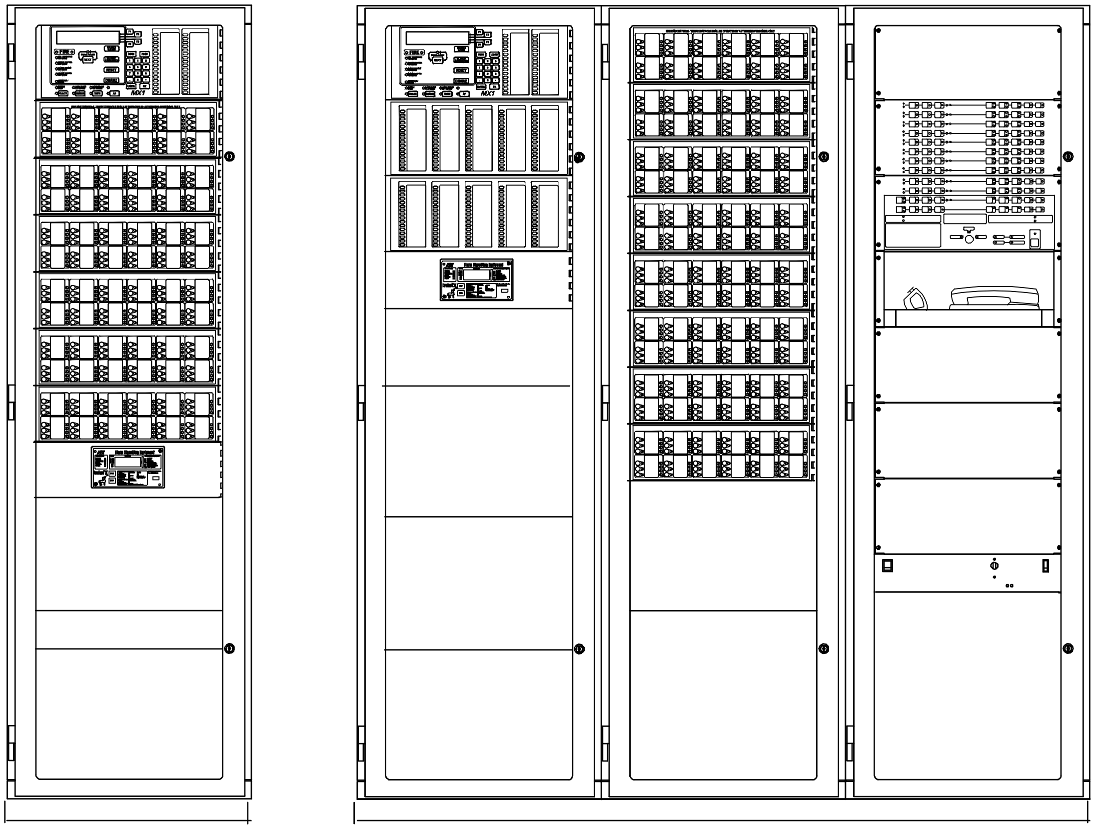
2 x 28U cabinets, 72 controls 15U cabinet, 36 controls 8U cabinet, 6 controls

Figure 10.12 – Rack mounted Fan Control Doors

The FP1056 doors are bolted to the cabinet rack, and additional FP1057 expansion kit PCBs are screwed to the doors. Each fan control PCB is addressed with a unique odd number (on a DIP switch), being the number of the top control.

Controls on doors are usually wired to each other using a short FRC (LM0553) although a short Ethernet cable (LM0585) may also be used. Multiple FP1056 doors interconnect using an Ethernet cable (LM0583).

The fan controller PCB has a switch to enable the fan control master function. This function has the board act as the interface between the *MX1* Controller and rest of the fan control boards. There can be only one fan control master per FFCP on an *MX1* panel.



40U cabinet+plinth, 72 controls 40U cabinets+plinth, 96 controls, 192 Zone LEDs, QE90

Figure 10.13 – Rack Mounted Fan Control Doors

The fan control master board connects to the *MX1* Controller for:

- 24V power, using LM0590 which includes a 5A fuse. If a different power cable must be used, a fuse of the same rating must be included. This power is then routed to the other fan control PCBs.
- Communication of button presses and status information from/to the rest of the FFCP. The master control communicates the indication status to the other fan control PCBs and collects button presses and monitors status. The connection to the *MX1* Controller is made using LM0324. This loom connects to the *MX1* Controller 10W serial port programmed in the SmartConfig database, either:
    - Directly to the 10W serial port, or
    - Indirectly via an *MX1* Loop Card connected to the programmed 10W serial port. The FFCP can be connected in series with up to 3 *MX1* Loop Cards.

Some installations may require co-located cabinets where no FFCP controls are mounted on the main cabinet containing the *MX1* Controller. If the connection between the *MX1* Controller and the fan control master cannot be made with the standard LM0324, then these installations require one additional FP0157 expansion kit PCB to be mounted within the main cabinet. This PCB is configured as the fan control master, which then uses an RJ45 cable to supply power and data to the fan controls in the other cabinets. This fan control PCB uses up 2 fan control positions, and must be programmed in the configuration even if it does not provide any useful I/O function.

Labels are fitted by sliding the labels into the slots on the rear of the door. Blank labels are fitted by default, and alternative pre-printed labels are supplied with each door and expansion kit. Customised labels can be printed from SmartConfig (Menu, File, Print Labels) or by using a Word template.

Full installation and diagnostic information is in LT0587 *MX1* Fan Control Installation Instructions.

10.18.4 Programming the Fire Fan Control Panel

The programming of the *MX1* FFCP is done using SmartConfig 2.5 or later, and uses features of the standard New Zealand Template V1.60 or later, including Fan Control Logic Blocks.

CAUTION The standard *MX1* Fire Fan Controls Logic Blocks provide a simple solution for standalone FFCP, and network FFCP with duplicated FFCP controls. They will not suit all FFCP applications. Additional functions may require additional programming, or may require fully customised FFCP programing that does not use the Fan Control Logic Blocks. Examples of such functions are: “Take Control” or exclusive control; multiple FFCP systems with independent Fire Mode; systems that have separate *MX1* panels for FFCP detection, FFCP operation and FFCP I/O.

To configure a fire alarm system with fire fan controls, the normal building detection system must be programmed, plus the additional FFCP detection system and MSB interface loop(s) and device(s).

Firstly all the input and output points that provide interfaces to the MSB must be programmed. All inputs must be set non-latching. As the fans can and will change state as controlled by the MSB, the Run/Stop inputs should be configured with Point Flags of “No off normal”, and with a Logging profile of “Log Nothing”.

Output points must be configured for Logic control without any logic programmed (otherwise there are multiple equations controlling the outputs, which will function erratically). The outputs should use Point Flags of “No off normal”, and with a Logging profile of “Log Nothing”.

The I/O sub-points may be mapped to a zone that uses the No Alarm Annunciation profile, if signalling of faults to the monitoring service is desired.

The FFCP function itself is then programmed in two main steps:

1. Configure the FFCP hardware
    a. Enable the connection to the physical doors and controls.
    b. Configure any network operation, if duplicate controls are required.
2. Configure the FFCP Operation
    a. Configure the controls themselves, using Logic Blocks.

10.18.5 Programming the FFCP Hardware

Programming of the FFCP hardware is made on the SmartConfig Hardware page, as shown in Figure 10-14.

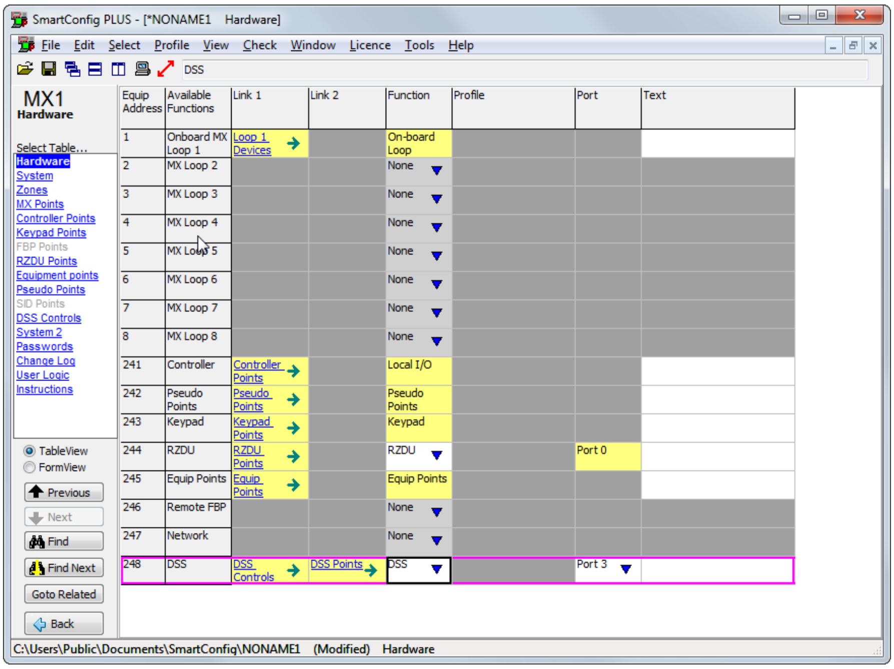


Figure 10.14 – SmartConfig Hardware Page

In most cases, the *MX1* will have physical fan controls fitted, i.e., one or more FP1056 doors with the necessary FP1057 expansion kits.

The hardware is enabled by setting the Equipment 248 DSS Function to "DSS". The correct communication port must be selected in the Port cell. The selected port maybe shared with up to three *MX1* Loop Cards.

When the Function is set to "DSS", the *MX1* will expect to use the programmed port to communicate with the board physically configured as the master Fan Control. The FFCP hardware will be configured using data created by the Fan Control Logic Blocks and stored in the DSS table. The configuration determines which controls should be present and how they should function. The *MX1* also monitors the status of the FFCP and presents that status as DSS Status points 245.248.x, for communication faults, CRC faults and foreign control faults.

There may be cases where the physical FFCP is not present. An example would be a site with a remote FFCP networked to an *MX1* that is exclusively interfacing to the MSB and is not normally accessible by a user. For these situations, the Equipment 248 DSS Function is set to "None".

With the DSS function set to "None", only the physical interface is non-functional. All internal operations based on the data created by the Fan Control Logic Blocks (DSS table entries, output logic etc.) will continue as programmed. The DSS Status Points 245.248.x will not be present in the system.

10.18.6 Programming a Network Fire Fan Control System

Networking must be enabled for *MX1* panels participating in a network FFCP system, e.g., Duplicate Fan Controls are present. Enabling of *MX1* networking is done on the Hardware page. See also Section 16 Networking.

If Duplicated Fan Controls are required on an *MX1*, networking must be enabled before any duplicate controls can be successfully programmed on any *MX1*.

By default a network *MX1* will send the status of its Primary Fan Controls onto the network. This is set by the System page “Send DSS Status to Network” setting being enabled. This can be disabled (if necessary) for network *MX1* panels with FFCP that do not require duplicate controls, to reduce network traffic.

The Fan Controls data is transferred as part of the Network Variables application, thus transfer of data for that application must be correctly programmed for *MX1* panels, I-HUBs, PIBs and other networking equipment. This requires that a local *MX1* must have a remote *MX1* panel in its SID list if:

- The local *MX1* has a Primary Fan Control mimicked on the remote *MX1* (permits the remote *MX1* to send button presses to the local *MX1*).
- The local *MX1* has a Duplicate Fan Control mimicking a Primary Fan Control on the remote *MX1* (permits the local *MX1* to receive control status from the remote *MX1*).

Network variables may also be used to share FFCP status and control amongst *MX1* panels, however consideration needs to be made in regards fault detection, network delays, etc.

Some network systems may require a function to have one FFCP ‘take control’ of the system and prevent other FFCP from controlling the system. The standard Logic Blocks do not support this operation, but the DSS Master Disable function may be utilised to implement such a function. Refer to Section 10.21 describing the DSS for more information.

10.18.7 Programming the Fire Fan Control Panel Using Logic Blocks

Programming the fan system is done by using the Fan Control Logic Blocks. These are accessed from within SmartConfig by using the Menu, Edit, Add Logic Block / Edit Logic Block / Delete Logic Block commands. See Figure 10-15.

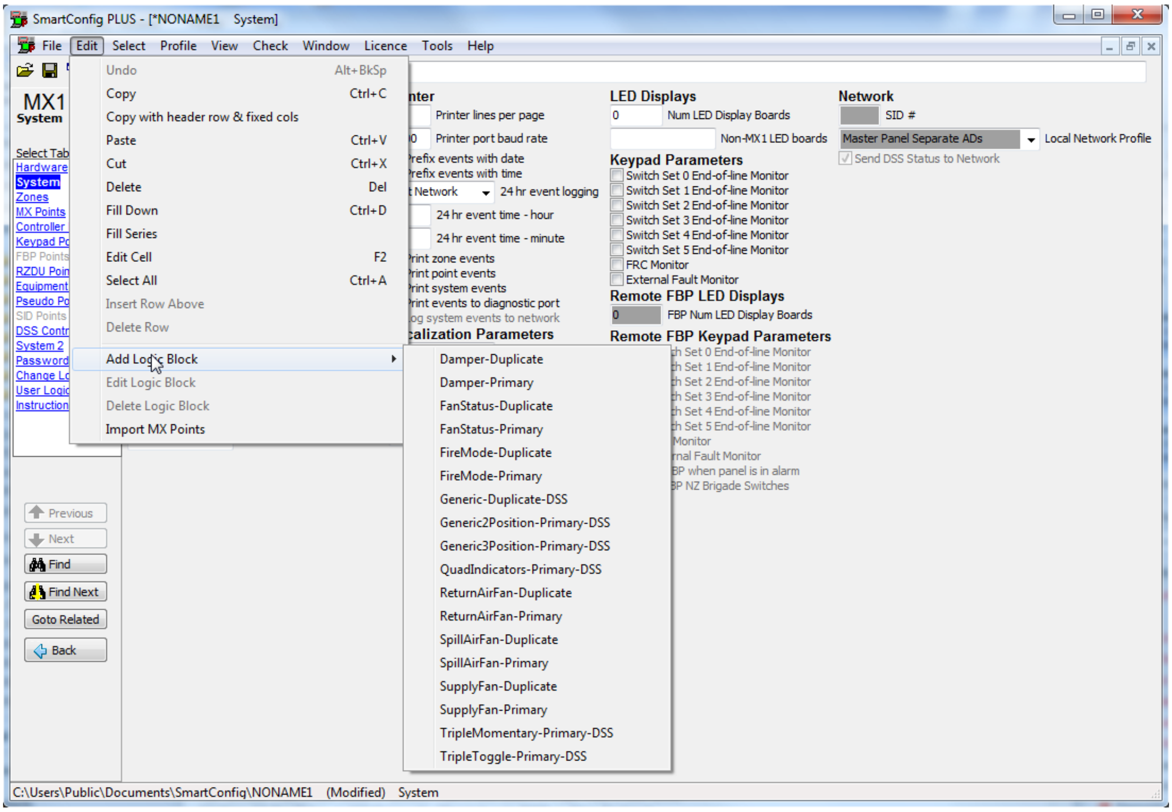


Figure 10.15 – Logic Blocks Menu Example

The Add Logic Block menu shows the available logic blocks. Click on the required Fan Control logic block. SmartConfig then presents a dialogue box requesting entry of the information required to program the fan control or damper control or Fire Mode control. See an example in Figure 10-16.

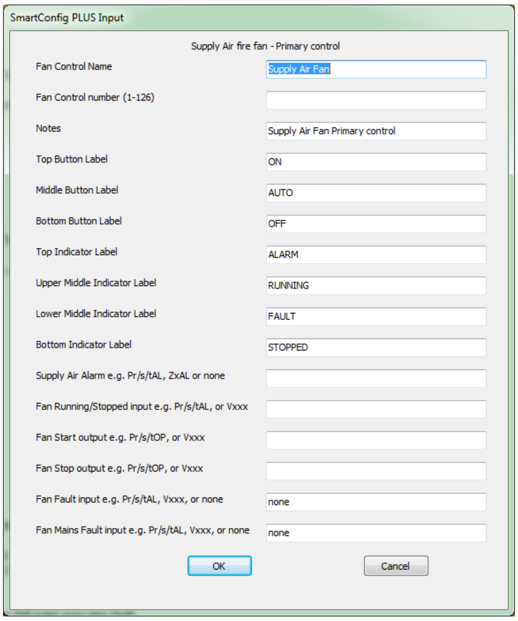


Figure 10.16 – Example Fan Control Logic Block

This example configures Control 1 for a Supply Air Fan function for Fan “AH1-12”, with the default labels. The Supply Air Alarm (duct detector) is Zone 5. The fan run/stop status is the alarm status of input P1/57/1. The Fan Start/Stop outputs are P1/57/4 and P1/57/5, respectively. Input P1/57/2 signals a fan fault condition. For this fan there is no specific Mains Fault input.

In the logic block dialogue box a Fan Control number must be entered, along with any inputs and outputs necessary for monitoring or controlling the fan itself. All inputs and outputs are entered as Output Logic Tokens, e.g., combine the point number and a condition. Additionally, a set of default information is presented, for example label texts, that may be retained or overwritten.

When OK is clicked, the Logic Block automatically configures the control for its correct operation and labels, and programs the *MX1* Output Logic to perform the fan control IO functions. This output logic can be seen on the Menu, Profiles, Automatic Logic page (which is read-only).

CAUTION: Care is needed when entering information, as the data checking capability of the Logic Block system is limited.

The Logic Block entry prompts suggest what can be used as inputs and outputs, but no specific format checking or range checking is done. Labels are plain text entries. Control numbers, pseudo-point and timer numbers, and timer values must be numeric. Inputs and outputs are entered as if they were to be used in output logic, e.g. Z53AL, P1/2/1AL, P1/2/3OP or V100.

CAUTION: Any zones or points used must be correctly programmed before any logic block programming is done.

A blank entry in a new logic block will indicate mandatory information is required. For some entries (not all), a value of “none” is permitted and such entries will have “none” as their default value. Other entries, for the most part labels, have suitable default text preloaded.

If the data entered is incomplete, or if in some cases the data does not conform to expected formats, the logic block cannot be exited until valid data is entered or the screen is cancelled.

The data entered is not further validated until a Check Output Logic or Check Tables command is entered. Any errors will be displayed against the specific table the error is found in, thus the user may need to deduce the logic block that needs adjustment. Examples of this are: Invalid variable numbers, the use of unconfigured points and the use of input points as outputs, and vice versa.

If some aspect of the control requires adjustment, the Edit Logic Block command can be used. It recalls the originally programmed information and presents it in the same manner as the Logic Block screen. Changes can be made and the Logic Block can be re-saved.

CAUTION: Always use the Edit Logic Block command to update the Fan Control data. The Edit Logic Block command uses the data stored for a logic block, not the information it may have programmed into other *MX1* tables, such as the DSS table or Logic Substitutions table. Independent changes to such data will be lost when the Logic Block is edited and re-saved.

If a logic block is no longer required, the Delete Logic Block command can be used. This removes the functional logic and Logic Block settings.

CAUTION

At this time settings made to tables such as the DSS table and Logic Substitution Tables do not get deleted when a Logic Block is deleted. Some manual adjustments to the database may be required, for example programming the fan control to be “Disabled” in the DSS table.

Fan Control Logic Blocks are available in two classes:

- Primary – these program the *MX1* to perform all the fan functions locally on that *MX1* panel. This includes monitoring and indicating the fan status, controlling the fan, and responding to user input. These controls also ‘memorise’ the position of the ‘switch’. They can be successfully programmed for both standalone and network *MX1* panels.
- Duplicate – these program the *MX1* to monitor the state of a Primary control on another *MX1*. The states shown locally come from the monitored fan control over the network, and any local button presses are sent to the monitored fan control for processing. Duplicate Fan controls can be successfully programmed only if the *MX1* has networking enabled.

The following sections describe the Logic Blocks for the Primary Fire Mode Control, Primary Fans, Primary Dampers, and all Duplicate versions of those.

Programming the Primary Fire Mode Control

Each *MX1* FFCP requires a Primary Fire Mode Control. This section describes the Fire Mode Control Logic Block implementation. (Figure 10-17)

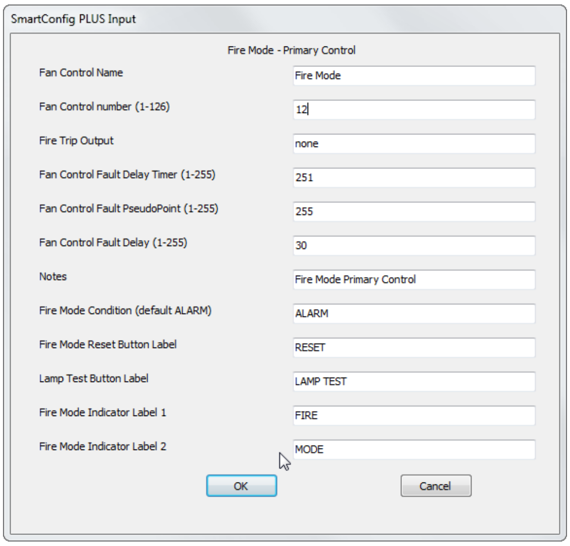


Figure 10.17 – Primary Fire Mode Control Logic Block

CAUTION

There can be only ONE Fire Mode Control (Primary or Duplicate) per *MX1*. Multiple Fire Mode Controls are possible, but only with customised programming.

Operationally, the Fire Mode Control manages and indicates the Fire Mode status of the FFCP, controls the optional Fire Trip output, and provides the necessary Fire Mode Reset and Lamp Test controls. It ensures the *MX1* FBP Smoke Control Activated indicator turns on. It also manages the AS4428.7 FIP Fault signalling, including the delay for signalling of an FFCP fault.

In most situations, the only data that needs to be entered is the control number to be used as the Fire Mode control, and the optional Fire Trip output.

All of the other settings, such as the labels, the pseudo-point used for fault signalling and the fault delay timing can be altered, but only if it is necessary or if the timer or pseudo point is required for some other function.

In the above example, Control 12 is the Fire Mode control, the default settings and labels are used, and there is no Fire Trip output programmed.

The primary Fire Mode Control will not permit a Fire Mode Reset as long as the Fire Mode Condition is TRUE. In most situations, the *MX1* will need to have all alarms reset and/or disabled to permit the FFCP to be reset out of Fire Mode.

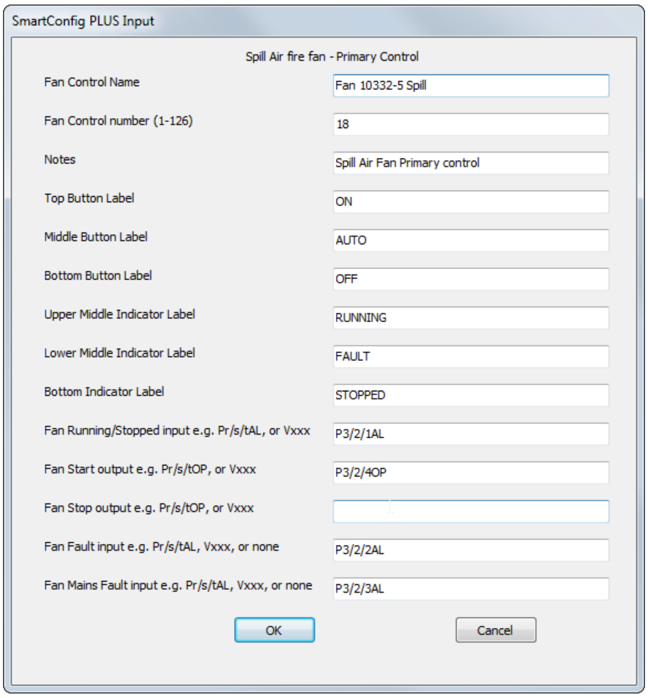
The Primary Fire Mode Control will not permit a Lamp Test during Fire Mode.

Programming the Primary Fans and Dampers

SmartConfig provides the following Logic Block types for Primary controls:

- Supply Air Fan
- Spill Air Fan
- Return Air Fan
- Fan Status
- Damper

All options provide similar programming options, with minor differences as described further below. Each of the Primary Logic Blocks programs a fan or damper control for which all operation, I/O and memory of the control's switch position is local to the programmed *MX1*. A Spill Air example is shown below in Figure 10-18.


SmartConfig PLUS Input

Spill Air fire fan - Primary Control

Fan Control Name	Fan 10332-5 Spill
Fan Control number (1-126)	18
Notes	Spill Air Fan Primary control
Top Button Label	ON
Middle Button Label	AUTO
Bottom Button Label	OFF
Upper Middle Indicator Label	RUNNING
Lower Middle Indicator Label	FAULT
Bottom Indicator Label	STOPPED
Fan Running/Stopped input e.g. Pr/s/tAL, or Vxxx	P3/2/1AL
Fan Start output e.g. Pr/s/tOP, or Vxxx	P3/2/4OP
Fan Stop output e.g. Pr/s/tOP, or Vxxx	
Fan Fault input e.g. Pr/s/tAL, Vxxx, or none	P3/2/2AL
Fan Mains Fault input e.g. Pr/s/tAL, Vxxx, or none	P3/2/3AL

OK Cancel

Figure 10.18 – Primary Spill Air Fan Logic Block

Operationally, the Fan and Damper Controls manage and/or indicate the status of the fans / dampers. The inputs and outputs programmed are used to generate fan status and to control the fans/dampers. The fan fault indication has options as described below. The fault indication for a fan is also used to drive the AS 4428.7 required fault signal on the panel.

In most situations, the data that needs to be entered is the fan name, the control number to be programmed, and the I/O needed for status and control.

Inputs should be Point or Zone alarm conditions, or variables, as required.

Outputs should be Point or Zone operate conditions, or variables, as required.

The labels are set to suitable defaults for AS1668.1 and for printing from SmartConfig, but may be adjusted. Note that if the labels are made too long, the labels for the buttons may overlap the labels for the indicators.

When not in Fire Mode (as determined by the Fire Mode Control), the outputs used by:

- the fan controls are determined by the control's switch position as follows:
    - ON: The Start output is ON, the Stop output is OFF.
    - AUTO: The Start output is OFF, the Stop output is OFF.
    - OFF: The Start output is OFF, the Stop output is ON.
- the damper controls are determined by the control's switch position as follows:
    - Fire: The Fire output is ON, the Non-Fire output is OFF.
    - AUTO: Both Fire and Non-fire outputs are OFF.
    - Non-Fire: The Fire output is OFF, the Non-Fire output is ON

When in Fire Mode (as determined by the Fire Mode Control), the outputs used by:

- the fan controls are determined by the control's switch position as follows:
    - ON: The Start output is ON, the Stop output is OFF.
    - AUTO: At most one of the Start and Stop outputs will be ON, based on the fan type and any Supply Air alarms. The other output will be OFF.
    - OFF: The Start output is OFF, the Stop output is ON.
- the damper controls are determined by the control's switch position as follows:
    - Fire: The Fire output is ON, the Non-Fire output is OFF.
    - AUTO: The Fire output is ON, the Non-Fire output is OFF.
    - Non-Fire: The Fire output is OFF, the Non-Fire output is ON

Supply Air Fan

A Supply Air fan is usually on, but turns on harder to increase air pressure when the system is in fire mode. It will turn off in fire mode if smoke is detected within the ducting system, based on the Supply Air Alarm condition, which is also indicated on the control. The fan can also be manually turned on and off.

If the Fan Fault input is set to "none", then during Fire Mode the control uses its fan output control state and its Run/Stop state to determine the fault condition.

If the Fan Mains Fault input is set to other than "none", that input is used in the fan's fault indication status.

Return Air Fan

A Return Air fan is usually running, but turns off when the system is in fire mode. It can also be manually turned on and off. If smoke is detected within the ducting system (the Compartment Alarm condition), this can be indicated on the control but does not affect the operation of the fan. The fan can also be manually turned on and off.

If the Fan Fault input is set to "none", then during Fire Mode the control uses its fan output control state and its Run/Stop state to determine the fault condition.

If the Fan Mains Fault input is set to other than “none”, that input is used in the fan’s fault indication status.

Spill Air Fan

A Spill Air fan is usually off, but turns on when the system is in fire mode. It can also be manually turned on and off.

If the Fan Fault input is set to “none”, then during Fire Mode the control uses its fan output control state and its Run/Stop state to determine the fault condition.

If the Fan Mains Fault input is set to other than “none”, that input is used in the fan’s fault indication status.

Fan Status

A Fan Status control is used to indicate the status of a fan that is ‘linked’ to another fan. Its control buttons have no function as the fan operation is controlled by another fan control. One example of this are stairwell fans where two or more fans service a stairwell (and must be monitored) but only 1 control for all those fans is required.

For ‘linked’ fans, one fan control is programmed as a Supply, Spill or Return Air fan, and uses its one set of outputs to control the multiple fans through the MSB. That fan’s status is indicated on its control. The status of the other ‘linked’ fans is shown on their own Fan Status controls. Grouping of linked fans would be done by having all the controls similarly named and located physically together.

The Start/Stop outputs for a Fan Status control are programmed to be the same as for the fan control that is actually driving the outputs. These are used to allow the fan to determine its own fault status, as well as documenting the ‘as installed’ configuration of the system. Note that there is no crosschecking of these outputs to those used by the control driving the MSB.

If the Fan Fault input is set to “none”, then during Fire Mode the control uses its fan output control state and its Run/Stop state to determine the fault condition.

If the Fan Mains Fault input is set to other than “none”, that input is used in the fan’s fault indication status.

Dampers

Dampers are used by the Air Handling System to direct air from the ducting system to and from compartments within the building. During a fire, these dampers will open and close as required to control where air will flow. They can also be manually forced to their Fire or Non-Fire position.

Dampers have only outputs to be configured. There are no position or fault statuses to be indicated.

All of the other settings, such as the labels can be altered, but only if it is necessary.

Programming Duplicate Fire Mode Controls, Fans and Dampers

Duplicate Fan Controls are used to have a Primary Fan Control on one *MX1* be mimicked on one or more *MX1* panels across a Panel-Link network.

The Duplicate Fan Controls data is transferred as part of the Panel-link Network Variables application. Duplicates can only be programmed on a network *MX1*. Thus transfer of data for that application must be correctly programmed for *MX1* panels, I-HUBs, PIBs and other networking equipment.

SmartConfig provides the following Logic Blocks for Duplicate controls:

- Fire Mode Control
- Supply Air Fan
- Spill Air Fan
- Return Air Fan
- Fan Status
- Damper

A Duplicate Supply Air fan example is shown below in Figure 10-19.

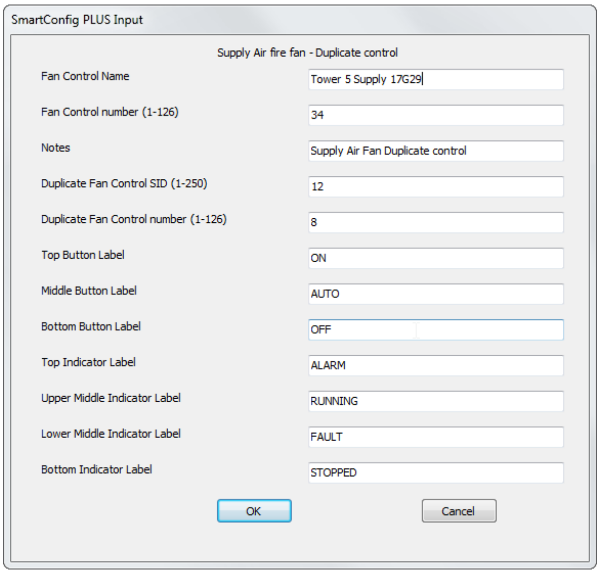


Figure 10.19 – Duplicate Supply Air Fan Logic Block

Each of the Duplicate Logic Blocks programs a local Duplicate Fan Control for which all operation, I/O and memory of the control's switch position is determined by a Primary Fan Control on another *MX1*.

In most situations, the data that requires entry is the fan name, the number of the local Duplicate Fan Control to be programmed, the SID number of the *MX1* the associated Primary Fan Control is programmed at, and the control number of the associated Primary Fan Control.

The labels are set to suitable defaults for AS1668.1 and for printing from SmartConfig, but may be adjusted. Note that if the labels are made too long, the labels for the buttons may overlap the labels for the indicators.

In the example above, Control 34 is configured to duplicate Supply Air fan "Tower 5 Supply 17G29", which is Control 8 on *MX1* SID 12. This control (34) uses the default labelling for buttons and indicators.

For the most part, a Duplicate Fan Control appears to operate exactly as the Primary fan control is programmed. Indications at the Primary Control appear on the Duplicate Control indicators. Buttons that do not work at the Primary Control also do not work at the Duplicate Control. Buttons pressed on a Duplicate Control are sent to the Primary Control for processing.

The Duplicate Fire Mode Control has some operational differences to the Primary Fire Mode Control it mimics. Firstly, the Fire Mode Control's Lamp Test performs that function at the local FFCP, NOT at the remote FFCP. Secondly, the Duplicate Fire Mode Control drives the local *MX1* “Smoke Protection Activated” indicators, based on its mimicked Fire Mode indication.

There can be only ONE Logic Block based Fire Mode Control (Primary or Duplicate) per *MX1*. Multiple Fire Mode Controls may be possible, but only with customised programming.

Duplicate Controls should not be programmed to duplicate another Duplicate Control, as Duplicate Controls do not send status onto the network. At this time, SmartConfig cannot warn if this is done.

It is not possible to program two Duplicate controls on an FFCP to mimic the same Primary Fan Control.

It is not possible to program a Duplicate control on an FFCP to mimic a Primary Fan Control in the same FFCP.

The default logic creates a pseudo point 242.255.0 (AS1668 Common Fault) which will create a fault condition on the *MX1* when any AS1668 control indicates a fault condition.

10.19 Fire Fan Control (AS 1668) Applications Using ME0472

10.19.1 Supported Fan Control Configurations

The *MX1* can be used as a Fire Fan Control Panel (FFCP) to control and indicate smoke control systems within a building.

This section describes how this may be done using the obsolescent

ME0472 MX1 2U DOOR 4 X AS 1668 + COMMON CONTROLS

and MIO800 modules. The information presented here is retained for historical purposes and may be used as assistance for systems providing fan controls in this manner.

See Section 10.18 for AS 1668 Fire Fan Control applications using the FP0156/FP1057 Fan Control Doors and Kits.

Figure 10.20 – ME0472 Controls & Indicators

ME0472 is a prebuilt 2U rack mounting panel fitted with 4 fan controls and indications, plus a common Fire Mode indicator, a Fire Mode reset control, and a lamp test control. The fan controls connect to the GP Inputs (J11) and O/C Outputs (J1) on the LCD/keyboard using the supplied flat ribbon cables.

If more than 4 x AS1668 controls are required IO-NET can be used as a separate system. See Section 10.19.8.

Interfacing to a fan unit requires one MIO800 *MX* module. The MIO800 provides 3 clean contact inputs, suitable for sensing the fan's Run status and Fault status (if provided). It also provides 2 relay outputs, suitable for driving the unit's Run and Stop control inputs.

The standard *MX1* New Zealand Template contains predefined Output Logic and Logic Substitutions to make it easier to interface to the ME0472 and to create a fan control configuration. The substitutions are generally as follows, where x is the number of the fan control (1 - 4 from left to right when viewed from the front).

The following substitutions allow user logic to determine the switch position of each fan control.

- $FAN_CONTROL_x_OFF
- $FAN_CONTROL_x_AUTO
- $FAN_CONTROL_x_ON

The following substitutions allow user logic to turn on the required indicator for each fan control.

- $FAN_CONTROL_x_STOP
- $FAN_CONTROL_x_FAULT
- $FAN_CONTROL_x_RUN

The following substitution can be used in logic to drive fan indicators when the Lamp Test control is activated. Its function is inhibited when $FAN_CONTROL_FIREMODE is true.

- $FAN_CONTROL_LAMPTEST

The following substitution is for the reset pushbutton on the fan module. It is automatically used in $FAN_CONTROL_FIREMODE to exit fire mode, and can be used in other logic as a fire mode reset.

- $FAN_CONTROL_FIREMODE_RESET

The following substitution provides logic to drive the Fire Mode indicator when $FAN_CONTROL_FIREMODE is active.

- $FAN_CONTROL_FIREMODE_INDICATOR

The following substitution is used to determine whether the *MX1* fan controls should enter Fire Mode.

- $FAN_CONTROL_FIREMODE_START

The following substation indicates when the FFCP is in fire mode, so that controls in the Auto position make the corresponding fan run or stop as appropriate. System Logic uses the states of $FAN_CONTROL_FIREMODE_START and $FAN_CONTROL_FIREMODE_STOP to control fire mode and turn on the smoke control indicator in the FBP.

- $FAN_CONTROL_FIREMODE

With a fan control in the Auto position, the *MX1* logic makes the corresponding fan run or stop as it must during a fire condition.
It also prevents $FAN_CONTROL_LAMPTEST becoming TRUE during fire mode.

10.19.2 Configuring *MX1* for Fan Controls

To add AS 1688 controls to a configuration, use the following steps:

1. Determine what conditions will put the fans into fire mode, and put these into the logic equation for $FAN_CONTROL_FIREMODE_START.
    - Example: to enter fire mode when any brigade calling alarm occurs
      $FAN_CONTROL_FIREMODE_START = CZBRALM

2. Add into the user logic, on its own line, the substitution $FAN_CONTROL_FIREMODE_INDICATOR
   - This substitution, by itself, includes the logic necessary to drive the Fire Mode indicator.
3. For each fan to be controlled, configure an MIO800 module.
   - Input 1 (alarm) must be used for determining if the fan is running. Use a non-interrupt profile, no delays, and set to not latch.
   - Input 2 (alarm) must be used for monitoring the fan's fault status (if provided). Use a non-interrupt profile, no delays, and set to not latch.
   - Input 3 is available for other use.
   - Output 1 must be used for driving the fan's Start input, and be set for logic control.
   - Output 2 must be used for driving the fan's Stop input, and be set for logic control.
   - Set all Event Logging Profiles to None.
   - The point flags profile may remain as 'Standard' so that the MIO800 faults and disables are indicated, but the monitoring service will not be signalled.
   - The sub-points may be mapped to a zone that uses the **No Alarm Annunciation** profile, if signaling of faults to the monitoring service is desired.

4. For each supply air fan, configure the duct smoke detection devices and zones. The detector alarm condition must be non-latching, and a delay profile such as **Supply Air Shutdown** must be used. The zone must be non-latching.

5. For each fan control, add the necessary logic equations as detailed in sections 8.18.3 through 8.18.6. The logic equations selected will be based on the fan type (e.g. supply / spill / return).

An example of these equations is given in Section 8.18.7.

10.19.3 Fan Control Status Indication Equations

All fan types require the following equations to indicate fan status, where x is the number of the fan control to be used for the fan, and Py/z is the device number of the associated MIO800. Py/z/1 receives the fan running status, Py/z/2 receives the fan fault status (if available or used), Py/z/4 is the Fan Start output, and Py/z/5 is the Fan Stop output.

; Stopped indication
$FAN_CONTROL_x_STOP = not Py/z/1AL or $FAN_CONTROL_LAMPTEST

; Running indication
$FAN_CONTROL_x_RUN = Py/z/1AL or $FAN_CONTROL_LAMPTEST

For the fault indication, if the fan provides its own fault signal, use

; Fault indication
$FAN_CONTROL_x_FAULT = (Py/z/2AL) or $FAN_CONTROL_LAMPTEST

For the fault indication, if the fan does not provide its own fault signal, use
; Fault indication
$FAN_CONTROL_x_FAULT = ((not Py/z/1AL and Py/z/4OP) or (Py/z/1AL and Py/z/5OP)) or $FAN_CONTROL_LAMPTEST

10.19.4 Supply Air Fan logic

A Supply Air fan is usually on, but turns on with increased air pressure when the system is in fire mode. It will turn off in fire mode if smoke is detected within the ducting system (the override condition). It can also be manually turned on and off.

For a Supply Air fan, use the following logic, where x is the number of the fan control to be used for the fan, Py/z is the device number of the associated MIO800, and <OVERRIDE> is a condition that should cause the fan to stop running - usually an alarm from a duct detector or zone. Py/z/4 is the Fan Start output, and Py/z/5 is the Fan Stop output.

; Start output - supply
Py/z/4OP = $FAN_CONTROL_x_ON or ($FAN_CONTROL_x_AUTO and $FAN_CONTROL_FIREMODE and not <OVERRIDE>)

; Stop output - supply
Py/z/5OP = $FAN_CONTROL_x_OFF or ($FAN_CONTROL_x_AUTO and <OVERRIDE>)

Note: if the Fan Control is in Auto, with Fire Mode not active and no duct detector in alarm (<OVERRIDE>), then both relays will be off.

10.19.5 Spill Air Fan Logic

A Spill Air fan is usually off, but turns on when the system is in fire mode. It can also be manually turned on and off.

For a Spill Air fan, use the following logic, where x is the number of the fan control to be used for the fan, Py/z is the device number of the associated MIO800. Py/z/4 is the Fan Start output, and Py/z/5 is the Fan Stop output.

; Start output - spill
Py/z/4OP = $FAN_CONTROL_x_ON or ($FAN_CONTROL_x_AUTO and $FAN_CONTROL_FIREMODE)

; Stop output - spill
Py/z/5OP = $FAN_CONTROL_x_OFF

Note: if the Fan Control is in Auto with Fire Mode not active then both relays will be off.

10.19.6 Return Air Fan logic

A Return Air fan is usually running, but turns off when the system is in fire mode. It can also be manually turned on and off.

For a Return Air fan, use the following logic, where x is the number of the fan control to be used for the fan, Py/z is the device number of the associated MIO800. Py/z/4 is the Fan Start output, and Py/z/5 is the Fan Stop output.

; Start output
Py/z/4OP = $FAN_CONTROL_x_ON

; Stop output
Py/z/5OP = $FAN_CONTROL_x_OFF or ($FAN_CONTROL_x_AUTO and $FAN_CONTROL_FIREMODE)
Note: if the Fan Control is in Auto with Fire Mode not active then both relays will be off.

10.19.7 Fan Control Logic Example

In this example, Fan 1 is a Supply Air fan which is controlled by MIO800 P1/17 and has a duct detector 814P P1/16, and Fan 2 is a Spill Air fan controlled by MIO800 P1/42. Both fans have a fault signal.

```
; The suggested equation is to use CZBRALM
$FAN_CONTROL_FIREMODE_START = CZBRALM

; Add Common Fan Control Logic
$FAN_CONTROL_FIREMODE_INDICATOR

; FAN 1 Supply Air

; Start output - supply
P1/17/4OP = $FAN_CONTROL_1_ON or ($FAN_CONTROL_1_AUTO and
$FAN_CONTROL_FIREMODE and not P1/16/1AL)
; Stop output - supply
P1/17/5OP = $FAN_CONTROL_1_OFF or ($FAN_CONTROL_1_AUTO and P1/16/1AL)
; Stopped indication
$FAN_CONTROL_1_STOP = not P1/17/1AL or $FAN_CONTROL_LAMPTEST
; Running indication
$FAN_CONTROL_1_RUN = P1/17/1AL or $FAN_CONTROL_LAMPTEST
; Fault indication
$FAN_CONTROL_1_FAULT = (P1/17/2AL) or $FAN_CONTROL_LAMPTEST

; FAN 2 Spill Air

; Start output - spill
P1/42/4OP = $FAN_CONTROL_2_ON or ($FAN_CONTROL_2_AUTO and
$FAN_CONTROL_FIREMODE)
; Stop output - spill
P1/42/5OP = $FAN_CONTROL_2_OFF
; Stopped indication
$FAN_CONTROL_2_STOP = not P1/42/1AL or $FAN_CONTROL_LAMPTEST
; Running indication
$FAN_CONTROL_2_RUN = P1/42/1AL or $FAN_CONTROL_LAMPTEST
; Fault indication
$FAN_CONTROL_2_FAULT = (P1/42/2AL) or $FAN_CONTROL_LAMPTEST
```

10.19.8 Using IO-NET for AS1668 Controls

When more than 4 AS1668 controls are required an IO-NET system can be used instead of the *MX1* panel itself. The *MX1* sends zone alarms to the IO-NET system, which is programmed to provide the AS1668 functionality required. Refer to the IO-NET documentation for details.

10.20 Upgrading Existing *MX1* Panels

Existing *MX1* panels using the PA1011 Controller can be upgraded to support the Remote FBP, multiple *MX* loops, networking, AS 1668 controls and other features available with V1.60 firmware onwards.

For non-networked *MX1* panels using the existing PA1011 Controller, the panel can (at most) be upgraded to 4 *MX* loops, 1000 devices, and 999 zones.

For networked *MX1* panels using the existing PA1011 Controller, the panel can (at most) be upgraded to 3 *MX* loops, 700 devices, and 999 zones.

If the existing PA1011 Controller is replaced with a PA1081 Controller, or it is present already, then the maximum capacity is 8 *MX* loops, 2000 devices.

The biggest issue in upgrading will be installing the additional equipment. The slimline cabinet has mounting for at most 1 *MX* Loop Card and, depending on its age, may not have mounting for the I-HUB or PIB networking equipment. Also if a T-Gen2 or T-Gen 50 is fitted there won't be room for a PIB. Therefore, at least drilling of mounting facilities, or the fitting of a separate suitable cabinet next to the original one will most likely be required.
The steps involved in upgrading an existing *MX1* are shown in Table 10-2.

Table 10.2 – Upgrading Existing *MX1* using the PA1011 Controller

1.	Upgrade the *MX1* Controller (PA1011) firmware to V1.60 or higher. *MX1* Service Manual (LT0366) Section 5.3 describes this. OR Purchase a PA1081 and replace the PA1011 in the panel. Mounting and wiring is unchanged. Section 7.4 of the *MX1* Service Manual (LT0366) covers this. Upgrade the PA1081 firmware to V1.60, if needed. Section 5.3 of the *MX1* Service Manual describes this.
2.	Upgrade any existing *MX* Loop Card firmware to the latest, or purchase a new *MX* Loop Card (FP0950). *MX1* Service Manual (LT0366) Section 5.6 describes the firmware upgrade process.
3.	Upgrade the site specific configuration to V1.60. This is described in LT0366 Section 5.5.5.
4.	Add any additional equipment in a separate cabinet positioned immediately adjacent to the existing cabinet and wire back to the *MX1*.
5.	Program the site specific configuration and re-test as a new system.

10.21 MX1 Distributed Switch System (DSS)

10.21.1 Introduction

As of Firmware V1.60, the *MX1* supports the Distributed Switch System, or DSS. The DSS provides a flexible switch and indication framework for local and cross-network fire related control and indication functions.

The DSS is the basis of the *MX1* AS1668.1 Fire Fan Control Panel solution (See Section 10.18). It can also provide switches and indications for other application such as control of drain valves used for testing, deluge system tests, isolation switches, etc. By using the DSS network capability, switches and indications can be replicated between multiple *MX1* panels.

The *MX1* DSS provides 126 DSS controls, each of which may be used for fan controls or other functions and is configured as Disabled, Primary or Duplicate.

Disabled Controls have no function or operation. There should not be a physical control provided for Disabled controls, unless it is physically paired with an enabled control.

Primary Controls provide support for:

- 3 buttons which can be used for individual functions (momentary or toggle) or can be combined to provide one 2 or 3 position switch. The status of the switch is accessible via Output Logic to implement the desired system function. The buttons or switches can programmed to remember their position (non-volatile) or not, whether the buttons can be pressed (Enabled) or not, and whether the buttons can be

disabled at runtime (Master Disable). Buttons can also be programmed to be trapped for ‘Special Functions’ such as Lamp Test.
- 4 Indicators, the status of each is determined by Output Logic. Indicators with no logic equation are always off. The physical control has two red LEDs, one yellow LED and one green LED. Indicators can be trapped for ‘Indicator Functions’, which allow, for example, display of a common indication status.
- 8 freely programmable labels, one of which names the associated control, and 7 others which name the assigned function for each of the buttons and indicators. These labels can be printed from SmartConfig (Menu, File, Print Labels).

Duplicate Controls provide support for replicating a primary control on one *MX1* panel to one or more controls on other *MX1* panels:
- The SID number of the *MX1* panel and the Control Number that is being mimicked.
- 3 buttons, the status and configuration of which are sent by the control being mimicked. If a button is enabled by the control being mimicked, button presses are sent to the control being mimicked for processing. Buttons can also be programmed to be trapped for ‘Special Functions’ such as Lamp Test.
- 4 Indicators, the status and configuration of which are sent by the control being mimicked. The physical control has two red LEDs, one yellow LED and one green LED. Indicators can be trapped for ‘Indicator Functions’, which allow, for example, display of a common indication status.
- 8 freely programmable labels, one of which names the associated control, and 7 others which name the assigned function for each of the buttons and indicators. These labels can be printed from SmartConfig (Menu, File, Print Labels).

The DSS provides the button and indicator trapping functions which interface to Output Logic (allowing for Lamp Test or processing of common indication conditions), communication with and monitoring of any physical controls connected to the *MX1* (status indicated via DSS Status points 245.248.x), networking between the primary control and any duplicates, and support for “Master Disable’ and ‘Lamp Test’ Functions (within Output Logic).

Physical controls will usually be provided on a panel, but are not necessary.

For example, one panel could provide the physical I/O connections and thus the primary control, but have no physical control hardware present. Another *MX1* with physical controls (programmed as duplicates) networks to the original panel to provide a distributed system.

Note that if physical controls are provided there <u>must</u> be a physical control for every Primary or Duplicated control.

The DSS uses the FP1056 and FP1057 hardware for both the fan controls and other functions. Refer to Section 10.18 for details.

10.21.2 Programming the DSS

The programming of the *MX1* DSS system is done within SmartConfig 2.5 or later, and uses features of the standard Template V1.60 or later, including Logic Blocks for Fan Controls and General Purpose switches and indication.

The DSS functions are then programmed in two main steps:
1. Configure the DSS hardware
   a. Enable the connection to the physical control doors
   b. Configure any network operation, if duplicate controls are required.
2. Configure the DSS Operation
   a. Configure the controls themselves, using Logic Blocks.

This section uses the term DSS for the general switch system, and Fan Control for the specific use of the DSS for that application. In part, this is because the hardware is named for the Fire Fan application, as that is initially the main use for the DSS.

Some of the DSS programming is common with that of Fan Control programming, so is not repeated here. References are made to the relevant sections in Section 10.18.

10.21.3 Programming the DSS Hardware

Programming of the DSS hardware is made on the SmartConfig Hardware page, as described in Section 10.18.5.

Section 10.18.6 describes network programming of fan controls, which also applies to DSS use.

10.21.4 Programming the DSS Using Logic Blocks

Programming the DSS system is be done by using Logic Blocks. These are accessed from within SmartConfig by using the Menu, Edit, Add Logic Block / Edit Logic Block / Delete Logic Block commands. See Figure 10-21.

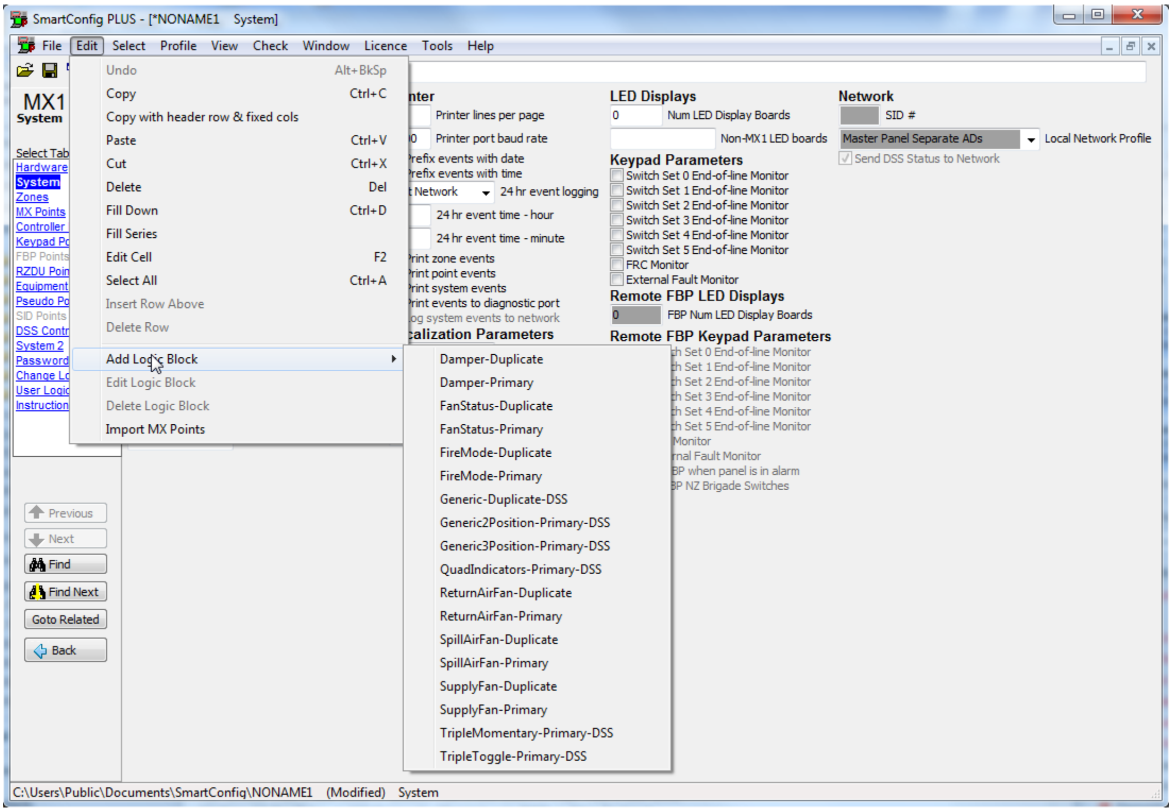


Figure 10.21 – Logic Blocks Menu Example

The Add Logic Block command shows the available logic blocks. Click on the required DSS function to open a dialogue box requesting entry of the information required to program a DSS control. The Logic Blocks that provide generic switch options (Figure 10-22), and direct programming of the DSS table are described in the following sections.

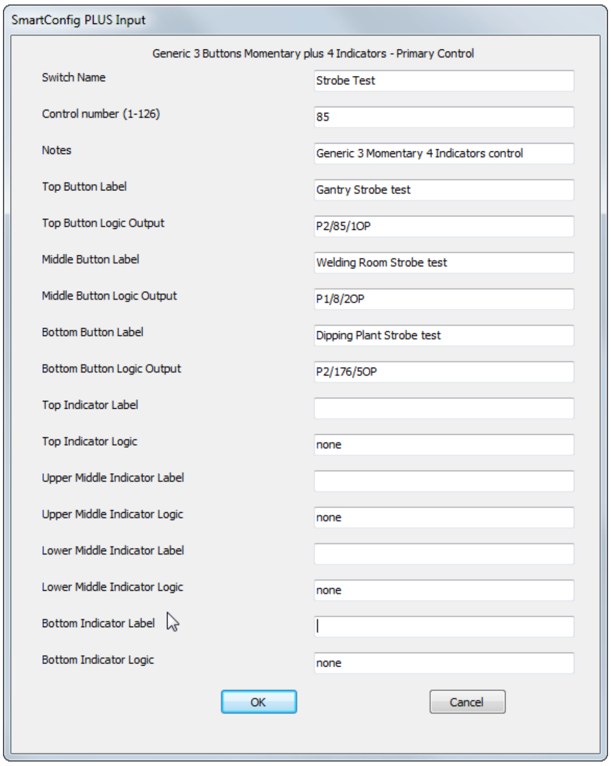


Figure 10.22 – Example DSS Logic Block

In all cases a DSS control number must be entered, along with the outputs to be controlled by the DSS Control buttons, and the inputs to drive the DSS Control Indicators. Additionally, a set of default information is presented, for example label texts, that will usually be deleted or overwritten.

In the example above, Control 85 (Strobe Test) is configured for 3 momentary pushbuttons, which are labelled with their functions and configured with the outputs to be activated when the corresponding button is pressed. Nothing drives the indicators, and thus the corresponding label texts have been deleted.

When the user presses OK, the Logic Block automatically configures the control for its correct operation and labels, and programs the *MX1* Output Logic to perform the DSS control IO functions. This output logic can be seen on the Menu, Profiles, Automatic Logic page (which is read-only).

Care is needed when entering information, as the data checking on entry of the logic block is limited.

The Logic Block entry system does not perform any format checking or range checking. Labels are plain text entries. Control numbers must be numeric and reference a valid control. Inputs and outputs are entered as if they were to be used in output logic, e.g. Z53AL, P1/2/1AL, P1/2/3OP or V100.

A blank entry in a new logic block will indicate mandatory information is required. For some entries (not all), a value of “none” is permitted and this is interpreted (variously) as the function is not required, the logic block must infer some function or an input does not exist. Such entries will have “none” as their default value. Other entries, for the most part labels, have a guiding text preloaded.

If the data entered is incomplete, or if in some cases the data does not conform to expected formats, the logic block cannot be exited until valid data is entered or the Logic Block is cancelled.

The data entered is not further validated until a Check Output Logic or Check Tables command is entered. Any errors will be displayed against the specific table the error is found in, thus the programmer may need to deduce the logic block that needs adjustment. Examples of this are: Invalid variable numbers, the use of unconfigured points and the use of input points as outputs, and vice versa.

If some aspect of the control requires adjustment, the Edit Logic Block command can be used. It recalls the originally programmed information and presents it in the same manner as the add logic block screen. Changes can be made and the Logic Block can be re-saved.

Always use the Edit Logic Block command to update the DSS Control data. The Edit Logic Block command uses the data stored for a logic block, not the information it may have programmed into other *MX1* tables, such as the DSS table or Logic Substitutions table. Independent changes to such data will be lost when the Logic Block is edited and re-saved.

If a logic block is no longer required, the Delete Logic Block command can be used. This removes the functional logic and Logic Block settings.

At this time settings made to tables such as the DSS table and Logic Substitution Tables do not get deleted when a Logic Block is deleted. Some manual adjustments to the database may be required, for example programming the fan control to be “Disabled” in the DSS table.

DSS Control Logic Blocks are available in two classes:

- Primary – these program the *MX1* to perform all the programmed DSS functions on the local *MX1* panel. Most Logic Blocks, other than “3 Independent Momentary”, ‘memorise’ the position of the ‘switch’. They can be successfully programmed for both standalone and network *MX1* panels.
- Duplicate – these program the *MX1* to monitor the state of a Primary control on another *MX1*. The states shown locally come from the primary DSS control over the network, and any local button presses are sent to the primary DSS control for processing. Duplicate DSS controls can be successfully programmed only if the *MX1* has networking enabled.

The following sections describe the Logic Blocks for the DSS Controls. See Section 10.18.7 for details of the Fire Fan Control Logic Blocks.

Programming the Primary DSS Control Logic Blocks

SmartConfig provides the following Logic Blocks for Primary DSS controls (controls for which the I/O is on this *MX1* panel):

- Generic3Position-DSS-Primary
- Generic2Position-DSS-Primary
- TripleMomentary-DSS-Primary
- TripleToggle-DSS-Primary
- QuadIndicators-DSS-Primary

These provide similar programming options, with minor differences as described below. An example of the Generic3Position-DSS-Primary logic block is shown in Figure 10-23.

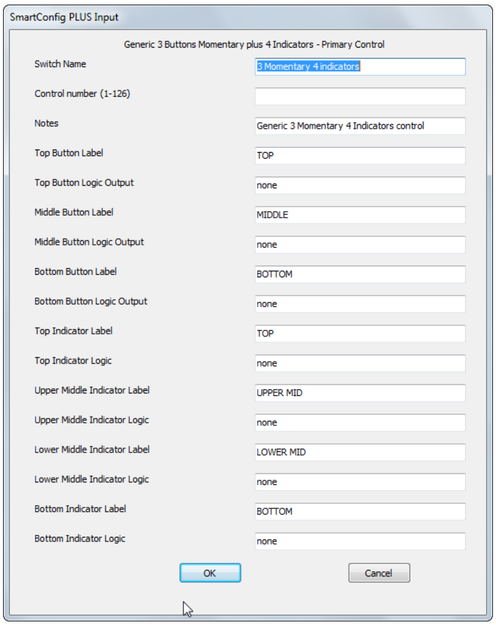


Figure 10.23 – Primary 3 Position Switch Logic Block

Generic3Position-Primary-DSS

The Generic3Position -Primary-DSS Logic Block programs a DSS control to operate as a 3 position switch, with memory of its position that persists over *MX1* restarts. Its default position, if its memory is lost, is the centre/middle button being ON, the others OFF. The control also has 4 programmable indicators.

If the Button Logic is set to “none”, then there is no effect on the system, other than indicating the button is ON when pressed. Otherwise, the output specified will turn on and off dependent on whether the relevant button is ON or OFF.

If the Indicator Logic is set to “none”, then the indicator will remain off. Otherwise the indicator will turn on or off dependent on the Output Logic entered.

Generic2Position-Primary-DSS

The Generic2Position-Primary-DSS Logic Block programs a DSS control to operate as a 2 position switch, with memory of its position that persists over *MX1* restarts. The two positions use the top and bottom buttons, with the centre button being non-functional. Its default position, if its memory is lost, is the top button being ON, the others are OFF. The control also has 4 programmable indicators.

If the Button Logic is set to “none”, then there is no effect on the system, other than indicating the button is ON when pressed. Otherwise, the output specified will turn on and off dependent on whether the relevant button is ON or OFF.

If the Indicator Logic is set to “none”, then the indicator will remain off. Otherwise the indicator will turn on or off dependent on the Output Logic entered.

TripleMomentary-Primary-DSS

The TripleMomentary-Primary-DSS Logic Block programs a DSS control to operate as 3 independent momentary action switches. There is no switch memory. Each default position is OFF. The control also has 4 programmable indicators.

If the Button Logic is set to “none”, then there is no effect on the system, other than indicating the button has been pressed. Otherwise, the output specified will turn on for 1 second following the button press, and then OFF again. If the function requires a longer period than this, then output logic timers can be used to lengthen the switch ON time.

If the Indicator Logic is set to “none”, then the indicator will remain off. Otherwise the indicator will turn on or off dependent on the Output Logic entered.

TripleToggle-Primary-DSS

The TripleToggle-Primary-DSS Logic Block programs a DSS control to operate as 3 toggle action switches that can be turned on and off independently of each other. Each button has its own switch memory that persists over *MX1* restarts. The button’s default position is OFF. The control also has 4 programmable indicators.

If the Button Logic is set to “none”, then there is no effect on the system, other than indicating the button has turned on or off when pressed. Otherwise, the output specified will turn on and off to follow the button state.

If the Indicator Logic is set to “none”, then the indicator will remain off. Otherwise the indicator will turn on or off dependent on the Output Logic entered.

QuadIndicators-Primary-DSS

The QuadIndicators-Primary-DSS Logic Block programs a DSS control to have 4 programmable indicators. All buttons are non-functional.

If the Indicator Logic is set to “none”, then the indicator will remain off. Otherwise the indicator will turn on or off dependent on the Output Logic entered.

Programming Duplicate DSS Controls

Duplicate DSS Controls are used to have a Primary DSS Control on one *MX1* be mimicked on one or more *MX1* panels across a Panel-Link network.

The Duplicate DSS Control data is transferred as part of the Panel-link Network Variables application. Duplicates can only be programmed on a network *MX1*. Thus transfer of data for that application must be correctly programmed for *MX1* panels, I-HUBs, PIBs and other networking equipment.

SmartConfig provides the following Logic Blocks for Duplicate controls:

- Generic-Duplicate-DSS

A Generic-Duplicate-DSS example is shown below in Figure 10-24.

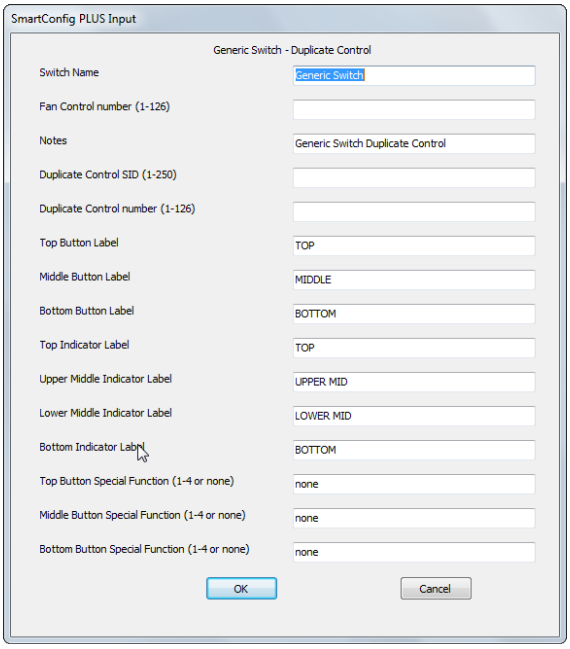


Figure 10.24 – Generic Duplicate Logic Block

The Duplicate DSS Block programs a local DSS Control for which all operation, I/O and memory of the control's switch position is determined by a Primary DSS Control on another *MX1*.

CAUTION Duplicate Controls should not be programmed to duplicate another Duplicate Control, as Duplicate Controls do not send status onto the network. At this time, SmartConfig cannot warn if this is done.

It is not possible to program two Duplicate DSS controls on one *MX1* to mimic the same Primary Fan Control on another *MX1*.

It is not possible to program a Duplicate DSS control to mimic a Primary DSS Control on the same *MX1*.

In most situations, the data that requires entry is the control name, the number of the local Duplicate DSS Control to be programmed, the SID number of the *MX1* the associated Primary DSS Control is programmed at, and the control number of the associated Primary DSS Control.

The labels are set to texts that identify the buttons and indicators, and should be adjusted as desired for printing from SmartConfig. Note that if the labels are too long, the labels for the buttons may overlap the labels for the indicators.

For the most part, a Duplicate DSS Control appears to operate exactly as the Primary DSS control is programmed. Indications at the Primary DSS Control appear on the Duplicate Control indicators. Buttons that do not work at the Primary DSS Control also do not work at the Duplicate DSS Control. Buttons pressed on a Duplicate DSS Control are sent to the Primary DSS Control for processing.

10.21.5 Programming the DSS Table

This section describes how to directly program the DSS using the DSS Table and Output Logic. This can be done if the Logic Blocks do not provide the necessary functions, or if, for example, a mixture of toggle and momentary buttons are required on one control.

The *MX1* DSS Table provides for up to 126 DSS Controls per panel, which may (and usually will) have an associated physical set of controls. The available settings on the DSS table are shown below in Figure 10-25 (shown using "Form View" layout).

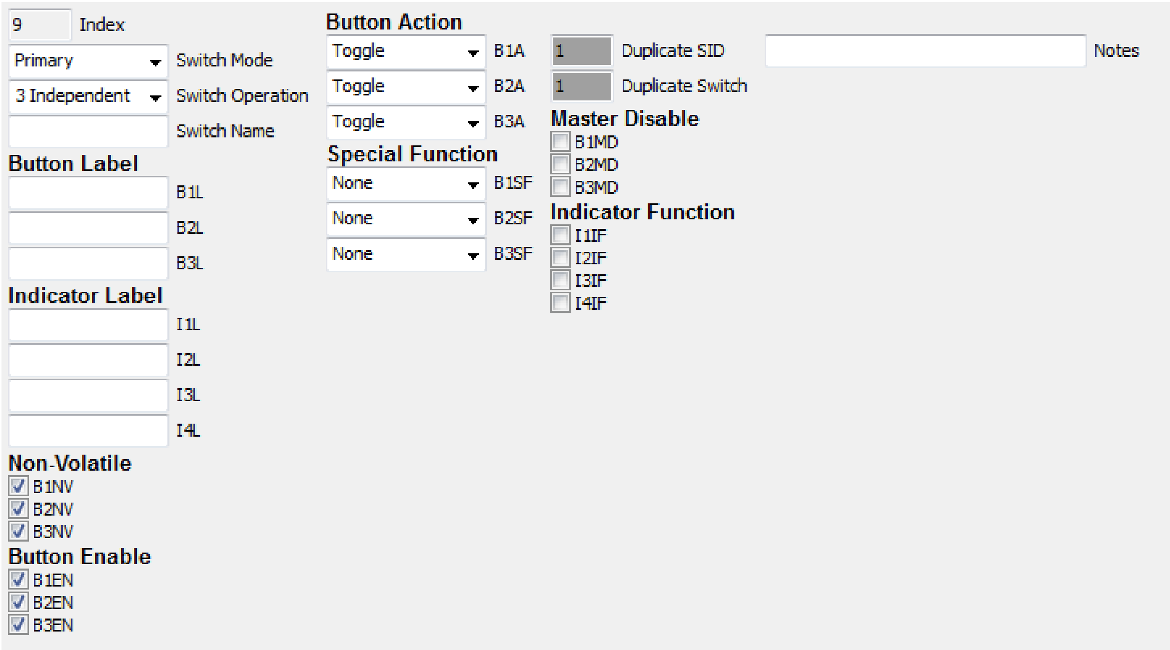


Figure 10.25 – DSS Table Settings for 1 DSS Control

Index

Every DSS Control is identified by a number, 'Index', which is used for its settings, its output logic tokens and matches the control number.

Switch Mode

The Switch Mode setting determines the basic switch function of the control. The basic switch functions have settings particular to each, and SmartConfig allows a user to program only those settings relevant to the switch function selected.

<u>Unused</u>: the control is not used in the system. No other settings can be updated. No physical control matching this Index should be present, unless paired with a control that is not Unused. No output logic should be written for an Unused control.

<u>Primary:</u> the control is used in the system, and its operation and status are maintained on the *MX1* being programmed. Most settings are available to be programmed (partly determined by the switch mode), except for the Duplicate settings. The status of Primary controls is sent onto the network if networking is enabled AND the 'Send DSS Status to Network' setting on the System page is ticked (its default setting is ticked).

<u>Duplicate:</u> this setting is available only for *MX1* panels that are networked. The control is used in the system being programmed, but its operation and status are maintained on the *MX1* panel set in the control's Duplicate SID settings. Thus settings related to Switch

Operation, memory, button actions, etc., are unavailable. However, most other settings are available for local use.

Switch Operation

Primary switches use this setting to determine how the buttons on the control operate.

<u>3 Position:</u> The control is automatically configured for all 3 buttons to work together as a 3 position switch - if a button is pressed, it becomes the button that is ON and the others become OFF.

3 Position switches are useful for Fire Fan Controls.

By default a 3 button switch remembers its position through an *MX1* restart (Non-Volatile ticked), and all buttons can be pushed (Button Enabled ticked). These settings can be unticked if required (e.g. if a volatile switch is required, or if the button position needs to be viewed but not changed by pressing a physical button).

The default state for a 3 Position switch is the centre button ON.

<u>2 Position:</u> The control is automatically configured for the top and bottom buttons to work together as a 2 position switch – the centre button is not enabled, thus cannot be used. If the top or bottom button is pressed, it becomes the button that is ON and the others become OFF.

2 Position switches are useful for controlling drain valves or applications where an OFF/ON switch needs to be grouped with some associated status indications.

By default a 2 button switch remembers its position through an *MX1* restart (Non-Volatile ticked), and only the top and bottom buttons can be pushed (Button Enabled ticked for those, the centre button is always unticked). These settings can be unticked if required (e.g. if a volatile switch is required, or if the button position needs to be viewed but not changed by pressing a physical button).

The default state for a 2 Position switch is the top button ON.

<u>3 Independent:</u> The control is automatically configured for all 3 buttons to work as independent switches. How each individual switch works is controlled by the Button Action setting (Momentary or Toggle).

3 Independent switches are useful for providing Lamp Test and Fire Mode Reset support for an FFCP, applications requiring a large number of ON/OFF controls (such as plant isolate) or if a momentary action is required, such as triggering a timer controlled output.

By default a 3 Independent control is configured for 3 Momentary action buttons, with no memory (Non-Volatile unticked) and all can be pushed (Button Enabled ticked). These settings can be changed if required, e.g. if a toggle switch is required.

Note that a Momentary action button can never be Non-Volatile.

The default state for all buttons on a 3 Independent switch is OFF.

Switch Name, Button Labels and Indicator Labels

These fields are used to label the switch/control and its buttons and indicators.

SmartConfig uses these text fields when printing the DSS labels. The printouts use a standard font that will produce 5mm high text as required for AS1668 applications. If different heights and fonts are required then use the Word Template LT0590.
The texts also provide documentation for a programmer. The *MX1* itself does not make any use of these fields.

CAUTION The text fields are configured to provide limits to the text lengths. Entry of a maximum length text does not guarantee the text will print properly. Reasons for this include: different characters have different widths; button labels and indicator labels occupy the same horizontal space, and may overlap if the texts are too long.

The Switch Name field permits entry of text up to 31 characters long. SmartConfig formats this for up to 2 lines of text.

The Button Labels and Indicator Labels allow for up to 13 characters of text. SmartConfig formats this for 1 line of text each. It does not check for overlaps of text. These will be evident when the labels are printed.

Non-volatile settings

The Non-Volatile settings determine which button(s) on the local control have their status remembered over a restart of the *MX1*. If unticked, the button(s) do not remember their state and revert to a default state determined by the Switch Mode and Switch Operation settings.

SmartConfig controls which settings are available, and which settings are inherently tied together based on the Switch Mode and Switch Operation settings. For example, a 3 button switch has only 1 user changeable setting which is applied to all 3 buttons.

All Switch types except Momentary action switches are Non-volatile by default.

Button Enable settings

The Button Enable settings determine which button(s) on a Primary Switch, and any Duplicates of that Switch, can be pressed. If ticked, the button can be pressed (and the physical control will indicate it has been pressed.) If not ticked, the button cannot be pressed (and the physical control will not indicate even if it is pressed).

SmartConfig controls which settings are available, and which settings are inherently tied together based on the Switch Mode and Switch Operation settings. For example, a 3 button switch has only 1 user changeable setting which is applied to all 3 buttons.

The Button Enable setting is used, for example, for the 2 Position switch to effectively stop the middle button from working. It may also be used to have a switch that the user cannot directly control using a button, but the status of which can be seen by the user and can be changed by suitable output logic.

Button Action settings

The Button Action settings are valid for only the 3 Independent Switches setting, and determine whether a button has a Momentary or Toggle action.

A Momentary Action switch turns on for 1 second and then turns off. An example usage would be for a Reset switch.

A Toggle Action switch turns on or off for each press. An example usage would be for a plant disable function.

Special Function settings

The Special Function settings determine whether a button on a control being pressed is treated as one of 4 Special Functions. If the setting is None, the button is not a special function, and thus is processed as normal. If the setting is SFX, then the button sets the corresponding DSS-FUNCTION(X) logic token to TRUE for 1 second. No further processing or use of the button press is made. X can be 1 – 4.

This function is used by the Fire Fan Control logic blocks to implement the Lamp test Function. The Lamp Test button is captured for both Primary and Duplicate Fire Mode controls and sets a DSS-FUNCTION() token to TRUE, which then sets the DSS-LAMP-TEST token to TRUE to initiate the lamp test. Of particular note, the Duplicate Fire Mode control Lamp test button is captured for local processing, while the Reset button is sent across the network (as expected) to be processed at the Master Fire Mode control.

Duplicate SID and Duplicate Control settings

The Duplicate SID and Duplicate Controls apply only to Duplicate switches, and determine the remote *MX1* panel, and its control, that are to be duplicated locally.

The remote *MX1* and its control are where the programmed control gets its setup for its button from, its switch and indication status from, and where any buttons must be sent to for processing.

The remote *MX1* must have that control enabled, be networked, and be enabled to send DSS Status onto the network. The local *MX1* must be in the remote *MX1*'s SID Points table. Otherwise the duplicate control will not function correctly.

Master Disable settings

The Master Disable settings determine which button(s) on the local control stop being able to be pressed when the DSS-MASTER-DISABLE logic token is TRUE. The buttons still indicate their status, and the switch can still be controlled by other controls on the network, or output logic driving the Primary Switch. When the DSS-MASTER-DISABLE logic token is FALSE, the buttons return to their Button Enable controlled operation.

The Master Disable function, in conjunction with suitable buttons or keys, and network logic, may be used, for example, to control which of multiple FFCP on a network are able to be used at any one time.

Indicator Function settings

The Indicator Function settings determine whether indicator X on a control being ON contributes to set the corresponding DSS-INDICATION(X) logic token to TRUE for the longer of the indicator being on, or 1 second. The setting is ticked to have the indicator contribute.

X is 1 for the top red indicator, 2 for the middle red indicator, 3 for the middle yellow indicator and 4 for the bottom green indicator.

This function is used by the Fire Fan Control logic blocks to determine if there are any Fire Fan faults (yellow indicator on for Fan Controls) and if the Fire Fan Master is in fire mode (top red indicator) so the *MX1* Smoke protection indicator can be turned on.

Notes Field

This field allows for storage of any (short) useful information for this control.

10.21.6 Programming the DSS Output Logic

The DSS system interacts with the rest of the *MX1* via output logic, to implement the functions associated with the various controls and buttons.

There are logic tokens to read and 'press' the buttons, set the indicators on and off, signal the Special and Indicator functions, and send controls to any physical hardware for Lamp Test and Master Disable.
The Fire Fan Control and Generic Logic Blocks make extensive use of these tokens, and may be examined as examples.

Button Output Logic Tokens

The Button tokens are of the form SIPx/y. This translates to Switch Position for control x button y. 'y' is 1 for the top button, 2 for the middle button and 3 for the bottom button.

When used as a Right Hand Side token, as part of a logic equation, this token is TRUE if the corresponding button is ON.

For example V10 = SIP14/2 will set Variable 10 be true if the middle button on control 14 is ON.

When used as a Left Hand Side token, the corresponding button acts as if it has been pressed when the logic equation result is TRUE. Depending on the Switch Configuration, this may set a 3 position switch to the specified position, or change the status of toggle switch.

For example SIP8/1 = P1/2/1AL will have control 8 respond as if button 1 had been pressed when P1/2/1AL is TRUE.

Indicator Output Logic Tokens

The Indicator tokens are of the form SIIx/y. This translates to Switch Indicator for control x indicator y. 'y' is 1 for the top indicator, 2 for the upper middle indicator, 3 for the lower middle indicator and 4 for the bottom indicator.

When the logic equation driving the SII token is TRUE, the corresponding indicator is turned ON.

For example SII43/4 = P3/5/2AL will make control 43 turn on Indicator 4 when P3/5/2AL is TRUE.

Special Function and Indicator Function Logic Tokens

The Special Function token, DSS_FUNCTION(x), can be used to initiate actions when a particular button is pressed. While a similar operation could be implemented using the specific button's SIP token, the Special Function allows for multiple buttons to perform the function, or logic to be written without knowing exactly which button will be used. The Special Function also allows the buttons to be captured for local processing, which is of particular importance for Duplicate Controls.

The DSS-FUNCTION(x) token goes TRUE for 1 second whenever a button configured for SFx is pressed.

One use for the Special Function token is to manage the FFCP Lamp Test operation.

The Indicator Function token, DSS_INDICATOR(x), can be used to initiate actions when indicator 'x' on a control is ON. While a similar operation could be implemented using the logic driving an indicator's SII token, the Indicator Function allows for the status of indicator 'x' on multiple controls to easily be combined to perform the desired action.

The DSS-INDICATOR(x) token goes TRUE when one or more Indicator 'x' programmed for the Indicator Function is on, with a minimum TRUE period of 1 second.

One use for the Indicator Function token is to combine multiple FFCP Fan Faults (as indicated by the yellow indicator) and use this signal to create an *MX1* fault condition.

Lamp Test Logic Token

The DSS-LAMP-TEST token is used to trigger the lamp test function on the local DSS hardware.

The Lamp Test Function (turn on all LEDs) is triggered when the logic equation driving DSS-LAMP-TEST changes from FALSE to TRUE.

Lamp tests cannot be retriggered while a Lamp test is in progress, and are not extended if the DSS-LAMP-TEST token is set TRUE longer than the DSS hardware's test period.

For example DSS-LAMP-TEST = DSS-FUNCTION(1) causes the hardware to perform a lamp test when the DSS-FUNCTION(1) token becomes TRUE.

Master Disable Logic Token

The DSS-MASTER-DISABLE is used to trigger the Master Disable function on the local DSS hardware.

The Master Disable function, when active, has the DSS hardware ignore presses on all buttons programmed to obey the Master Disable signal.

For example DSS-MASTER-DISABLE = N33/1 has the local hardware disable buttons programmed as obeying Master Disable when network variable NV33/1 is TRUE. Panel 33 could be programmed to set this network variable TRUE whenever a user operates a switch to prevent users at other panels from pressing buttons (a "Take Control" function).

10.22 Application – Using D51MX Duct Sampling Unit

The AS 1603.13 compliant D51MX duct sampling unit is designed to detect smoke in the air passing through an air conditioning duct by extracting some air through a smoke detector installed inside the D51MX.

A 850P or 850PH smoke detector should be installed for use with the MX1. In SmartConfig the smoke detector needs to be programmed with a Profile of **Count Normal** for the smoke sub-point for use in the D51MX. Any other selection is not approved. This provides a nominal 8%/m obscuration alarm level.

The D51MX contains a **Vigilant 3626** R5 version of Termination PCB.

Connect the MX Addressable Loop into the **IN +V, -V** terminals and the outgoing loop to the **OUT +V, -V** terminals, when an 850P or 850PH detector is used with an MX1 panel.

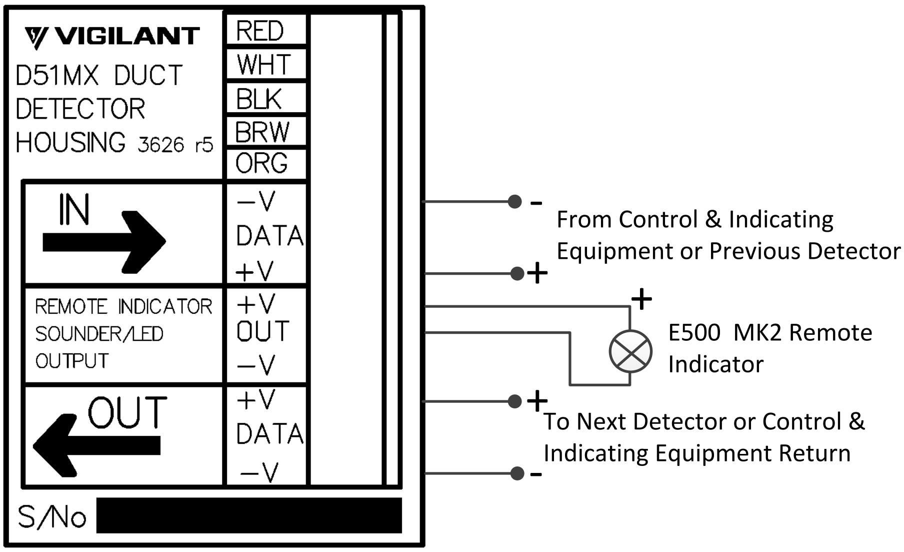


Figure 10-26 – D51MX with 850P/PH Field Wiring

11 Battery Capacity and Design

11.1 Battery Capacity and Design

11.1.1 General

This section describes the procedure of selecting a battery and power supply to meet the requirements of a particular *MX1* system.

A reliable power supply for a fire alarm system is of the utmost importance as the successful operation of the whole system depends on it. The following calculations of battery and battery charger capacities must be performed in order to ensure that the fire alarm system meets the requirements of the local standards and codes.

These requirements (from NZS 4512) are:

- A system must be able to run with the mains off in the non-alarm condition (with a fault) for a specified period. For a brigade-connected system, this minimum period is typically 24 hours; for a non brigade-connected system, this period is typically 72 hours.
- After this period, the system must be able to run with the mains off in the alarm condition (with evacuation load) for a specified minimum period, typically 30 minutes.
- After these two periods, the battery charger must be able to restore the nominal capacity of all rechargeable batteries within a given period, typically 24 hours, while the system is in the non-alarm condition, with a fault.

The minimum battery capacity to meet these requirements is based on four quantities:

- The current drawn by the *MX1* system and associated loads in the non-alarm condition with a fault (non-alarm load or NAL).
- The current drawn by the *MX1* system in a fire alarm condition (alarm load or AL).
- The minimum specified time for non-alarm operation from the battery during a mains failure.
- The minimum required time for fire alarm operation from the battery.

Once the necessary battery capacity has been calculated, the battery charger capacity can be checked, based on these figures, plus:

- The maximum allowed time for the charger to recharge the battery.
- The maximum available battery charger current.
- The current drawn by loads powered only from the charger and not from the battery. This may include loads such as door holders.

11.1.2 Local requirements

The detailed rules of how the battery and charger capacity are calculated vary depending on local requirements. These different calculation methods are described later in this chapter.

Regardless of the local requirements, the values for NAL, AL, and non-battery loads must be calculated for the system.

11.1.3 MX1COST Calculation Tool

A software tool, MX1COST, is available for the *MX1* to make these calculations faster and easier, and to produce printed reports based on the local requirements.

MX1COST also checks the expected *MX* Loop performance. In general, the recommended approach is to use the latest version of MX1COST.

11.2 Manual Battery Calculation – System Loads

The following instructions allow a system designer to manually calculate PSU and battery sizes. The calculations for battery and PSU sizes are based on conservative figures, particularly in regards some alarm loads.

A more detailed calculation can be obtained by using MX1Cost, which permits more specific installation information to be used.

Refer to Chapter 7 for details of the *MX* Loop Load calculations. From these calculations add up the Total Loop Battery Load NAL and AL values into the right hand cells of the first row of this table.

Enter the number of *MX* Loop Cards in its box and multiply the NAL and AL figures to the right hand side boxes.

Do the same for each of the listed pieces of equipment that can be used. Note that the currents for T-Gen 60, T-Gen 120 and T-Gen 50 presume maximum power output and the use of AS2220 tones and default messages. The currents may be reduced pro-rata based on the actual speaker loads (if known). Any T-Gen2 strobe load must be included as Additional Battery Loads.

Enter the NAL and AL values for any other battery loads not already accounted for in the final row. Additional battery loads will include optional items such as VLC800MX detectors, printers and RDU devices powered from the *MX1* supply plus loads switched on in alarm – like SNM800 and 901SB sounder bases, and strobe outputs on a T-Gen2.

Sum the NAL and AL columns to produce the system total battery loads.

	Quantity	Individual		Collective	
		NAL (mA)	AL (mA)	NAL (mA)	AL (mA)
Total Loop Battery Loads (from *MX* Loop calculations)					
Controller Bd				120	150
LCD/Keyboard				30	140
Zone display board allowance				16	56
MX Loop Card		70	70		
T-Gen 60 (0, 1,2 or 3)		170	2400		
T-Gen 120 (0 or 1)		170	4800		
T-GEN 50 (0 or 1)		64	2200		
100V Splitter Module		15	15		
100V Switching Module		10	10		
Mini-Gen (0, 1, or 2)		0	1200		
SGD (0 or 1) if powered from *MX1*		10	10		
I-HUB		100	100		
OSD Fibre Modem		15	15		
PIB		35	35		
Moxa Switch (fibre)		320	320		
Moxa Switch (Ethernet only)		260	260		
Ethernet Extender (DDW-120)		110	110		
Remote FBP		180	180		
FP1056 AS1668 Control Doors		8.5	8.5		
FP1057 AS1668 Extender Kits		8.5	8.5		

Additional Battery Loads		

Calculate the non-battery-backed load currents drawn directly from the charger:

		Individual	Collective
	Quantity	NAL (mA)	NBL (mA)
24V door holders		50	
Additional Non-battery Loads			
Total Non-battery Load			

11.2.1 Battery Capacity Calculation - New Zealand Requirements (NZS 4512:2010)

Sections 503 (e) and (f) of NZS 4512:2010 specify the calculation methods for battery and charger capacity. Enter the system loads NAL, AL, and NBL calculated previously into the first three rows, and calculate the battery capacity BC and charger capacity CC using the equations given.

Note – the CC calculation has an allowance for a daily battery test in the recharge time, based on current default settings in *MX1* configuration templates. If the actual settings are different, use MX1COST instead of this manual configuration.

For a brigade-connected system:

Non-alarm load (from load calculation)	NAL =		Amps
Alarm load (from load calculation)	AL =		Amps
Non-battery load (from load calculation)	NBL =		Amps

Minimum battery capacity	BC =	$NAL \times 24 + AL$	
	=		Ampere-hours
Minimum charger capacity	CC =	$BC \div 22.7 + NAL + NBL$	
	=		Amps

For a non-brigade-connected system:

Non-alarm load (from load calculation)	NAL =		Amps
Alarm load (from load calculation)	AL =		Amps
Non- battery load (from load calculation)	NBL =		Amps

Minimum battery capacity	BC =	NAL $\times$ 72 + AL	
	=		Ampere-hours
Minimum charger capacity	CC =	BC $\div$ 22.7 + NAL + NBL	
	=		Amps

If the minimum charger capacity is less than 5.0A, then the *MX1*'s internal charger will be sufficient. If not, refer to section 11.4. It is very unlikely that this charger will not be sufficient for the system requirements.

11.3 Battery Housing

From the table below, find the smallest available battery that will meet the minimum capacity requirements from the above calculation or from MX1COST.

If the required battery is larger than will fit in the *MX1* cabinet being used, an external battery box will be required to house all of the batteries. The FP0576 battery box (550W x 440H x 180D) is suitable for housing 24V batteries to 40Ah capacity and greater. Alternatively, an empty Slimline *MX*1 cabinet (part number FP0944) may be used for this purpose.

Calculated Battery Capacity	***MX1* Slimline Cabinet**	**15U Cabinet**
12Ah	Internal	Internal
17Ah	Internal	Internal
26Ah	External battery box required	Internal
35Ah	External battery box required	Internal
40Ah	External battery box required	Internal

If it is not convenient to locate the external battery box near the *MX1* cabinet, it can be located separately as long as the following maximum distances are observed. Note that the *MX1* Controller has two sets of battery terminals each with a 4.0mm^2 wire capacity.

Cable Requirements to External Battery Box

Cable Size to External Battery	**Maximum cable length from *MX1****
2.5mm^2 TPS	6m
Auto154 (3.1mm^2)	7.5m
4.0mm^2 TPS	10m
Auto156 (4.6mm^2)	11m
Dual run of 4.0mm^2 TPS	20m

* Distances are based on a maximum 0.5V drop in the battery wiring at 5A load. If the Alarm Load is greater than 5A, these distances should be reduced in proportion, e.g., for AL = 8A, the maximum cable lengths are 5/8 of the values in the table.

If an external battery box is used, overcurrent protection must be fitted in series with the battery leads, to protect against overheating and the risk of fires arising from short circuits in the battery wiring. A 20A fused battery lead, LM0571, is recommended for this purpose, and is to be fitted between the two batteries. Note that if such a fuse is used, all the batteries must be fitted in the battery box so that an open circuit fuse is detected by the "battery present" test.

11.4 Additional Charger and Batteries

A Grade 2 T-Gen2 installation requires a separate power supply. A Grade 3 T-Gen2 solution can be powered from a single shared supply, as per the MX1 PSU. If a charger capacity greater than 5A is required for a system, an additional charger and battery will be required. The additional charger and battery should be used to power the external loads such as the T-Gen2s, T-GEN 50s, Mini-Gens, strobes, bells, etc., that would have been powered from a +VBF terminal on the *MX1* Controller.

The additional charger must be capable of performing the monitoring tasks such as checking for Battery Low, and Battery Connection and generating a fault output. It should also have an external Battery Test input to allow the Controller to perform regular battery tests. The PSU2406F (ME0334 or ME0340) and PSU2412F (ME0343) are suitable units for this application. The 14A PSE (FP1139) should be used for T-Gen2.

The additional charger must be connected to the Controller as follows:

- The 0V of the charger and Controller must be connected. This connection does not have to carry load current, so does not need to be especially heavy. This is to allow fault monitoring and control of the charger by the Controller.
- The FAULT- output of the charger should be connected to one of the GP Inputs on the Controller. This input should be configured as an external fault input as described in Section 10.5. On the PSU24xx set the charger fault output for open collector and fit the MX1 GP Input 3K3 EOL resistor between pin 4 of J7 and 0V on the PSU.
- The BATTERY TEST- input of the charger should be connected to one of the GP Outputs on the Controller. A user logic equation is required to control this output from the logic tokens for automatic and manual battery test:

```
; Send Battery Test signals to the additional charger
; Combine Automatic and Manual battery test tokens
$GP2_OUTPUT = BTA OR BTM
```

The 0V terminals of each external load must be connected directly to the additional charger rather than the Controller. The +V terminal of each external load is connected directly to the additional charger (for T-GEN 50) or via an Ancillary Relay contact (for Mini-Gen, bells, strobes, etc.)

The Controller itself is powered from the *MX1* charger and a smaller battery, which has only to carry the load of the *MX1* and the *MX* Loops. Two sets of battery calculations must be carried out for a system with an additional charger and battery:

- the first calculation takes account of the *MX* devices on the loops, and the Controller and LCD/Keyboard loads. External loads are not included. This calculation will give the necessary size for the battery connected to the Controller.
- the second calculation takes account of the external loads, and ignores *MX* devices and Controller loads. If using MX1COST, set the numbers of all *MX* devices to zero, and subtract the quiescent and alarm loads of the Controller and LCD/Keyboard (166mA and 356mA respectively) from the external load totals. This calculation will give the necessary size of the additional charger and battery.

Possibilities of cabinets to house the extra charger and batteries are the:

- FP0576 battery box (550W x 440H x 180D) suitable for housing 24V batteries to 40Ah capacity and greater.
- An empty *MX1* cabinet (part number FP0944), suitable for 24V 17Ah batteries.

11.5 Powering from an External DC Supply

If 230V mains power is not available to power the *MX1* then an external DC power supply can be used instead.

The requirements for the external DC power supply are:

- Supply voltage: 24V to 28V
- Supply current: 6A
- Wiring fuse: 10A

The external DC power supply should be wired to the J14 PSU INPUT of the *MX1* Controller. Cut the existing power supply lead to J14. Connect the orange wire (Pin 3, +VNB) and the red wire (Pin 4, +VB) together and to +24V of the external power supply. Connect the black wire (Pin 1, 0V) to 0V of the external power supply. Fit a 10A fuse at the external power source to protect against cable faults and overload. See Figure 11.1.

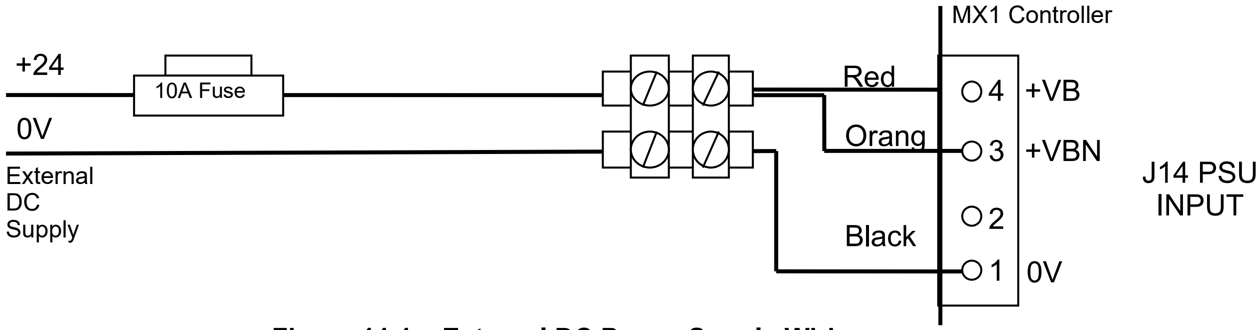


Figure 11.1 – External DC Power Supply Wiring

As no battery will be connected to the *MX1*, fit a mini-jump to the BATT CONN link LK3 to prevent the *MX1* generating battery faults.

Because the panel will not be earthed via the mains power lead, a separate earth wire should be connected between the panel's gear plate and a suitable earth point. If the external supply is earthed, or is supplying another load that is earthed, then the Earth Fault monitoring must be turned off in the *MX1* (using SmartConfig set point 241.25.3 to **Log Nothing** and **Hidden**).

The minimum operating voltage for the *MX1* is 22V. The panel will generate the Power Supply Supervisory fault if its supply voltage drops below 21.8V. The Power/Operating LED will flash and a Mains fault will be generated if the supply voltage drops further (around 20V).

The cabling between the external power source and the *MX1* must be rated to carry the maximum MX1 current and not allow the voltage to drop below 22V at the *MX1* (a higher minimum voltage is recommended).

Using SmartConfig, set the following *MX1* Controller sub-points to Log Nothing and Hidden.

Point	Description	Logging Profile	Point Flag Profile
241.25.1	Battery Low	Log Nothing	Hidden
241.25.2	Battery Connection	Log Nothing	Hidden
241.25.4	Battery Test	Log Nothing	Hidden
241.25.9	Battery Capacity	Log Nothing	Hidden
241.25.11	Charger High	Log Nothing	Hidden
241.25.12	Charger Low	Log Nothing	Hidden
241.25.13	Battery Fail	Log Nothing	Hidden

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12 Zone Display Design

12.1 General

The *MX1*'s alphanumeric display can be used to view the states of any zone. Some aspects of the operation of the alphanumeric display, particularly the alarms list, are configurable on a per-site basis.

However, it is usual to have individual zone indicators to provide "at-a-glance" status information without requiring access to the *MX1* keyboard, especially for Fire Service use.

MX1 can be fitted with individual zone indicators in multiples of 16, comprising a red alarm indicator and a yellow fault/disabled indicator for each zone.

The Slimline *MX1* cabinet (also available empty as FP0944) can accommodate up to 32 zone indicators (2 modules of 16). The 15U *MX1* cabinet can accommodate up to 192 zone indicators (12 modules of 16). Subsequent indicators can be used for common Normal/Fire/Defect alarm type indications (smoke, heat, MCP etc.), followed by zone alarm indications.

For New Zealand use, the first zone indicator position is always reserved for common status indicators.

The 15U *MX1* can support up to 191 zones of LEDs in a front service format. It does not have a brigade index. This can be provided via an empty *MX1* Slimline cabinet (FP0944), a PFD cabinet, a Remote FBP or an LED-RZDU.

MX1 also has several options for driving remote zone displays which are located at another part of the protected premises. These remote displays can be compact alphanumeric displays, or individual zone indicators or a combination of these. Some of these remote displays can also provide limited remote control of the *MX1* system.

12.2 Zone Display Modules

12.2.1 General

Table 12.1 – Some Brigade Index Options for *MX1* Systems

Panel format	No of Zone Indications	What cabinet arrangement to use
MX1 front service	Up to 31	FP0893 *MX1* in Slimline cabinet
MX1 rear service	Up to 31	FP0893 *MX1* in Slimline cabinet
MX1 rear service	32-63	FP0893 *MX1* in Slimline cabinet + FP0944 empty Slimline cabinet stacked vertically or horizontally
MX1 rear service	64-95	FP0893 *MX1* Slimline cabinet + 2 x FP0944 empty Slimline cabinets stacked vertically or horizontally
MX1 front service	191	FP1010 plus separate brigade index

See Chapter 13 for Remote Brigade Index options, as well.

12.2.2 Module Options

The *MX1* zone displays are driven from a connector on the LCD/Keyboard Controller. This is compatible with the following zone display modules:

Compact Version (available as FP1002 extender kit)

This includes the compact 16 zone display module normally used with *MX1*. The Slimline cabinet has positions for two of these displays behind the keyboard overlay (front service) or on the gearplate (rear service). The empty *MX1* cabinet (FP0944) has positions for two of the displays on the gearplate (rear service). The 15U cabinet has the same keyboard overlay, but can also be fitted with up to two 4U brackets which can each hold five of these zone displays.

Each module has 16 sets of zone indicators: one red LED and one yellow LED for each set. The red LED indicates alarm conditions, while the yellow LED is used to indicate fault conditions (flashing) or disable conditions (steady). The module supplied with the *MX1*(NZ), also has a green LED in the first position, which is used for the Common Normal indicator in NZ applications.

MX4428 Version (available as FP0475 extender kit)

The FP0475 is the older and larger 16 zone display also used in MX4428 and F3200. This module and the compact module are electrically compatible and can be arbitrarily mixed together in an installation. The Slimline *MX1* cabinet has no facility for these modules to be fitted internally. The 15U cabinet can be fitted with up to four of these modules on a 7U door (ME0060).

This module has 16 sets of zone indicators: one red LED and two yellow LEDs for each set. The red LED is for alarm, and the yellow LEDs are for separate fault and disable. Refer to the Configuration section below for more about using this zone display.

12.2.3 Distance Limitations

The port on the LCD/Keyboard used to drive the zone display modules is not protected, and should only be used to drive zone displays located in the *MX1* cabinet. If a customised zone display is required for an installation, mounting the zone display modules in another metal cabinet adjacent to the *MX1* cabinet would normally be acceptable.

For more about providing remote zone displays with the *MX1*, refer to Chapter 13 "Remote Displays".

12.2.4 Display Module Power Bussing

The *MX1* zone display Modules draw much less current than the older MX4428 display modules. This means that additional power wiring ("power bussing") is not required for systems with up to12 zone display modules.

In practice, since 12 modules is the physical limit of the larger *MX1* cabinet, this means that power bussing of *MX1* display modules is not required in either of the standard *MX1* cabinets.

For the MX4428 display modules, normal practice would recommend power bussing for systems with more than four modules. Since the 15U *MX1* cannot contain more than four of these modules, this means that power bussing is not required in standard *MX1* cabinets.

12.2.5 Hardware Configuration

***MX1* Compact Version ZONE LED Module (FP1002)**

These do not require any hardware configuration.

MX4428 Version ZONE LED Module (FP0475)

These displays must have Lk1 NOT fitted, unless one is used in the last (zone 1) position at the end of the display chain, in which case, Lk1 must be fitted to this one.

In SmartConfig, defining a new zone will automatically assign a zone indicator position based on the zone number, e.g., zone 1 will assigned to position 1, zone 5 to position 5, etc. This indicator allocation can be overwritten: setting it to 0 will result in no zone indicator being assigned to this zone, while changing the number of the indicator will move its position on the zone display.

SmartConfig checks the LED mappings and will produce a warning if more than one zone is mapped to any LED. If the larger MX4428 displays are used, the *MX1* configuration will normally only drive the Alarm and Disable LEDs, flashing the Disable LED to indicate a fault.

If faults are required to be displayed on the fault LED, this can be enabled for a whole module by including the display board number in the list of "Non-*MX1*" LED boards in the System window of SmartConfig. Board number 1 is the one at the end of the chain, i.e., furthest from the LCD/Keyboard, with the lowest numbered LEDs.

12.2.6 Direct LED Control by Logic

The normal mapping of a zone to a position on the zone display results in the correct driving of the red and yellow LEDs by the zone's Alarm, Fault and Disable states. In NZ mode, the first LED position is automatically assigned to the common Normal, Fault, and Alarm (Normal, Fire, Defect) status LED indicators, and no additional configuration is required for correct operation. Common alarm type indications for Smoke, heat and MCP alarms can be programmed – the V1.20 and later NZ templates have preconfigured logic for this purpose. The compact zone display module has a green LED for the Normal indicator. For nearly all applications this zone mapping method will provide the required indicator operation.

However, it is also possible to directly and individually control the state of each LED of a zone set from user logic equations, if individual control is necessary for special display applications.

For example, an MX4428 zone display might be used to drive a 16 way relay board for additional output control. The relays could be controlled by mapping zones to them and forcing the zone alarm state to operate the relay, or the Alarm LEDs in the zone display position could be directly driven by logic equations.

See Section 12.2.9 for more about using zone groups and direct LED control for common alarm type indications on the Brigade Index.

It is often desired to have one alarm indicator operate to show an alarm for a search area which is covered by multiple *MX1* zones. This indicator may be controlled by using an LEDMxxx logic equation to combine the zone states.

Refer to the SmartConfig manual section on *MX1* User Output Logic for "LED Masks".

12.2.7 Zone Indicator Labelling

Front Panel Labelling
Individual zone indicators must be labelled with the zone name or designation. In the standard *MX1* keyboard overlay, this is done by means of a pocket for a slide-in label, accessible from the inside of the cabinet.

There are three recommended ways of creating these slide-in labels:

- SmartConfig V1.6 or later can directly print labels from the information in the database. Zone names are used to label the LEDs controlled by the zone. For LEDs controlled by logic equations, the label will be the optional text assigned as part of the logic equation itself.

- LB0600 is a pre-printed label on grey card which is a reasonable match to the colour of the keyboard overlay. There is no text on this label, which means that it can be used to blank over a zone display module position that is not used. Each *MX1* is supplied with two LB0600.

- LT0369 is a template MS Word document available from Johnson Controls. This is a form for five sets of labels. The zone names are entered into the appropriate parts of the form, and the completed form is printed at full-size onto appropriate heavy paper or light card. A suitable stock is Kaskad Owl Grey 225gsm card, available from commercial stationery suppliers. The printed form is then cut up and fitted into the pockets of the *MX1* keyboard overlay.

Zone Index - NZ Use
The NZ *MX1* Slimline cabinet is supplied already fitted with a rear service zone index. This can be quickly removed from the cabinet and engraved with zone designations and site plan in the usual manner.

A front service index is available as FA2417, which is fastened to the front door with four screws provided with the *MX1*. This index only needs to be marked with the site plan information, since the zone indicators will be labelled as described in the previous section.

In some installations, the LCD on the *MX1* cabinet may be impossible to read when the *MX1* is mounted at the right height for the Fire Brigade to see the Zone Index LEDs on the outside of the building. In these cases an abutted FP0944 empty *MX* cabinet could be used to house the *MX1* display boards. Note that the FRC connection from the *MX1* to the display boards must not leave the master cabinet or the abutted cabinet pair, to prevent RFI and electro-magnetic susceptibility problems.

12.2.8 Built-in support for Common Alarm Type Indications

The index of a standard NZ installation will usually need to show:

- the panel state for Normal, Common Defect and Common Fire
- the alarm state of each zone
- indications of the type of alarms present, e.g. Smoke, Heat Callpoint etc.

Prior to *MX1* V1.20, common indications required points to map to 2 zones, one for the alarm zone, the other for the alarm type indication. This configuration required both the alarm zone and alarm type zone to be reset to clear the alarm indications, or alternatively time consuming updates to make points latching and zones non-latching.

As of *MX1* V1.20 controller firmware, the *MX1* and its corresponding database template provide features to simplify the provision of common alarm type indications. Each sensor or input sub-point type that generates an alarm is assigned to the appropriate category as noted below.

For V1.30 or later systems, the default assignments in the table apply, but the assignments can be adjusted as required on a point by point basis within SmartConfig.

Devices:	**Alarm Signalling Type:**				
	SMOKE (ALS)	HEAT (ALH)	MCP (ALMCP)	CO (ALCO)	OTHER (ALOT)
801PC	X	X		X	
801F					X
814PH	X	X			
814H		X			
814P	X				
814CH		X		X	
814I	X				
850H		X			
850P	X				
850PH	X	X			
850PC	X	X		X	
DDM800					X
DIM800					X
MIM800					X
MIM801			X		
CIM800					X
QIO850					X
QMO850					
QRM850					
SIO800					X
MIO800					X
SNM800					
RIM800					
LPS800					
VLC800	X				
CP820/830			X		
MCP820/830			X		
801PHEx	X	X			
801CHEx		X		X	
801HEx		X			
CP840Ex			X		
IF800Ex					X
S271f+/S271i+					X
FV411f/FV412f/FV413f					X
SAB801					
SAM800					
Pseudo Points					X
Controller Inputs					X
RDU MCP					X
Keypad Points					X

When a sub-point enters alarm, the zone(s) the sub-point is mapped to also enter the alarm condition. As well as maintaining a common alarm state the zones also track the Alarm Signalling Type(s) of the sub-points in alarm.

These extra Alarm Signalling Types are available on a per-zone basis in output logic, using the corresponding ALxx zone token as indicated in the above table. The ALxx states are forced FALSE if the zone is disabled, just as is the zone's usual alarm state.

Zone Groups to which the zones are mapped also track the ALxx states for the zones mapped to them and provide corresponding ZGnnnALxx states themselves to the output logic.
Refer to Section 12.2.9 for examples using these tokens.

The New Zealand database template V1.20 and later automatically maps a number of its zone profiles to zone groups for this reason.

The different alarm signalling type tokens are then used in logic equations to drive alarm LEDs on the *MX1* LED boards and alarm LEDs sent to RDUs to provide the common alarm signalling type indications.

The New Zealand database template V1.20 onwards provides these equations, based on Zone Groups and as supplied commented out, in its User Logic page.
A technician must uncomment the appropriate equations and edit them to map to the required *MX1* LED sets. It is recommended that all common alarm type indications be placed at the bottom of the index, as this avoids updating the fault LED set(s) that the alarm zones indicate on and provides a logical correspondence between the *MX1* zone numbering (zone 1, 2, 3, etc.), the *MX1* Index LEDs, and the RZDU LEDs.

12.2.9 Zone Index Example

System Information

An *MX1* is installed to provide "Type 7" protection of a four-level hotel building.

There is one fire brigade search zone per level - Basement, Ground Floor, First Floor, Second Floor, Third Floor.

Fire Detection:

(a) Addressable Manual Call points on each level
(b) Brigade-connected 814PH smoke detectors in the corridors
(c) Local 814PH smoke detectors with sounder bases in the hotel rooms with the heat detection sensors of the 814PH configured to provide brigade-connected thermal detection.
(d) Sprinkler system installed throughout the building.

Zone Index
A zone index similar to that shown in Figure 12.1 will be required. This features:
Search zone indications for each of the levels
Detector operated "Type" indications for manual call points, thermal detectors, brigade-connected smoke detectors and sprinkler
Separate indications for local smoke detector zones as required by NZS 4512.

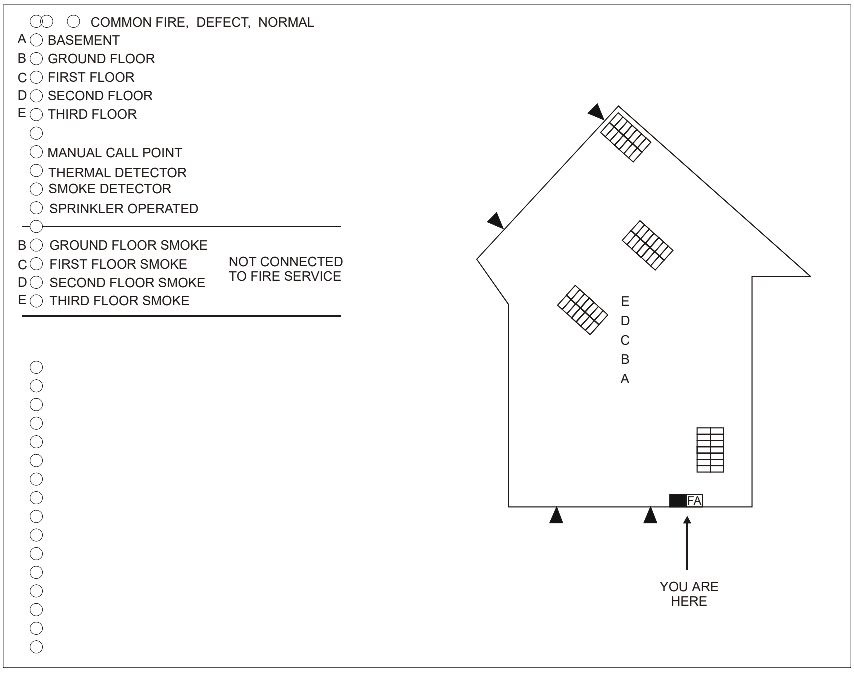

Figure 12.1 – Example Index Layout

Index Design Procedure

1. Choose Zone Numbering

While not essential, the most logical location for the fire brigade search zone indicators is at the top of the index, so that there is a logical correspondence between the *MX1* Zone numbering (Zone 1, 2, 3 etc.) the *MX1* Index LEDs, and the RZDU LEDs. In this example Z1 will cover the building Basement, Z2 the Ground Floor, Z3 the first Floor etc.

The Detector Type LEDs should therefore be located on the index below the search zone indicators.

The local smoke detectors are mapped to separate zones (with the "Residential" Zone profile) and are labelled "NOT CONNECTED TO FIRE SERVICE".

2. Configure Suitable Zones in SmartConfig

Set up the zones in SmartConfig as shown in Figure 12.2 below.

Note:

(a) The "Std Detection G1" zone profile automatically maps its zones to Group 1.

(b) The *MX1* Zone Number and the RZDU LED numbers must be the same in order to drive an RDU correctly. The *MX1* LED numbers however are set one higher than the actual zone number because the NZ Common LEDs take up the first LED number on the *MX1* LED display.

(c) If possible, it is best to choose zone numbers for the Residential Zones that are related in some way to the zone numbers of the brigade search zones where the Residential Zones are situated. For example the brigade search zone for the second floor is Zone 4 and the second floor residential smoke zone is Zone 14 (brigade search zone plus 10). This sort of pattern makes the zone mappings easier to remember when programming and servicing.

(d) There is no mapping to *MX1* LEDs 7 to 10 (RZDU LEDs 6 to 9), because the common type LEDs will use these indicators.

Zone No.	Zone Type Profile	Zone Name	Points Mapped	Controlled Points	Map To Groups	Zone Action Text	Zone Recall Text	MX1 LED No.	MX1 LED Combines Fault/Disable	RZDU LED No.	Logging Profile	Notes
1	Std Detection	Basement	1.1, 1.1.1, 1.2, 1.2.1, 1.3, 1.3.1		1			2	☑	1	Log All	
2	Std Detection	Ground Floor	1.4, 1.4.1, 1.4.2, 1.5, 1.5.1, 1.6,		1			3	☑	2	Log All	
3	Std Detection	First Floor	1.11, 1.11.1, 1.11.2, 1.12, 1.12.1, 1.12.2,		1			4	☑	3	Log All	
4	Std Detection	Second Floor	1.17, 1.17.1, 1.18, 1.18.1, 1.19, 1.19.1,		1			5	☑	4	Log All	
5	Std Detection	Third Floor	1.23, 1.23.1, 1.24, 1.24.1, 1.25, 1.25.1,		1			6	☑	5	Log All	
6												
7												
8												
9												
10	Sprinkler FBA/DBA	Sprinkler Operated	241.2					11	☑	10	Log All	
11												
12	Residential - LCD	Ground Floor Local Smoke	1.9, 1.9.1, 1.10, 1.10.1					13	☑	12	Log All	
13	Residential - LCD	First Floor Local Smoke	1.15, 1.15.1, 1.16, 1.16.1					14	☑	13	Log All	
14	Residential - LCD	Second Floor Local Smoke	1.21, 1.21.1, 1.22, 1.22.1					15	☑	14	Log All	
15	Residential - LCD	Third Floor Local Smoke	1.27, 1.27.1, 1.27.2, 1.28, 1.28.1, 1.28.2					16	☑	15	Log All	
16												

Figure 12.2 – Snippet of SmartConfig Programming of Zones

3. Provide output logic to drive the Common Alarm Type LEDs

Logic equations are required for both the *MX1* mimic and the RZDU bus. Sample equations are noted as comments on the NZ Template. The zone group tokens (e.g. ZG1ALS) automatically become true when a detector of that Type in that group has operated. The Alarm Type is automatically assigned in SmartConfig, but can be changed as detailed in Section 12.2.10.

```
LEDM10(Smoke Detector) = Z_LED_ALM. (ZG1ALS+ZG1ALCO)
LEDR9 = Z_LED_ALM. (ZG1ALS+ZG1ALCO)
; Heat
LEDM9(Thermal Detector) = Z_LED_ALM. (ZG1ALH)
LEDR8 = Z_LED_ALM. (ZG1ALH)
; Call Points
LEDM8(Manual Call Point)= Z_LED_ALM. (ZG1ALMCP)
LEDR7= Z_LED_ALM. (ZG1ALMCP)
```

The text in brackets on the left hand side of the *MX1* LED equations (e.g. LEDM10(Smoke Detector) is optional and defines the label for that LED that may be printed out from SmartConfig.

Refer to Section 13.2 for the recommended RDU mode settings to ensure that Common Alarm Type LED indications are not displayed as alarms on the RDU LCD.

12.2.10 Changing the Alarm Signalling Type

In some cases it may be desirable to have a device indicate a different Alarm Type than its default, for example, a MIM801 with a heat probe should signal heat alarm.

For V1.3x and later firmware, the required alarm type for a device can be selected within SmartConfig. For the above example, the MIM801 Alarm Type would be changed from "other" to "heat" directly for the required point.

For V1.2x and earlier firmware, it will usually be necessary to have these devices map to different zones than those to which the standard devices map. The default alarm state from the mapped zones can then be included in equations to indicate the correct alarm type.

It may be necessary to create a new zone profile, with a different or no zone group mapping, to ensure the device does NOT indicate as it would by default.

As an example, consider a panel with the following programming:

P1/1/1, a MIM801 has an MCP and maps to Zone 1
Zone 1 maps to Zone Group 1
LED set 15 shows heat alarms with LEDM15 = Z_LED_ALARM.ZGA1LH
LED set 16 shows MCP alarm with LED16=Z_LED_ALARM_ZG1ALMCP

Thus P1/1/1 would always indicate on LED set 16 as a Manual Call Point.
However, if in addition there was a MIM801 with a Heat Probe at point P1/2/1.

Then to have this indicate as a heat alarm it would be necessary to have, for example:
P1/2/1 mapped to zone 2
Zone 2 specially configured to NOT map to Zone Group 1
LED set 15 equation changed to include Zone 2 MCP alarm
LEDM15=Z_LED_ALARM (ZG1ALH + Z2ALMCP)
Thus, an alarm on P1/2/1 on Zone 2 would correctly show as a Heat alarm on LED set 15.

12.2.11 Alarm Type Text

The following table describes the default Alarm Type text assigned to each detector or module. These texts can be changed on a point by point basis, as required. The Alarm Type Text is displayed on the LCD as part of the LCD Alarm Display

Sensor Type	Sensor/Input	Default Alarm Type Text
814P, 850P Photoelectric Smoke Detector	Photoelectric Sensor	Smoke
814PH, 850PH Photoelectric + Heat Smoke Detector	Photoelectric Sensor Heat Sensor	Smoke Heat
814CH Carbon Monoxide + Heat Detector	CO Sensor Heat Sensor	CO Heat
814I Ionisation Smoke Detector	Ionisation Sensor	Smoke
814H, 850H Heat Detector	Heat Sensor	Heat
801PC, 850PC Photo/CO/Heat Detector	Photoelectric Sensor CO Sensor Heat Sensor	Smoke CO Heat
801F(Ex) Flame Detectors	Flame Sensor	Flame
FV411f, FV412f, FV413f Flame Detectors	Flame Sensor	Flame
S271i+, S271f+ Flame Detectors	Flame Sensor	Flame
VLC-800MX VESDA LaserCOMPACT	Vesda Sensor	Smoke
MIM800 Mini Input Module	MIM800 input	Input
MIM801 Mini Input Module	MIM801 input	MCP
CIM800 Contact Input Module	CIM800 input	Input
CP820, CP830, MCP820, MCP830 Manual Call Point		MCP
DDM800 Universal Fire & Gas Detector Module	DDM800 Input 1	Input 1
	DDM800 Input 2	Input 2
	DDM800 Input 1 Fast	In1Fast
	DDM800 Input 2 Fast	In2Fast
DIM800 Detector Input Monitor	DIM800 Input 1	Input 1
	DIM800 Input 2	Input 2
IF800Ex Intrinsically Safe Interface Module	IF800Ex Input	Input

MIO800	MIO800	Input 1 Input 2 Input 3	Input 1 Input 2 Input 3
QIO850 Quad Input/Output Module	QIO850	Input 1 Input 2 Input 3 Input 4	Input 1 Input 2 Input 3 Input 4
SIO800 Single Input/Output Module	SIO800	Input	Input

12.3 Alphanumeric Alarm Display

12.3.1 Zone information on the Alphanumeric Display

The alphanumeric display in the *MX1* is available for display of zone information in a number of ways:

- Alarm Display - The display shows critical alarm information for use by Firefighters. Many aspects of the operation are adjustable in the site specific configuration to change how information is displayed, which controls are active, and how much information is used. These are described in the following sections of this manual. More information can be found in the SmartConfig User Manual.

- Zone Status Recall - the *MX1* keypad menu system can be used to recall status of zones and perform commands on zones. Access to recalls and controls are controlled by operator Access Levels, as described in the *MX1* Operator Manual, (LT0344). Available recalls and commands are also detailed in the *MX1* Operator Manual. Control of access level 3 requires a username and password, configuration of which is described in SmartConfig User Manual.

12.3.2 Alarm Display Design

There are a number of site specific configuration settings that control the display of alarms on the alphanumeric display. These settings are made within SmartConfig (on the System Page or within a System Profile, depending on the *MX1* Controller and SmartConfig versions).

To meet statutory requirements, the correct settings must be used. These settings will usually be present in the template used as a starting point for a site specific configuration. Other settings may be adjusted to suit the requirements of the project.

Descriptions of each setting and its application follow.

- Zone Profile Settings - each zone profile has a setting to determine whether or not an alarm on that zone will be displayed on the *MX1* Alarm Display.

- Use Detail Alarm Display - if disabled, the AS 7240.4 prescribed layout is used, with one Zone Alarm per line and access to the alarm detail using the function keys. If enabled (NZ default), the alarm detail display is used, showing one zone per display.

- Enable Alarm Ack Control - if enabled (NZ default), an Acknowledgement Function key is made available within the detail display to acknowledge the alarm, which places an Ack indication on the display and for V1.20 or later controller firmware stops Zone Alarm LEDs flashing and signals acknowledgement to RDUs. If disabled, the Ack control is unavailable, although acknowledgements through other means may still be indicated on the LCD.

- Remote Ack Acceptance - if disabled, the zone alarm on the LCD must be acknowledged using the *MX1* keypad to produce the Ack indication on the alarm detail display. Note that the zone and its LED indications could still be acknowledged by other sources, for example an RDU. If enabled (NZ default), acknowledgement of a zone alarm from any source will result in the Ack indication being shown for the zone on the alarm detail display. Note that if multiple entries in the alarm list exist for a zone, then all entries for that zone will become acknowledged upon receipt of a remote acknowledgement.

- Silence Buzzer Does Global Ack - if disabled (NZ default) the Silence Buzzer key has its standard functioning. If enabled, use of the Silence Buzzer key enacts an acknowledgement of all alarms in the alarm list. This may be used to perform an acknowledgment when the Alarm List is configured to operate to AS 7240.4 requirements (Use Detail Display is disabled) but acknowledgement in conjunction with RDUs is required.

- Alarm List Accept Multiple Events - if this setting is disabled, a zone in alarm can have only one entry in the alarm list, regardless of how many points mapping to that zone are in alarm. If this setting is enabled (NZ default), then a zone can have multiple entries in the alarm list, one per point in alarm and when the zone leaves the alarm state all entries are removed from the alarm list.

- Always Ack Event Source - if disabled (NZ default), acknowledgement of an entry in the alarm list will display 'Ack' but will only acknowledge the zone itself (including indicating the acknowledgement to RDUs) once all entries for that zone in the alarm list have been acknowledged. If enabled, acknowledging an entry in the alarm list will always acknowledge the zone itself. Any other entries in the alarm list for the zone may or may not become acknowledged as a result, depending on the setting for Remote Acknowledge Acceptance.

- Re-annunciate New Alarm Cause - if disabled, the second and subsequent points in alarm mapping to a zone will not re-sound a silenced alarm sounder and make any corresponding zone LEDS start flashing again. If enabled (NZ default), any points subsequently entering alarm will result in the zone re-annunciating its alarm status by reactivating the alarm sounder and making any zone LEDS start flashing again. Re-sounding the sounder will also depend on whether the zone profile allows the zone to activate the alarm sounder.

- Generate Multiple Alarm (Zone Profile) - if disabled, the second and subsequent points in alarm mapping to a zone will not generate new alarms list event for the zone. If enabled (NZ default for alarm zones), those points entering alarm will result in the zone re-annunciating its alarm status by generating a new alarm list event (based on the point(s) entering alarm). Whether the alarm events actually enter the alarm list depending on the setting Alarm List Accept Multiple Events.

- Alarm Display uses ISOL - if disabled, the alarm list display will use the ISO term "Disable". If enabled (NZ default) the alarm list display will use the term "Isolate".

13 Remote Displays

13.1 General

MX1 has a facility to transmit zone status information to zone displays which may be located some distance away. Some examples of remote zone displays that can be used with *MX1* include:

- LED-RZDU – provides common Fire, Defect and Normal indications plus 15 Zone LEDs, with the ability to drive *MX1*-style Zone LED Display boards and mount in the empty *MX1* cabinet (FP0944). Can be optionally fitted with brigade keyswitches.

- Remote Display Unit (RDU) – provides an alphanumeric status display with optional individual zone indicators

- Nurse Station Annunciator (NSA) – provides an alphanumeric status display with a reduced functionality keypad, for special applications such as annunciation of alarms at a Nurse Station.

- IO-NET Mimics – a lower cost option to RDU, but which has only individual zone indicators.

- RFBP – Remote AS 7240 Fire Brigade Panel that matches the *MX1* Slimline cabinet and includes a brigade index and zone indicators.

The *MX1* supports only the LCD-A RZDU protocol so the receiving device may need to be programmed for this. Also the *MX1* sends only the Point Text in zone FF alarm messages so it may be necessary to program the Point Text with sufficient detail to clearly identify the alarm location.

Note: The RZDU protocol supports the transfer of up to 528 zones of information. The *MX1* supports 999 zones, but only the first 528 of these can have status sent through the RZDU port.

13.2 RDU/NSA

13.2.1 General

The RDU is an intelligent Remote Display Unit which performs the functions of a Fire Fighter's Control and Indicating Facility (FFCIF) as specified by the Australian Standard AS4050, or the Fire Fighter Facility (FF) functions as specified by the Australian Standard AS 4428.1 and NZS 4512 for New Zealand use. It can connect to an *MX1* system to remotely indicate zone status and optionally control the *MX1*.

The NSA is smaller than the RDU, and is intended for applications where building staff need to see and respond to alarm messages from the fire alarm system.

Up to 8 RDUs or NSAs can be multi-drop connected to, and monitored by, an *MX1* to achieve a distributed control and indication capability. Additional unmonitored units may also be connected.

The RDU is available in several physical formats, with the AS 4428.1 keypad. One format is a wall or flush mounted, low profile cabinet, powered from the *MX1*. The other format is a 15U cabinet complete with power supply, which can be expanded to include up to four 16 zone Display boards.

The NSA is available in surface or flush mount cabinets and is powered from the *MX1*.

The RDU and NSA have a high degree of flexibility. They can be programmed as to which of zones 1 to 528 they will process. This means that, in multiple RDU/ NSA systems, each RDU/ NSA can be assigned the zones corresponding to its own particular area. Alternatively, all RDUs/ADUs can be configured for all zones if required. An RDU/NSA can be programmed to simply mimic the *MX1* zone status, or it can be programmed for control as well, thus allowing the operator to acknowledge, reset or disable zones from the RDU/ NSA .

If an RDU is being used in NZ as a brigade attendance point, it must be fitted with zone displays, a NZ display extender card, and brigade keyswitches.

13.2.2 Connection

RDUs/NSAs are connected to the RZDU port on the *MX1* Controller. This is a four terminal port: +VRZDU, 0V, TX, and RX. The 0V, TX and RX terminals must be connected to the RDU(s)/NSA(s), but the +VRZDU connection is required only if the RDU/NSA is being line powered from the *MX1*. If the RDU has its own power supply, it must not be connected to the VRZDU terminal on the *MX1*.

Wiring between the *MX1* and the RDUs/NSAs can be daisy chain or star or a combination of these. There are no special requirements of the type of cable used for the connection. A single four core or a pair of twin core cables can be used equally well.

If there are line powered RDUs with zone displays connected, the 0V and +VRZDU conductors must be sufficiently large to avoid excessive voltage drop under load. Refer to the RDU Installation and Programming Manual (LT0148) for detail about supply requirements for the RDU.

Figure 13.2a shows the general wiring of the *MX1* to RDUs or other similar products when there is no T-Gen2 HLI Module present. Note that a single short circuit on the Tx line from the *MX1* could stop data being sent to all devices. If short circuit isolation is required – e.g., when a QE20 or QE90 is being used, a FP1143 HLI Interface Board (refer Figure 13.2b) or PA0481 RZDU/RS232 Interface board (as shown in Section 13.2.4) can be used to provide a short circuit isolated output or drive longer cables.

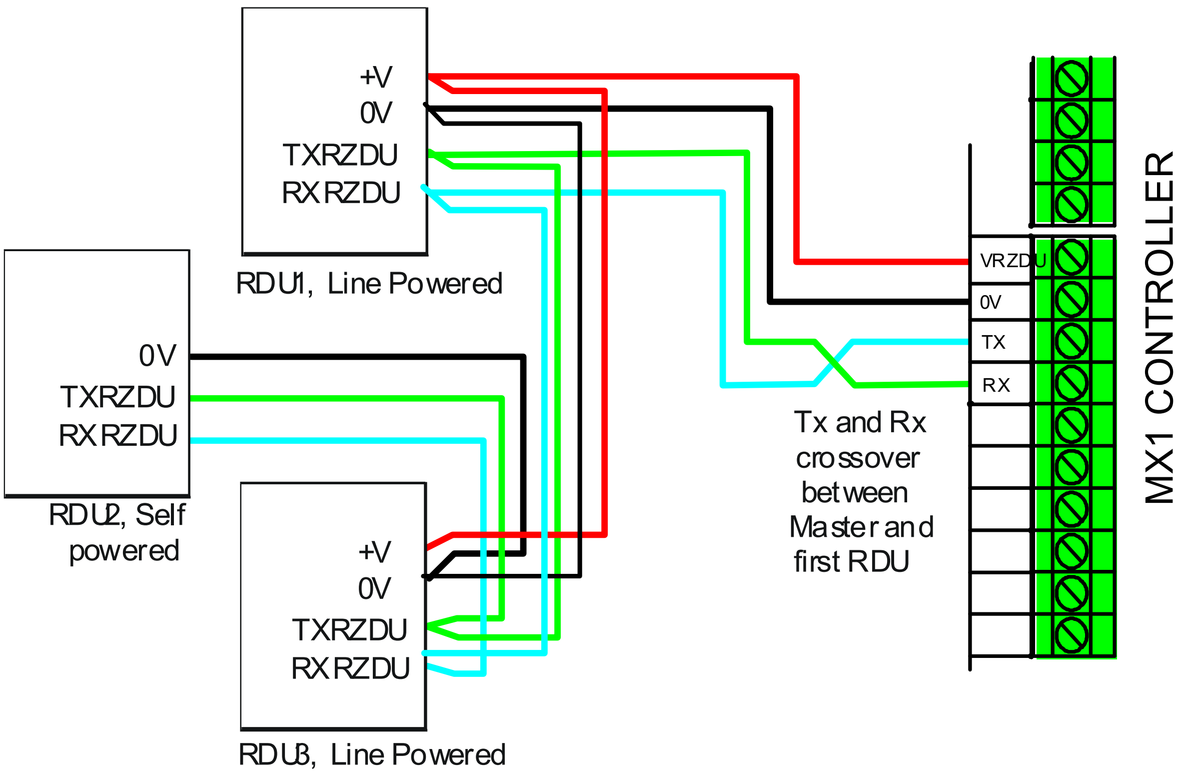

Figure 13.2a – General Wiring between *MX1* and RDUs

Figure 13.2b shows the wiring when a T-Gen2 HLI module is included. The links LK1 – 4 on the HLI Module need to be set to the RZDU position.

Note that the MX1 RZDU port is wired to the HLI module FIP connector J3, with Rx and Tx crossed over. All field RZDU devices are wired to the RZDU field terminals (J4) on the HLI module with a cross-over of Tx and Rx to the first device. The connection to a co-located QE20 or QE90 panel is made off the internal RZDU terminals. The connection to the T-Gen2 is made using an FRC cable from J2 on the HLI Board.

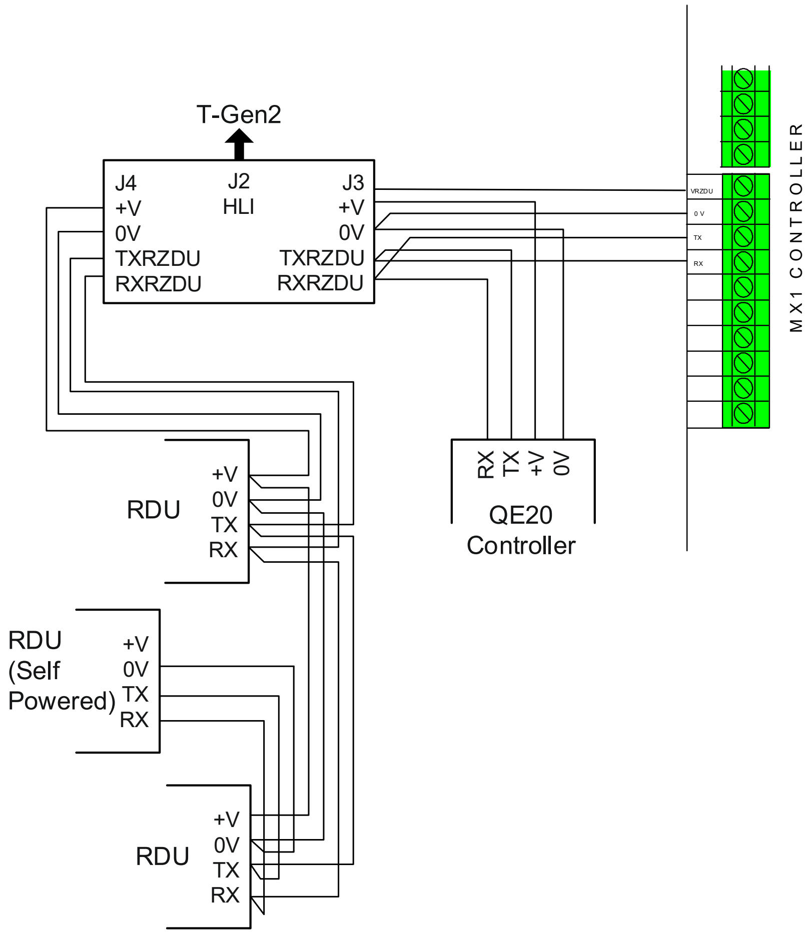

Figure 13.2b - RZDU Wiring with T-Gen2 HLI Module

13.2.3 Configuration

The RDU/NSA is configured separately from the *MX1*. Currently, SmartConfig cannot be used for configuring an RDU or NSA, except that the “RZDU LED number” for each zone, as transmitted to the RZDU port, can be configured in the Zones window of SmartConfig.

Refer to the RDU Installation and Programming Manual (LT0499) for detail about the configuration of the RDU.

Refer to the F3200/NDU/ADU AS4428.1 Programming Manual (LT0256) Section 6 for detail about the programming of the NSA.

For zone alarms to display on the RZDU LCD and clear as required, the RZDU LED number and the *MX1* zone number must be the same.

However, if desired, zones can be mapped to RZDU LEDs in any order, or not at all, similar to the mapping of zones to *MX1* zone LEDs. That is, *MX1* zone *x* can map to RZDU zone *y*, or to no RZDU zone at all. The consequence for such zones, as noted above, however, is that *MX1* cannot send LCD alarm information.

The RZDU LED number is the number used by the *MX1* to transmit the zone status via the RZDU port. All devices connected to the RZDU port will see the same set of RZDU zones. It is not possible to have different zone mappings for different RZDU devices. Thus different *MX1* zone to LED set and zone to RZDU zone mappings could be used. Alternatively, logic equations can be used to control the RZDU zones directly.

Where the RZDU LEDs are used to drive remote mimics with common “Alarm Type” LEDs, etc., (refer 12.2.8), as well as providing alarm information on the RDU LCD, the RDU must be programmed to ensure that the RDU LCD only displays alarms for zones that are also displayed as alarms on the *MX1* LCD.

In general, there would be little advantage in using different *MX1* and RZDU zone numbers except to manage the order of zone indicators on a mimic display. Using spare zones to transfer mimic status may be a preferable alternative.

MX1 Controller Firmware V1.00 sends alarm indications “steady” which will generally result in zone alarms being automatically displayed as Acknowledged at the RDU/NSA.

MX1 Controller Firmware V1.20 and later sends flashing and steady alarm indications, which allows RDU/NSA alarm acknowledgement to function properly.

13.2.4 Short Circuit Isolated Tx Output

Figure 13.3 shows how PA0481 RZDU/RS232 Interface Boards can be used to provide short circuit isolated Tx outputs from the *MX1* panel. Separately fused +VRZDU outputs may also be needed to provide isolation in case of shorts on the +VRZDU wires. Insert fuses at positions *1 of Figure 13.2, or use separately fused outputs off *MX1*. Note this arrangement does not solve a short on the Rx line back from the remote RDUs.

On each PA0481 set the links as follows:

Lk1 = RZDU, Lk2 = RZDU, Lk3 = FIP, Lk4 = FIP, Lk5 = FIP

Connect the TXD and RXD terminals together on J2. Connect the + and – J2 terminals on the PA0481 to the +VRZDU and 0V signals to provide power to the PA0481 board.

An alternative is to use the FP1143 HLI interface board to provide a short-circuit isolated RZDU output. Refer to drawing 1982-71 Sheet 139 in LT0442 for details.

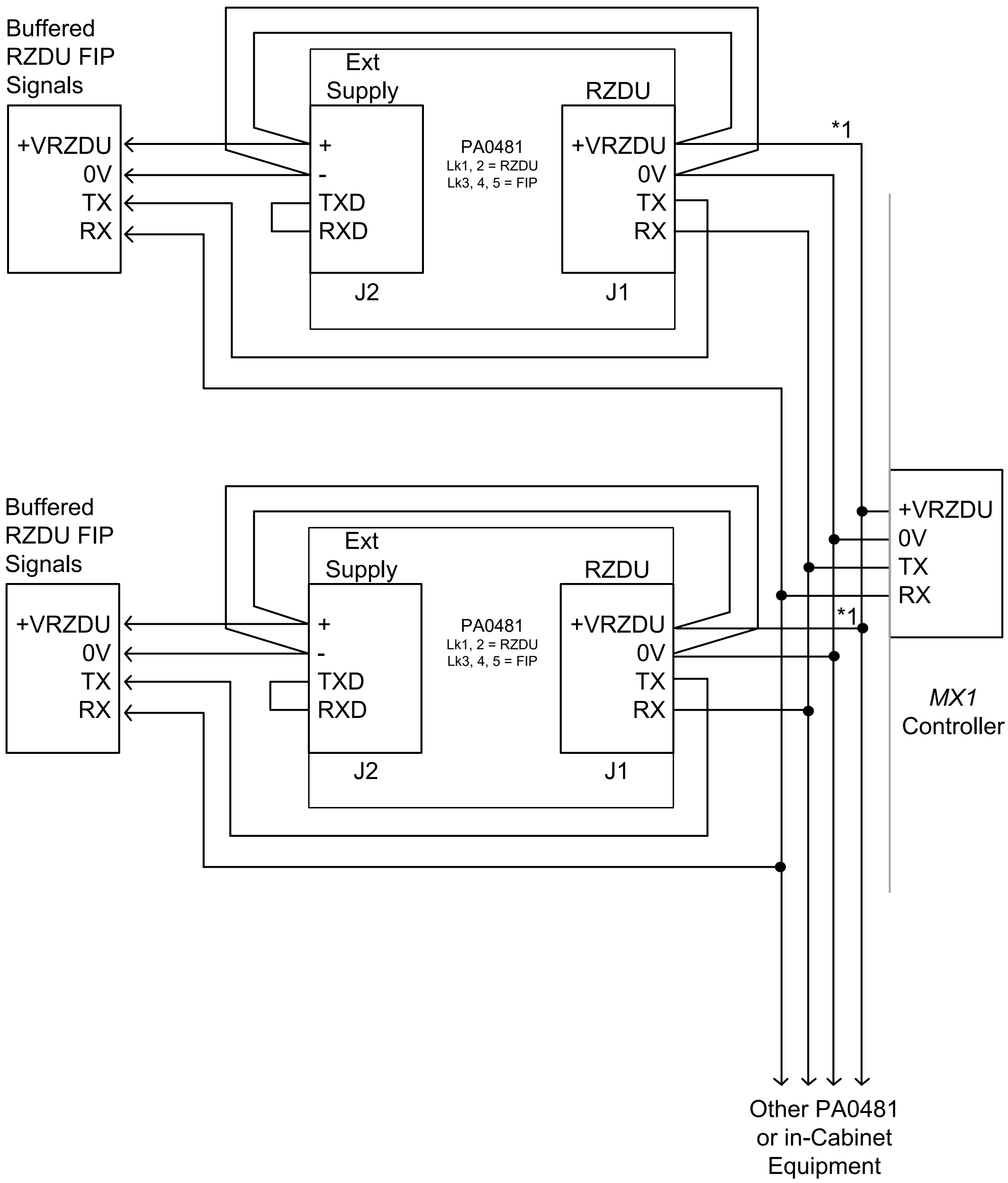

Figure 13.3 – Short Circuit Isolated RZDU Outputs

13.3 LED-RZDU Displays

13.3.1 General

The PA1048 LED-RZDU is a Remote Zone Display Unit (RZDU) control board. It contains on-board LEDs and is also capable of driving various LED display, termination, and relay boards in order to construct remote mimic panels for VIGILANT fire alarm systems.

It can connect to the RZDU port of *MX1* in either supervised or un-supervised mode.

The LED-RZDU has 16 on-board red zone Alarm LEDs, one common green Normal LED and one common amber Defect/Fault LED, all fitted on the rear of the board.

The LED-RZDU is capable of driving an FP1600 termination or mimic display board, an MX4428/F4000 termination or relay board, and/or a chain of MX4428/F4000 or *MX1* 16-zone LED display boards.

13.3.2 Connection

An LED-RZDU is connected to the *MX1* in the same way as for the RDU (see the previous section).

The LED-RZDU has facility for connection of brigade keyswitches, with the keyswitch status transmitted back to the *MX1*.

13.3.3 Mounting

The LED-RZDU is designed to be mounted directly into an empty *MX1* cabinet (rear service) on the standard gear plate.

For a more compact remote display, the LED-RZDU can be mounted in a FP0967 Picture Frame Display for up to 31 zones. For more zones of indication (up to 528), more FP1002 Displays can be mounted in adjacent Picture Frame Displays and driven from the LED-RZDU.

Table 13.1 – Some Remote Brigade Index Options for *MX1* Systems

Panel format	No of Zone Indications	What cabinet arrangement to use
Remote front- or rear-service display	Up to 31	LED-RZDU and FP1002 Display in FP0967 Picture Frame Display cabinet.
Remote front- or rear-service display	Up to 528	LED-RZDU and FP1002 Displays in multiple FP0967 Picture Frame Display cabinets stacked vertically or horizontally.

13.3.4 Configuration

Programming/configuration of the LED-RZDU is carried out using 28 DIP switches and three jumper links. Refer to the LED-RZDU Installation & Operating Instructions (LT0460) for details of how to do this configuration.

Configuration of the RZDU LEDs in the *MX1* for driving an LED-RZDU is the same as for driving an RDU.

13.4 IO-NET Mimic Displays

The LED-RZDU provides a straightforward remote display. If a more elaborate display is required, perhaps with local logic, an IO-NET Controller may be an effective means of achieving this. The IO-NET Controller can be connected to the RZDU port of the *MX1*, and can be configured to use the received zone status information to control up to 31 zones of indication (32 in Australia). If more than 31 zones are required, multiple IO-NET Controllers can be used, each additional IO-NET increasing display capacity by 32 zones.

This method does not support control inputs being passed back to the *MX1*. Currently, the RDU or the LED RZDU are the only means for achieving this.

13.4.1 Ordering Details for IO-NET

Ordering Code	Quantity
PA0908 PCB ASSY,1901-100,F4000 RZDU/RS232 I/F,NO LOOM	1
PA0498 PCB ASSY,1901-117,IO-NET CONTROLLER	As required by number of zones
PA0475 PCB ASSY,1901-73-2,F4000 IOR 32 OUTPUT TERM BD	1 per PA0498
LM0291 LOOM,FRC,26W,STYLE B,270mm or LM0118 LOOM,FRC,26W,STYLE B,600mm (depending on physical mounting arrangements)	2 per PA0498

This list does not include actual LED indicators or mounting hardware or cabinetry or miscellaneous wiring, since these will be installation dependent.

13.4.2 IO-NET Wiring

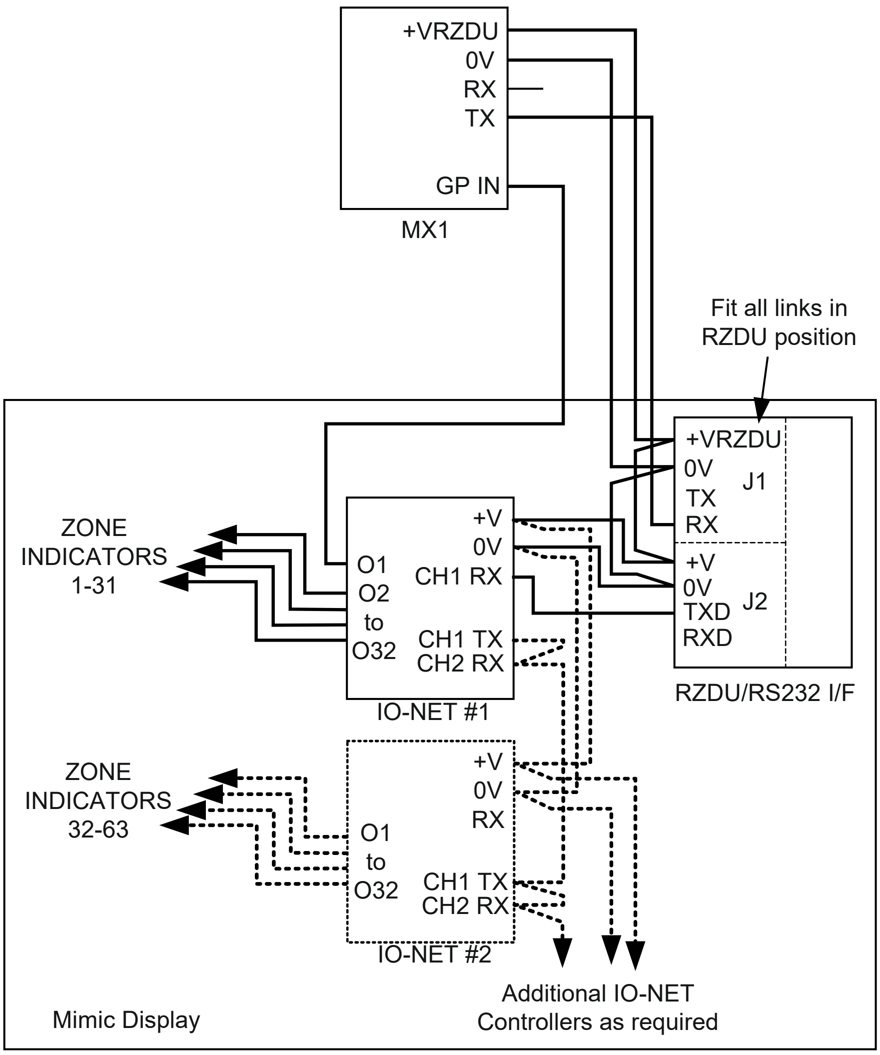

Figure 13.4 – General Form of a Mimic Display using IO-NET

The mimic display can be powered from the *MX1*. In this case, the 0V and +VRZDU conductors must be sufficiently large to avoid excessive voltage drop under load, especially under lamp test conditions. The voltage drop in the 0V conductor between the remote mimic and the *MX1* must not exceed 2V under maximum current conditions, otherwise the supervision signal to the *MX1* will be degraded and a fault will be generated.

Most installation standards require fault supervision of displays intended for brigade use. To achieve this, one of the outputs of the first IO-NET Controller can be fed back to a General Purpose Input on the *MX1* Controller, to allow display faults to be indicated. This output should be programmed in the IO-NET Controller to be pulsing regularly when the mimic display is in a normal state, ceasing to pulse if there is a power or communications failure to the mimic display.

For battery calculations, the current drawn by each IO-NET Controller must be allowed in Non-Alarm load and Alarm Load figures. The Alarm Load should also include an allowance for the current of 4 to 5 indicators, which are the zone indicators which have operated during the alarm.

13.4.3 Configuration

MX1

The *MX1* does not require any special configuration to transmit zone information to the RZDU Mimic Display port, other than to set the “Maximum Zones of Information” field in the System Window of SmartConfig.

The General Purpose input used for fault supervision is configured as

Profile Name		Band 1 Condition		Band 2 Condition		Band 3 Condition		Band 4 Condition	
G. P. Input 1	…	Active	…	Active	…	Active		Fault	

The logic equation controlling the status of the pseudo point representing the mimic display should be:

```
Viii = P241/2/0AI ; true when GP Input 1 is pulled low
TSjjj(0,10)FO = ViiiE
PPppp/0FA = NOT Tjjj
```

i.e., the pseudo point will go into the Fault condition when the GP Input is not pulsed for more than ten seconds. The pseudo point should have a Point Flags Profile which maps it to the brigade, for fault routing.

IO-NET

For details of wiring and configuring the IO-NET Controller(s), and for wiring of LEDs to the Output Termination boards, see the IO-NET User Manual (LT0115). The requirements of the configuration are as follows:

The option switches must be set for:

- First IO-NET with address 1, second IO-NET with address 2, etc., (A0-A6)
- Communications speed of 9600 bps, (N0-N2)
- Low current pull-up, (I0)
- Programmed Mode (I1)
- Network required if more than one IO-NET, otherwise network not required (I2)

Each IO-NET must be programmed with a set of logic equations to control the LED outputs from the received *MX1* zone information. Each IO-NET has a slightly different program.

The program for the first IO-NET Controller should include these equations:

```
; set up network and RZDU communications
MXST = <maximum number of IO-NET Controllers in the mimic
display>
RZDU = 1
RZDP = 1
TXZD = 1

; Check Panel communications and output connections
; and pulse output 1 active (low) when all is OK
T1(0,32) = PR1
;create pulse for supervision output
T2 (2,2) = NOT T2
O1 = T1 AND T2 AND OB1 AND OB2

; map RZDU zone 1 to output2, zone 2 to output3, etc..
O2 = Z1:1A
O3 = Z1:2A
…
O32 = Z1:31A
```

If there is more than one IO-NET Controller, change the affected line in the above program in the first controller to be:

```
T1(0,32) = PR1 AND IR2
```

The program for the second IO-NET Controller should include these equations:

```
; set up network communications
MXST = <maximum number of IO-NET Controllers in the mimic
display>

; map RZDU zone 32 to output 1, zone 33 to output 2, etc..
O1 = Z1:32A
O2 = Z1:33A
…
O32 = Z1:63A
```

The program for the third IO-NET is the same as for the second except that the outputs O1-O32 are driven by zones Z1:64-Z1:95, respectively.

These examples of IO-NET programs use a simple consecutive mapping of zone number to LED number. For most purposes this should be adequate.

If it is necessary to use a more complex mapping of zones to LEDs, there are two ways of doing this:

1. Change the IO-NET program equations so that the zone information controls different LEDs on the mimic. This method is less convenient for making changes, but does not affect any RDUs or other devices that may also be connected to the *MX1*'s RZDU output.

2. Use the *MX1* facility to change the mapping between *MX1* zone numbers and RZDU LED numbers, in the Zones window of SmartConfig. Note that this new mapping affects all devices connected to the *MX1*'s RZDU output. It may lead to inconsistent or confusing displays on RDUs.

The recommended method is to keep the default mapping of *MX1* zones to RZDU LEDs as in method 1 above, since this has much less scope for confusion and problems.

If you do think that using a different mapping of *MX1* zones to RZDU LEDs is a relevant method for your application, contact Product Support at Johnson Controls for more advice.

13.4.4 Mimicking Common LED States

An example application is to transmit the Common Normal, Defect and Alarm LED states to a remote IO-NET Controller driving a mimic.

To do this the three brigade states must be identified and used to control three RZDU LED sets (just the Alarm bit specifically) so the IO-NET can map these to three outputs.

At the *MX1* identify three unused RZDU LED sets – make these well above any LED sets for actual zones transmitted to any RDUs (for example LED sets 401, 402 and 403). Enter logic equations so the alarm state of these is controlled by the common brigade LED states. E.g.

```
LEDR401 = Z_LED_ALM . BRALM
LEDR402 = Z_LED_ALM . BRFLT
LEDR403 = Z_LED_ALM . NML
```

These equations will set the alarm bits and automatically clear the fault and isolate (disable) bits. Do not try to combine the three states into one LED set as IO-NET looks at all three bits to determine its zone state.

At the IO-NET Controller map alarms on these three zones to the required outputs. E.g.

```
O1 = Z0:401A
O2 = Z0:402A
O3 = Z0:403A
```

13.5 Remote FBP

One Remote Fire Brigade Panel (FBP) can be connected to the *MX1* to provide a second user interface for fire brigade or site personnel use. The FP1009 version is packaged in a Slimline cabinet the same as the Slimline *MX1*, so is suitable for both front and rear service and provides a brigade index.

The Remote FBP works independently of the *MX1* user interface, but uses the same core data, e.g., zone states, alarms, buzzer on/off, and muting. For example, users can be doing different things on the two user interfaces at the same time, but operate off the same data. For example, silencing the buzzer on one unit will silence the buzzer at the other as well.

In SmartConfig the Remote FBP must be enabled and configured for the serial port (0-4) that it is connected to. Note using Serial Port 0 will disable the RZDU port.

On the System Page there is a choice for **"Disable FBP when panel is in Alarm".** When this is ticked the Remote FBP keyboard will be disabled when there is an alarm present, to stop the Remote FBP user interfering with the fire alarm. This is used when the Remote FBP is not for fire brigade personnel. This should be unticked when the Remote FBP is to be used by fire brigade personnel.

Also note points 246.37.0, 246.37.1, and 246.37.2 do not work independently of the *MX1* front panel, but follow the 243.37.x points.

To connect a Remote FBP a PA0773 RS485 board must be installed in the *MX1* panel and connected to the Serial Port allocated in the site configuration for the Remote FBP. +24V power must also be provided to the RS485 board and to the Remote FBP. These parts and full installation instructions are included with the Remote FBP (LT0545).

Drawing 1982-71 Sheet 130 shows the wiring in the *MX1* and to the Remote FBP.

13.6 Networked Remote Displays

With the addition of networking equipment (refer Section 16) the *MX1* is able to use other units for remote displays. For example:

- A complete *MX1* panel on the network with no addressable loops and devices could be used as a remote display (and control unit). This can be programmed to display a selection of alarms (by panel) and what faults and other conditions it should show.

- Nurse Station Annunciator (NSA). The NSA supports Panel-Link networking in either point-to-point or multi-drop modes. So each NSA could be connected directly onto an *MX1* network using its own I-HUB or PIB (etc.,) together with a suitable power supply.

  If the NSA is configured for multi-drop mode, multiple NSAs could be put onto a dual channel RS485 bus and connected via a suitably configured port on an I-HUB and onto the *MX1* I-HUB or PIB ring. The NSA can be programmed as to which zones it displays – allowing a finer grain selection of zones from the network rather than all zones for selected panels.

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14 Alarm Routing/Brigade Signalling

14.1 Alarm Routing/Brigade Signalling Options

The *MX1* Controller has three interfaces for use with different alarm routing/brigade signalling equipment. Two of these are specific to particular types of brigade signalling equipment, but the third is more general.

- Brigade Signalling Interface (J8) – is a 10 way FRC header with unisolated open collector outputs and inputs. Compatible signalling devices are the GP SGD (PA0862) and GP Brigade Relay Interface (PA0861), normally used for NZ systems.
- ASE Interface (J12) – is a 2 wire connector designed for direct connection to a Centaur ASE. Normally used for Australian systems.
- Brigade Relays (J9, J10, J11) – Alarm, Fault and Disable voltage-free changeover contact outputs for wiring to most other signalling systems.

The functioning of the brigade outputs is determined by the database output logic and relevant controller point settings, which may themselves be determined by settings within System Profiles.

14.2 GP SGD or GP Brigade Relay Interface (NZ Systems)

The gearplate in the *MX1* cabinet has a footprint for mounting either a General Purpose SGD (PA0862) or a General Purpose Brigade Relay Interface (PA0861). Both of these incorporate control switches for Brigade Isolate and Brigade Test.

Either of these modules connects directly to the *MX1* Controller J8 via a 10-way FRC loom (LM0172), supplied with the unit, as shown here:

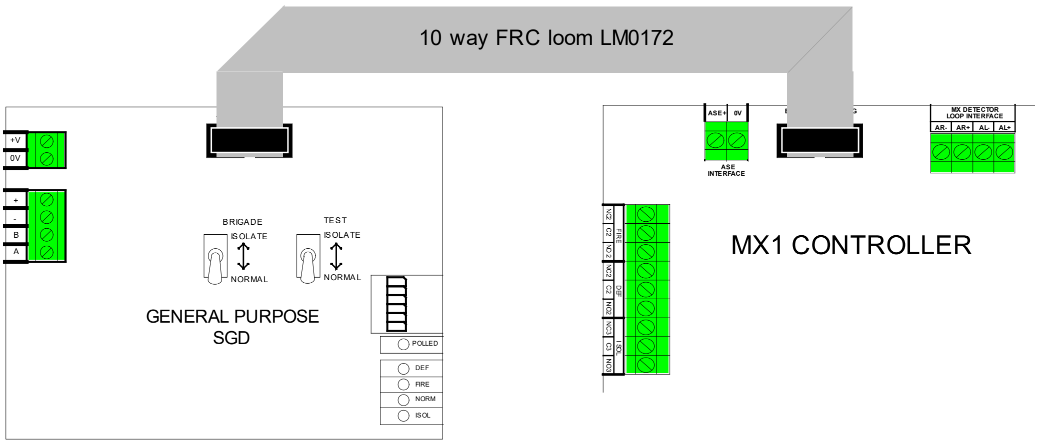

Figure 14.1 – "GP" Brigade Interface FRC Loom Connection

The FRC loom and plastic mounting standoffs are supplied with the SGD and GP Brigade Relay Interface.

If mounting the SGD on the 15U cabinet gearplate side flange, the longer FRC LM0084 supplied with the panel needs to be used.

Refer to the SGD Installation Instructions (LT0236) for the details of setting the SGD's address, etc.

The GP Brigade Relay Interface does not require configuration.

The GP Brigade Relay Interface should be used to connect to legacy signalling systems such as:

- Benefis transmitter
- SAFE transponder
- DBA2 modulator
- Common modulator
- Security company dialler or transmitter

Full details and suggested wiring arrangements for various standard interfaces are given in the *Vigilant Technical Manual* Volume 1, Section 1.4.13.

14.3 BRIGADE RELAYS

The *MX1* provides 3 sets of change-over relay contacts for the Alarm, Fault and Disable relays on J9, J10 and J11.

The Alarm (J9) and Disable (J11) relays are normally de-energised and energise on the specified condition. The contacts can be wired to external signalling systems.

The Fault relay (J10) is normally-energised and becomes de-energised on the occurrence of a fault condition. The contacts can be wired to external signalling systems.

Note that the second pole of each relay is used in the Centaur ASE Interface.

These relays can be used for other purposes if they are not required for brigade signalling.

One way to do this is use the “NZ Local” system profile and change the user logic equations for the local mode relay operate equations. I.e.

```
$LOCALMODE_FAULTRELAY_OPN
$LOCALMODE_ALARMRELAY_OPN
$LOCALMODE_DISABLERELAY_OPN
```

Note: Using the “NZ Local” system profile will make other changes to system operation.

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15 Remote Access

15.1 Remote Access

15.1.1 General

The *MX1* has a number of serial ports that can be used to communicate with external devices. This chapter details how to connect remotely to an *MX1* for the purposes of configuration, diagnostics, front panel access and also for the paging of alarms and other system events.

Nearly all front panel operator functions and many service functions can be carried out via a PC connected to the Diag/Prog serial port on the *MX1* Controller.

This connection could be:

- A direct serial cable from the PC – this would be a normal means during system installation and commissioning. This will give the highest speed connection, with the fastest download times for data files or firmware.

- A remote connection via a dial-up modem, set up for answer-only operation. The connection speed will generally be less than for a direct serial connection, but will be acceptable for most purposes. There are several choices of modem: V-Modem (now obsolete), commercial off-the-shelf PSTN modem, cellular radio modem.

- A remote connection via a terminal adapter (serial to Ethernet) or PIB, connected to a LAN or WAN. Depending on the nature of the LAN or WAN, this should also provide a high speed connection.

Using the PC connected to the *MX1* in this way, you can:

- Use the PanelX software to provide a “virtual” front panel on the PC display. This simulates the alphanumeric display and keys of the *MX1*, but not the individual zone indicators.

- Use a terminal emulator program, e.g., SmartConfig, HyperTerm or WinComms, to access the diagnostic commands for detailed fault finding or service.

Note: Where the *MX1* is to be remotely accessed, precautions must be taken to ensure that the remote operation can be achieved safely, in compliance with the relevant Standards and codes, and with appropriate security to ensure system changes (e.g. isolation of zones or points, programming changes) are authorised.

For example, a keyswitch may be necessary at the panel to disconnect the remote access facility until authorised on-site by operating of the keyswitch.

15.1.2 V- Modem

V-Modem is an obsolete Johnson Controls-supplied standalone PSTN modem. It can be configured to operate in several modes, and does not require any supporting configuration in *MX1* for use with it. It can be powered from the *MX1* internal supply so as not be affected by mains failure. It is designed for reliable long-term operation without requiring attention.

For remote access to *MX1*, the V-Modem installed at the *MX1* must be configured for “Dialup – Answer” operation. V-Modem will automatically answer calls, but will not originate calls. While it is off-line, any data received from the *MX1* will be discarded.

Mounting

The Slimline *MX1* cabinet does not have space to mount the V-Modem internally. The V-Modem case can be wall mounted adjacent to the *MX1*. A serial cable distance limit of 15m should be used, to avoid data transmission reliability problems.

A V-Modem can be mounted in the *MX1* 15U cabinet by using an ASE Rack Mounting front panel kit, part number KT0199, or KT0212 2-Up Rack Mounting Kit which can mount a V-Modem and an ASE.

Wiring

Wire as shown in Figure 15.1. Power can be taken from any of the +VBF terminals, though it is best to use an unused terminal (often +VBF2). Include the V-Modem's current consumption in the battery calculations.

The LM0166 cable from the V-Modem can be connected directly to the Diag/Prog serial port on the *MX1* Controller. A "straight" serial cable with male and female DB9 connectors can be used to provide additional length between the LM0166 and the *MX1* if required. Suitable cables are available from electronics or computer accessory suppliers.

The PA0730 relay board only needs to be included if site-specific datafile downloading over the V-Modem connection is required. The OC2 output of the V-Modem turns on whenever the V-Modem is on line, thereby write-enabling the database.

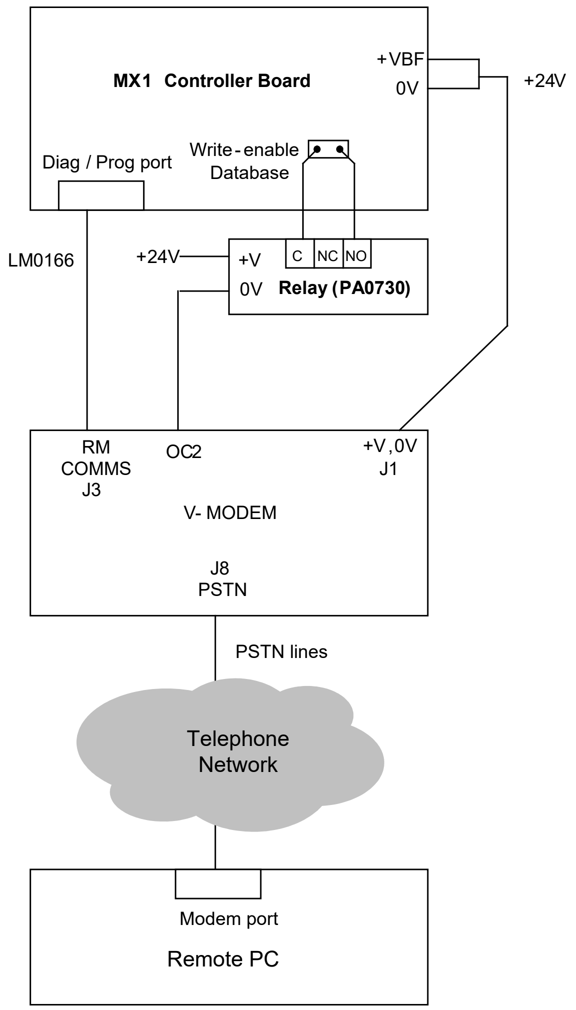

Figure 15.1 – V-Modem Connection

Configuration

Set the V-Modem into “Dial-up Answer” mode, 19200 baud, with Xon/Xoff enabled on all ports.

Connect the V-Modem serial port to *MX1* Diagnostics/Programming port, or to another serial port that has been configured to run as a terminal (DIAG/PROG port is the only option in the current release of *MX1* software).

Note that although the *MX1* to V-Modem serial link operates at 19200 baud, the remote PC needs to dial in and communicate at 2400 baud, which is the actual communications rate.

15.1.3 V-Modem Ordering Details

Ordering Code	Quantity
FP0778 V-Modem (fitted with LM0166 and includes a User Manual – LT0243)	Now Obsolete
A suitable PSTN lead is required, i.e. RJ11 to BT for New Zealand, or RJ11 to suitable plug for Australia.	1
“Straight” serial cable with male and female DB9 connectors, e.g., LM0138 LOOM,DB9M-DB9F,ALL PINS STRAIGHT THRU,1.8M, Altronic part number P1770	If required to extend the serial connection.
KT0199 ASE 19” RACK MOUNTING FRONT PANEL KIT	1, if mounting in 15U cabinet.
PA0730 24V GEN PURPOSE 2A 2CO RELAY BD	1, if remote control of data file write access is required.

15.1.4 Commercial PSTN Modem

For short term use during installation and commissioning, a commercial PSTN modem can be used for remote access.

Long term use of such a modem for remote access to *MX1* is not recommended. In general, these modems are not designed for long term unattended use, and the internal program execution can “lock up” and require manual intervention to be restarted. Arranging for standby power during mains-fail is also more complicated, since these modems use a mains plug pack for power, and cannot be powered from the *MX1* internal supply. A separate power outlet will be required.

Mounting

For short term use, it may be possible to tuck the modem inside or on top of the *MX1* cabinet.

Wiring

Serial – the modem serial port can be connected directly to the Diag/Prog serial port on the *MX1* Controller, via a “straight” serial cable with male and female DB9 connectors. Suitable cables are available from electronics or computer accessory suppliers. The modem must be no more than a cable distance of 15m from the *MX1*.

Power – the modem plug pack must be connected to a mains outlet.

Configuration

The modem must be set up to answer incoming calls by itself, without any support from the *MX1*, and to automatically hang up when the call is ended. The response codes sent by the modem to the *MX1* must be suppressed. The modem must be capable of operating at 19200 bps data rate to the *MX1*. Any modern V.34 or V.90 PSTN modem should be capable of doing this.

An initialisation string of (check the modem manual for details) AT S0=2 S7=30 E0 Q1 &W should set up the modem for:

- Automatic answer after two rings
- Automatic disconnection 30 seconds after the calling modem hangs up
- Disabling sending response codes
- Saving this configuration to non-volatile memory as power-on default.

15.1.5 PIB

The Panel-Link IP Bridge (PIB) can act as a IP to serial adaptor to allow connection to the *MX1*'s diagnostic (or printer) ports over a LAN/WAN. It mounts on a "responder" footprint, so can be fitted on the right hand wing of the 15U gearplate, or instead of the T-Gen2 or T-GEN 50 on either the 15U or Slimline gearplate. It can be powered by the *MX1*.

PanelX, SmartConfig, Wincomms, Hyperterminal, etc., can be used on the PC on the LAN/WAN to "telnet" to the PIB's remote access port and into the *MX1*. Details are contained in the PIB User Manual (LT0519).

15.1.6 Terminal Adaptor

These are small modules designed to connect between the serial port of some equipment and a local area network using Ethernet.

With appropriate software, a PC connected to the LAN can access the serial port on the equipment.

Different manufacturers use different names for these devices, e.g. Device Server, Universal Serial Device Gateway, or IP to serial adaptor.

Two devices that are known to work with *MX1* are:

- Lantronix UDS-10 – see www.lantronix.com. Requires DB9 female to DB25 male "straight" serial cable. Can be powered from the *MX1*'s DC supply or from 230VAC adapter.

- *Advantech* ADAM4577 – see www.advantech.com. Requires null-modem adapter between its serial cable and the *MX1*. Can be powered from the *MX1*'s DC supply.

MX1 does not require any special configuration to work with these adapters.

Refer to the manufacturer's documentation for configuration of the terminal adapter. It must be capable of a data rate of 19200 bps, 8 bits/character, no parity, to the *MX1*, and for receiving TCP socket connections from the LAN. Connection of the terminal adapter to the LAN must be done with the assistance of the LAN administrator so as not to adversely affect the network's operation.

Note that, generally, the terminal adaptor will need to be assigned a fixed or known IP address or host name so that users can connect to it.

15.1.7 PanelX

PanelX (SF0281) is a Johnson Controls proprietary Windows-based program that can be used to access an *MX1* via a simulated front panel display and control it remotely.

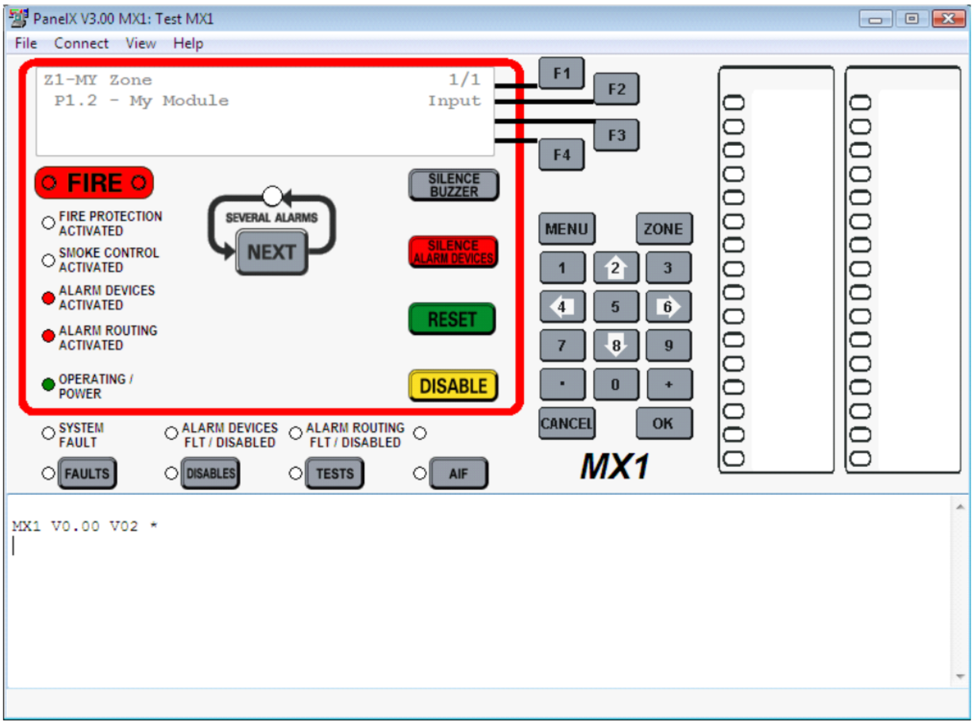

Figure 15.2 – Sample Screenshot of PanelX Display

PanelX supports direct RS232 connection, dialup connection using a modem, and a TCP/IP network connection, and uses Tandem Mode to access the panel. All versions of *MX1* firmware support Tandem Mode.

Note: A 'Tandem Mode' connection to *MX1* logs onto a separate virtual instance of front panel, not the actual front panel. Operation by remote connection will be invisible to a user at the physical front panel. Tandem mode and front panel access are independent as far as is possible when operating the same system.

PanelX is available as SF0281 PanelX Remote Communications Software. Version 3.00 or higher is required for use with *MX1* V1.34 firmware, and it supports all earlier *MX1* firmware versions as well as F3200 and MX4428 panels. To install the program run the SF0281 file and set up the connection details for the panels to use. Further information is contained in the Help file included in the program.

15.1.8 Telepager Interface

The VIGILANT Telepager Interface (TPI – now obsolete) can be connected to an *MX1* printer port and be programmed to send messages to alphanumeric pagers or message-receiving cellular phones when certain events occur.

Refer to LT0206 for full details on the use of a TPI. Connect the *MX1* Controller's Serial Port 1 (J23) to the TPI's RS232 Port B using cables LM0076 and LM0065.

Note that TPI V1.60 or higher software is required to support the *MX1* with V1.50 onwards firmware.

16 Networking

16.1 Introduction

Multiple *MX1* fire panels, along with other compatible Panel-Link devices, may be connected together to form a network.

Some of the devices which may be part of the network include:
1. *MX1* Fire panels
2. XLG Colour Graphics System
3. QE20 or QE90 Evacuation system
4. NSA Nurse Station Annunciator
5. PMB Panel-Link Modbus Bridge
6. NDU Network Display Unit (event printing and LED mimic displays.
7. MX4428 fire panel as a master or sub-panel
8. Compact FF

Networking allows *MX1* fire panels to share:

(i) Alarm information for display and control of alarms on the LCD. Alarms on one *MX1* can be displayed at other panels and Colour Graphics displays. Alarms can be silenced, reset and disabled from the *MX1*s and Colour Graphics displays.

(ii) Output logic status, allowing status and controls generated by the output logic at one *MX1* to be used by the output logic at another panel, e.g., for extended AS 1668 Fan Controls.

(iii) MAF Status, so that one *MX1* can be a main brigade display and signalling point for a number of panels on the site.

(iv) Event Information for status monitoring and network event printing. An *MX1* may be programmed to perform system wide event printing and event history, or from just selected panels.

(v) Control for activating, disabling and silencing the Alarm Devices on remote *MX1*s as a result of alarms or operator controls on the local *MX1*.

Refer to the *MX1* Network Design Manual (LT0564) for detail of how *MX1* can be networked with other panels.

An *MX1* panel generally uses either an I-HUB or a PIB as its network interface. These are shown in Table 16.1.

Table 16.1 – Comparison between I-HUB and PIB Networks

	I-HUB	PIB
Maximum number of nodes (panels) on the same ring/sub-net	64	64
Can merge ring/sub-nets together	Yes	Yes
Total number of nodes/panels supported over multiple merged rings/sub-nets	64	251
Protocol	Panel-Link	Panel-Link over UDP
Data speed on ring	Up to 57k6	Up to 100M
Additional networking hardware required for ring networking	OSD139HS Fibre Optic modems if fibre is to be used.	Moxa Fibre/Ethernet Switch

	I-HUB	PIB
Ports	2 x RS485 (ring) 2 x RS232 1 x TTL (to *MX1* Controller Bd)	1 x Ethernet (to Moxa Switch) 1 x TTL (to *MX1* Controller Bd)
Data cabling - Copper	Twisted copper pair up to 1,500m (depending on cable type and data rate).	Shielded CAT3/5/6 cable up to 100m. Twisted telephone copper pair up to 8km using Westermo Ethernet Extenders.
Data cabling – Fibre	Fibre using OSD139HS Fibre Optic modems. Single Mode fibre up to 40km, Multi-mode Fibre up to 3km.	Fibre using Moxa switch. Single Mode fibre up to 40km, Multi-mode Fibre up to 5km.

The following sections give a brief description of using these devices, plus a direct connection to certain devices.

16.2 I-HUB

The I-HUB is used to connect the *MX1* panel onto a RS485 or fibre optic ring network (see Figure 16.1), or a multi-drop bus network (see Figure 16.2), or an arbitrary arrangement of connections. It has five network ports, one of which is used as the I-HUB programming port. Each network port can be connected to a network of devices or to a single device. The I-HUB performs bridging and routing functions for the Panel-Link network and *MX1*. Panel-Link messages received on one port can be routed to any or all of the other ports. This allows the physical size of a Panel-Link system to be extended, or multiple Panel-Link networks to be joined together, and also allows devices on different physical media to be connected.

Two of the I-HUB ports are 2 or 4 wire RS485 connections that usually operate in tandem as a ring network (they cannot be configured to operate independently). By adding external fibre modems to segments of the ring, the ring can be run in fibre optic cable. A further two ports provide RS232 levels. If required, these may be connected to a variety of external interface boards that convert RS232 levels to RS485, or to modems.

The fifth port is a TTL level serial port that is connected to the *MX1* Controller in a *MX1* panel, or to compatible ports in other Panel-Link products.

Figure 16.1 shows the general arrangement of panels and I-HUBs in a ring network. This is the recommended networking arrangement as it results in the least cable, offers a higher level of fault redundancy, and supports more devices. Furthermore the I-HUB is factory configured for operation on a ring with an *MX1* connected to port 5, so for many situations no programming of the I-HUB will be required. Any QE20 will need the RS485 Network Kit included.

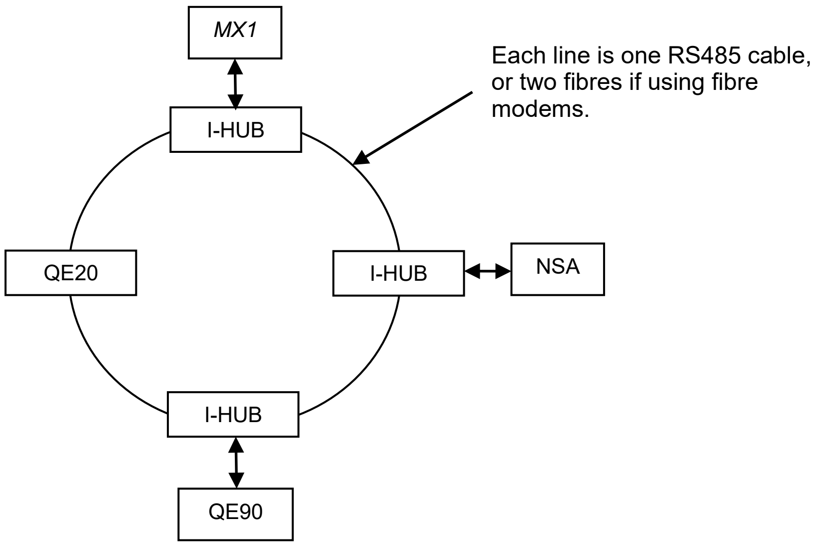

Figure 16.1 – I-HUB in ring topology

Figure 16.2 shows the general arrangement of a dual bus network. The I-HUB can be configured for this to suit certain legacy installations, but it requires programming of the I-HUB, and so is not recommended for new installations. Note a QE20 cannot be used on a multi-drop network.

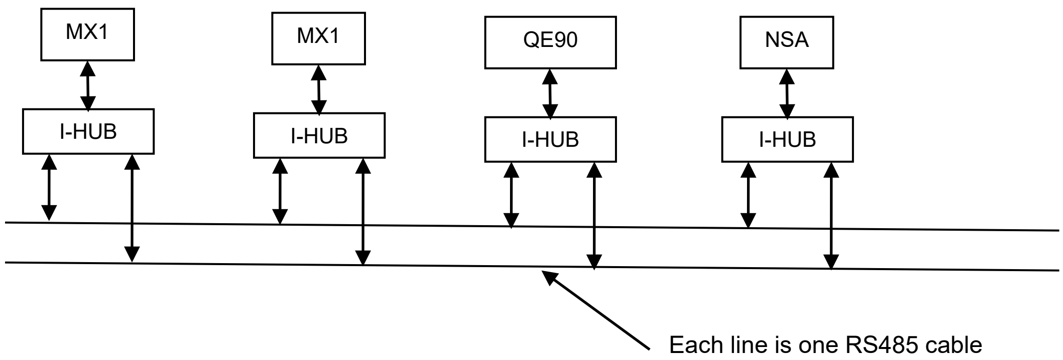

Figure 16.2 – I-HUB in multi-drop topology

By specially configuring one or more I-HUBs they can be arranged for arbitrary network arrangements to join various panels/media connections together. As this is a specialist application, please refer to the I-HUB User Manual (LT0229) for details.

Ordering Codes

The I-HUB is ordered as:

FP0771 F3200/F4000 I-HUB Upgrade Kit

This provides the I-HUB, mounting facilities and cables to mount the I-HUB in the cabinet and connect to the *MX1* using the I-HUB's port 5. If fibre optic cables are required the FP1032 kit can be ordered to provide mounting of two OSD fibre modems, e.g., for the ring cabling or star connected sub panels.

FP1032 OSD139 Fibre Optic Modem x 2 Mounting Kit
OSD139HS Fibre Optic Modem, Multi-Mode
OSD139HSL Fibre Optic Modem, Single-Mode

I-HUB Mounting

Slimline Cabinet
The I-HUB (FP0771) is mounted in the left side of the cabinet. Optional OSD fibre modems can be mounted on the gear plate or on the right-hand side of the cabinet in place of the *MX1* Loop Card using the FP1032 OSD139 Fibre Optic Modem Bracket (see Figure 16.3).

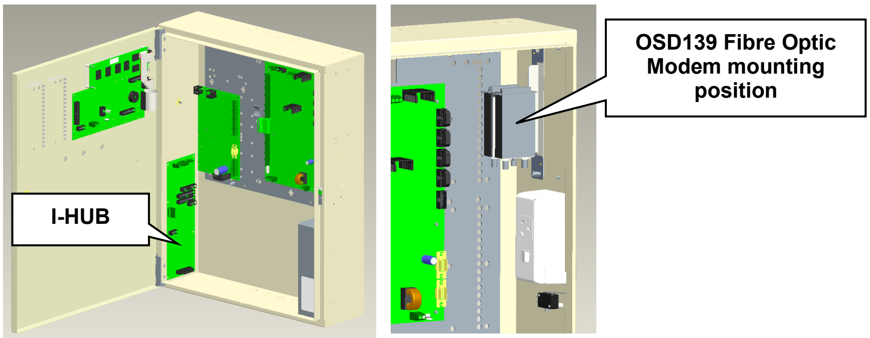

Figure 16.3 – I-HUB Mounting in the Slimline Cabinet

15U Cabinet
The I-HUB (FP0771) is usually mounted on the right hand gearplate flange (see Figure 16.4). Optional OSD fibre modems can be mounted on the *MX1* gearplate in place of *MX1* Loop Cards by using the FP1032 OSD139 Fibre Optic Modem Bracket.

Figure 16.4 – I-HUB Mounted on right side Flange

Refer to the gearplate drawings in Chapter 8 Miscellaneous Applications for other mounting options.

Documents

For further details regarding the I-HUB please refer to:

LT0229 Panel-Link I-HUB User Manual

16.3 PIB (Panel-Link IP Bridge)

The PIB can be used to interconnect *MX1* panels over an IP network or to extend a Panel-Link network over long distances or between locations where it is not convenient or economic to install the cable normally used for Panel-Link, but where an IP network is available.

Multiple PIBs at different physical locations can be connected to an IP network (either the customer's existing network (non-approved installations), or a network installed specifically for the purpose). In very simple terms, the PIBs act as a "piece of wire" between these locations.

Each PIB transmits the messages it receives from the connected Panel-Link device via the IP network to all the other PIBs it knows about. Each receiving PIB sends an acknowledge message back to the sending PIB and also transmits the Panel-Link message out on its Panel-Link port.

For the Ethernet/IP network, many media types are available (from other suppliers). For example:

- Screened Twisted Pair (STP). Note – limited to 100m. Fire rated cable is available but it may be difficult to terminate.
- Fibre. Note "Fire rated" fibre is available but although this rating applies to overseas standards it may not comply with current Australian standards.
- Wireless (WiFi, WiMax, Microwave, GPRS, 3G, etc.).
- DSL (DSL, ADSL, ADSL2, ADSL2+, etc.).
- Etc.

Also, multiple topologies (star, redundant ring, etc.) are supported by third party equipment.

Note that if the fire alarm system is required to meet NZS 4512 or other relevant standards you will have to check that the network and equipment you plan to use has been tested and approved to the required standards. The currently approved equipment is listed in the Order Codes section below.

Figure 16.5 shows a diagram of a fully redundant ring network. Each network 'node' includes a PIB and a Moxa Ethernet Switch (with 2 Fibre ports if applicable). If any one of the segments is broken, the switches will re-direct data as required so that communication will continue unimpeded. Furthermore, each of the switches can be configured to output a fault signal when this happens so that the fault can be identified, diagnosed and repaired.

Note QE20 supports only fibre networking on an IP ring.

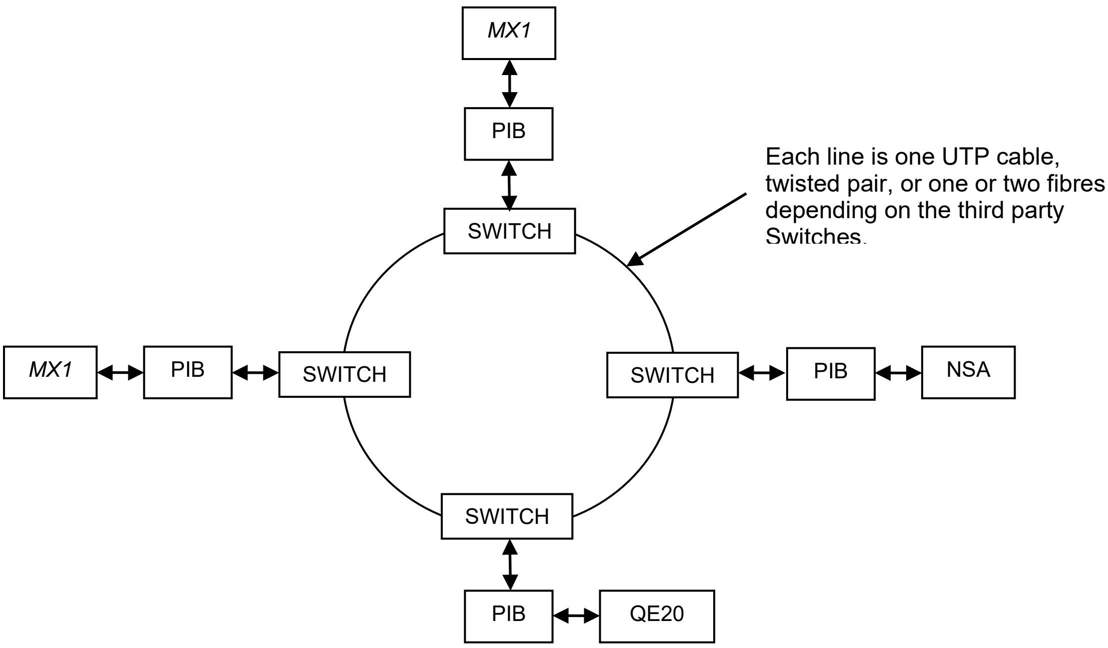

Figure 16.5 – Fully Redundant Ring Topology

Ethernet expenders can be used to send IP data over a twisted pair. An Ethernet extender is required at each end of the link, as shown in Figure 16.6.

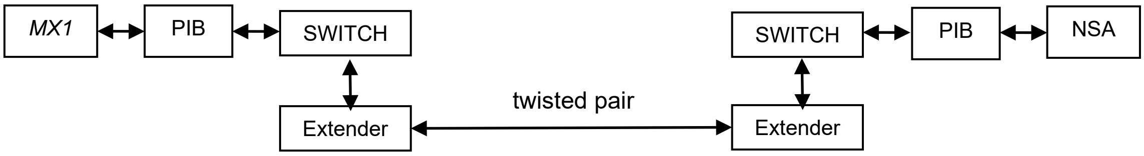

Figure 16.6 – Ethernet Extenders

Depending on the cable type used, the Wolverine DDW-120 Ethernet extender can support sending data over a twisted pair cable up to 5-8km in length.

Each PIB can connect directly to one Panel-Link device that supports point-to-point mode (i.e., *MX1*, I-HUB, PMB, NDU, NSA, QE20, QE90, or XLG colour graphics interface).

Order Codes

FP0986 PIB PANEL-LINK IP BRIDGE
FP1012 *MX1* DIN MODULE MOUNTING BRACKET
SU0319 MOXA 5 PORT E/NET SW, (2 MULTI MODE FIBRE)
SU0320 MOXA 5 PORT E/NET SW, (2 SINGLE MODE FIBRE)
SU0328 WESTERMO SHDSL ETHERNET EXTENDER DDW-120

PIB Mounting

In a 15U *MX1* the PIB is usually mounted on the gearplate flange on the right-hand side of the cabinet. Alternatively it can be mounted on the left hand side on one of the responder footprints, but this will leave less room for *MX* loop cards etc. The PIB is required to be earthed and the recommended earthing method is via 2 metal standoffs in the positions shown in Figure 16.7. The other standoffs may be plastic or metal.

Figure 16.7 – PIB Earthing

Figure 16.8 shows the mounting of the PIB in the Slimline cabinet with a Moxa switch mounted on the FP1012 mounting bracket.

Note that when using fibre cabling you will need to allow for cable entry and minimum allowed bend radius when connecting to the fibre modem.

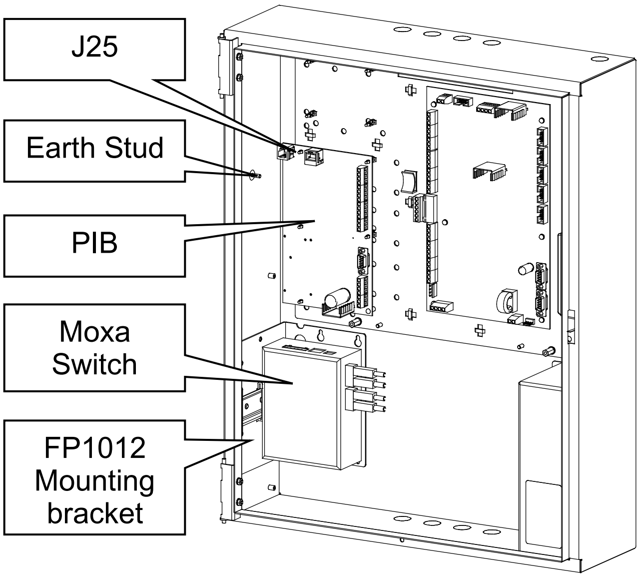

Figure 16.8 – PIB mounting in Slimline cabinet

Figure 16.9 shows the 3 mounting options for the PIB on the 15U gearplate. Position 1 is recommended because it provides the required earth facilities.

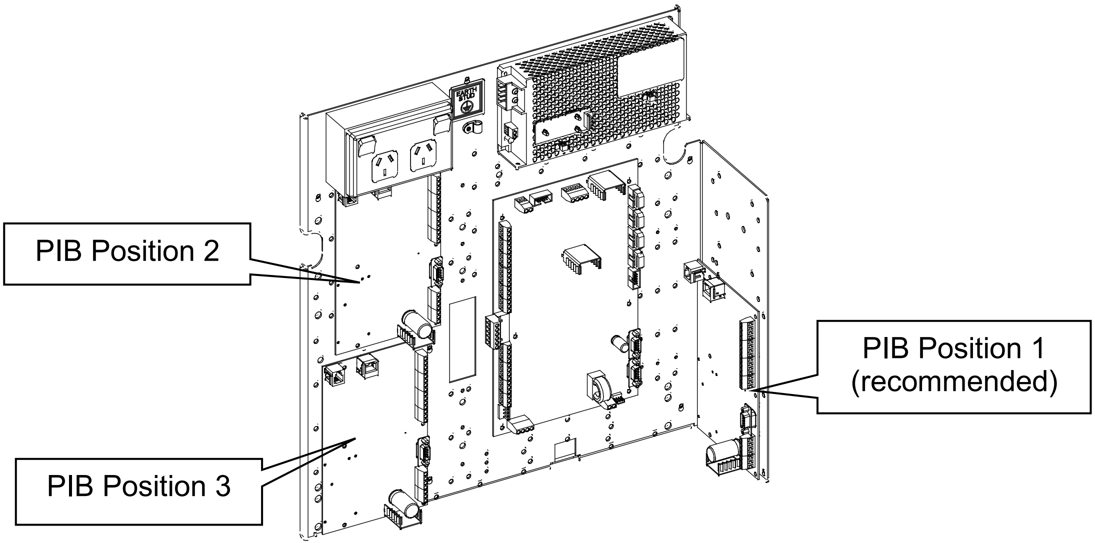

Figure 16.9 – 15U Cabinet PIB Mounting Options

When mounting the PIB in position 2, earth leads will need to be fitted between earth tabs J23 and J25 and the gearplate. When mounting the PIB in position 3 an earth lead will be required to be fitted between earth tab J25 and the gearplate. No earth lead is required for J23 as there is a metal standoff on the gearplate.

A Moxa switch and one Ethernet extender (or 2 Ethernet extenders) can be mounted using one FP1012 mounting bracket. This bracket is mounted on the left side of the gearplate, as shown in Figure 16.10. Note the Moxa switch needs to be earthed to the cabinet via the earth screw on its top, and the Ethernet extender requires 10mm of clear air around it for ventilation.

It is also possible to mount the PIB and the FP1012 in the same position to allow room for other devices such as *MX* Loop Cards. But in this case only the Moxa switch or an Ethernet Extender can be mounted on the FP1012 bracket and the PIB LEDs will not be visible.

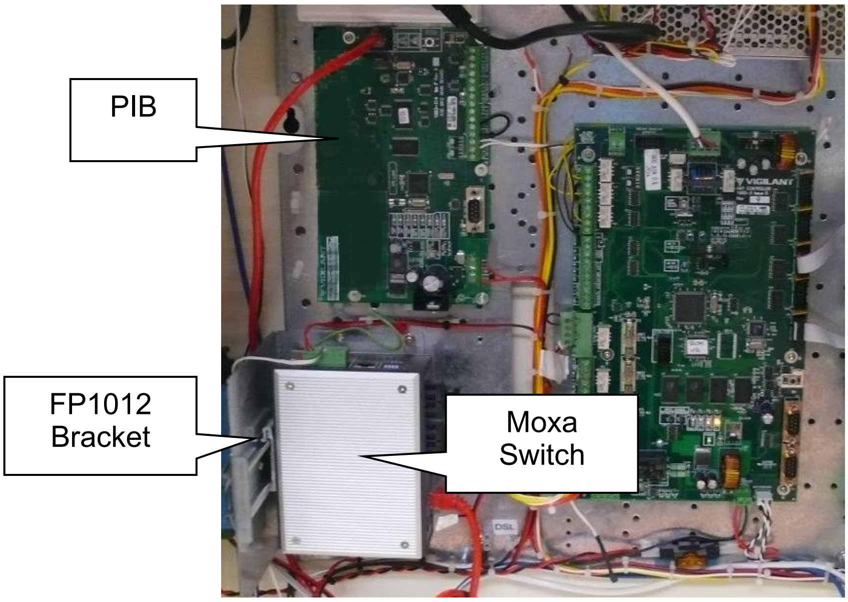

Figure 16.10 – 15U Cabinet PIB Mounting Options

Note: When using fibre cabling you must allow for cable entry and minimum bend radius in deciding the fibre cable route to the switch (commonly 60-90mm for field cables, 40mm for patch leads).

Refer to the gearplate drawings in Chapter 10 Miscellaneous Applications for further details regarding mounting options.

Documents

For further details on the PIB please refer to:

LT0519 PIB User Manual

16.4 Direct Connection

The *MX1* panel has one TTL level serial port that supports point to point Panel-Link with one other Panel Link device such as the PMB. This device must usually be located in the *MX1* cabinet and be powered by the *MX1* as the TTL level port is not suitable for connections outside the cabinet. Refer to the PMB User Manual (LT0202) for further details.

16.5 Programming

The *MX1* is configured for networking using the SmartConfig program.

Note that this section is an overview of the basic networking programming required by the *MX1*. Please refer to the *MX1* Network Design Manual LT0564 for more detail.

There are 3 main tables used to configure networking:

16.5.1 Hardware Table

In the hardware table (Figures 16.11 and 16.12) you must set the Network Function to either I-HUB, PIB, or Other (e.g., direct connection), and the Port to the serial port number on the *MX1* controller board used to connect to the network interface device (e.g., I-HUB or PIB).

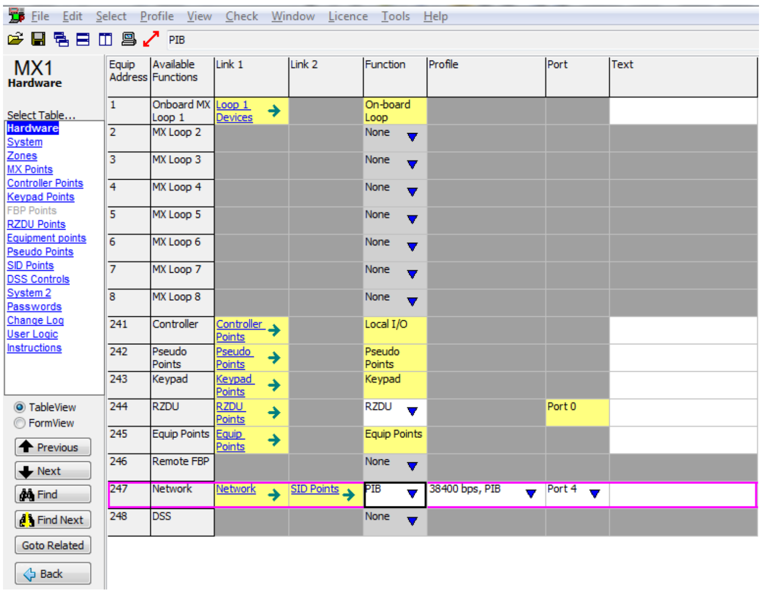

Figure 16.11 – Hardware Table

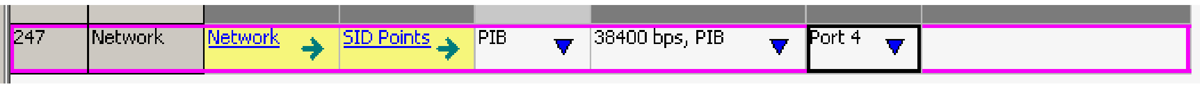

Figure 16.12a – Hardware Table (PIB configuration example)

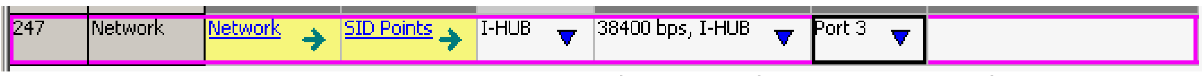

Figure 16.12b – Hardware Table (I-HUB configuration example)

16.5.2 System Table

In the system table (Figure 16.13) there are two network related settings: SID Number and Local Network Profile.

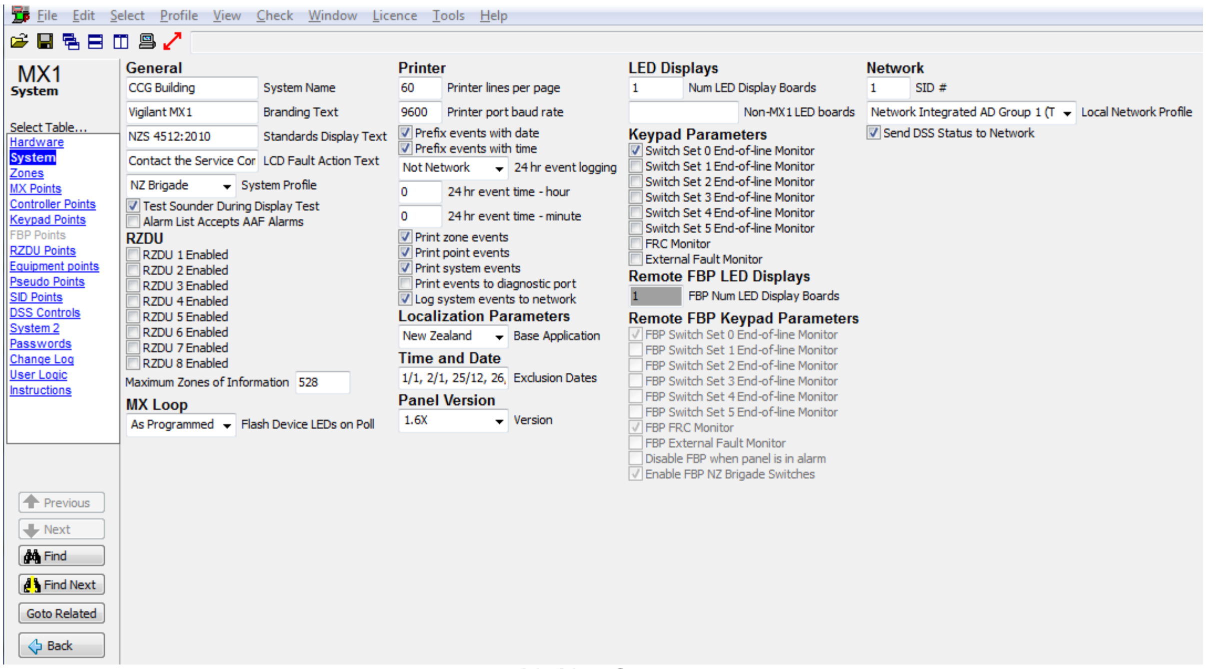

Figure 16.13 – System Table

SID Number

The SID number is used to identify each Panel-Link device (e.g., *MX1* Panel) on the network, and so each device on the same network must have a unique SID number.

Local Network Profile

Profiles provide a collection of settings commonly adjusted "in bulk" to configure an *MX1* for suitable operation in different applications. Figure 16.14 shows the Local Network Profiles available in SmartConfig.

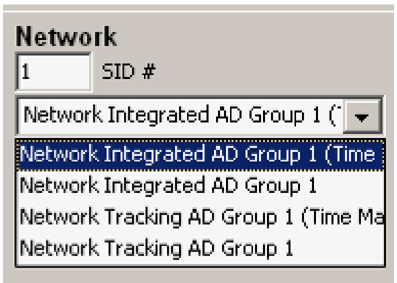

Figure 16.14 – Local Network Profiles

Network Integrated AD Group 1 (Time Master)

When an alarm occurs, the Alarm Devices turn on at all panels in AD group 1 and the Alarm Devices Activated LED turns on at all those panels. When the Silence Alarms keyswitch is operated at any panel in the group, the Alarm Devices are silenced at all panels in group 1 and will not re-sound for a new alarm. The panel is a time master that sends its time out on the network to synchronise the clocks of other panels.

Network Integrated AD Group 1
As per a Network Integrated AD Group 1 (Time Master) except the panel is not a time master.

Network Tracking AD Group 1 (Time Master)
When an alarm occurs, all panels in AD group 1 (if any) turn their Alarm Devices on but only the panel with the actual alarm will turn its Alarm Devices Activated LED on and the External Silence Alarms keyswitch is operational only at the panel with the alarm. Hence in tracking mode, the Alarm Devices will be sounding at all panels in group 1, if any panel in the group has an alarm and the External Silence Alarms control at that panel is not operated. The panel is a time master that sends its time out on the network to synchronise the clocks of other panels.

Network Tracking AD Group 1
As per a Network Tracking AD Group 1 (Time Master) except the panel is not a time master.

For detailed information on the network profiles please consult the *MX1* Network Design manual LT0564.

16.5.3 SID Points Table

The SID Points table is used to enter the details of the other Panel-Link devices on the network that this panel is required to interact with.

Each row is one network device, with the point number equal to the device's SID number. E.g., row 5.0 relates to the device with a SID of 5.

Each network device is configured with:
- its device type (e.g., *MX1*, XLG, QE90, etc.)
- a SID Config Profile. The profile options will depend on the device type.

Each network device will have 1 or more sub points depending on its type. For each sub point you can configure the point text, if the point can be disabled, the logging profile and Point Flags profile.

In the following example there are three *MX1* panels in a ring network using PIBs. There is a master panel with a SID of 1 and two subpanels with SIDs of 4 and 7. The master can see local events and events from both subpanels, and can control the subpanels. The subpanels can see only local events, but must generate a fault if the connection to the master panel fails.

In the SmartConfig SID Points table for the master panel (SID 1) the two subpanels are entered as shown in Figure 16.15. Entering the subpanel in the master's SID Points table allows the master panel to receive events from the subpanel (e.g., alarms, faults, etc.), control the subpanel and monitor the link to the subpanel.

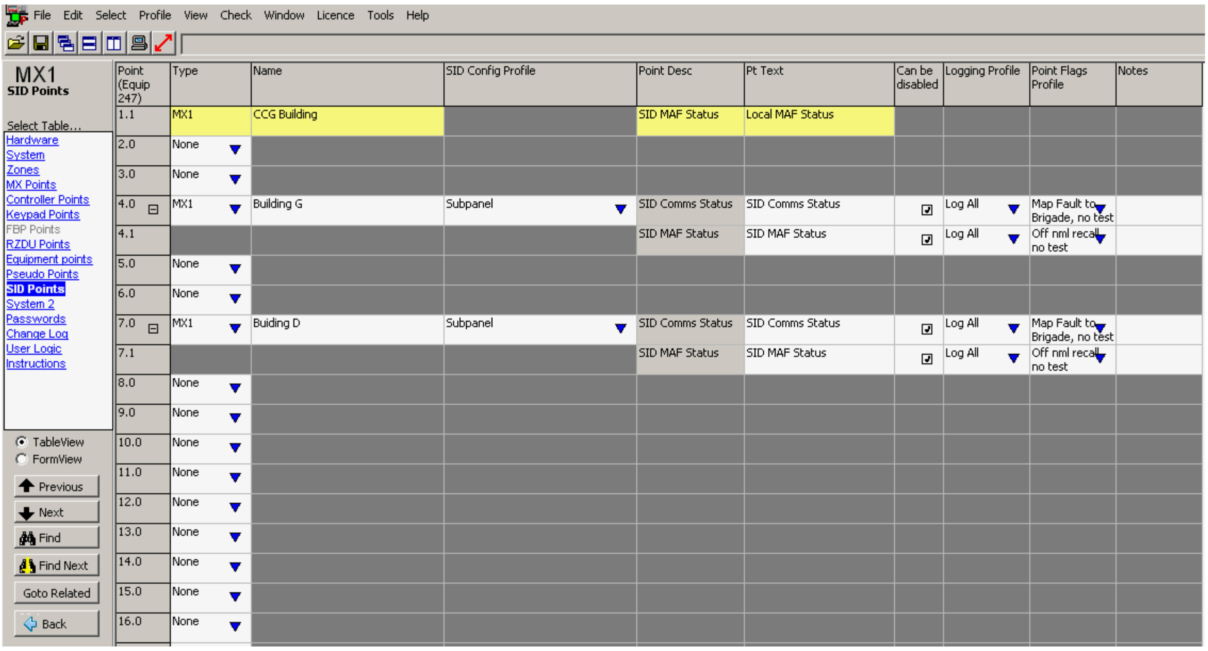

Figure 16.15 – SID Points Table in *MX1* Master

In the SmartConfig SID Points table for each subpanel (SIDs 4 & 7) the master panel (SID 1) is entered as shown in Figure 16.16. Entering the master panel in the subpanel's SID Points table allows the master panel to control it and the subpanel to monitor the link to the master panel.

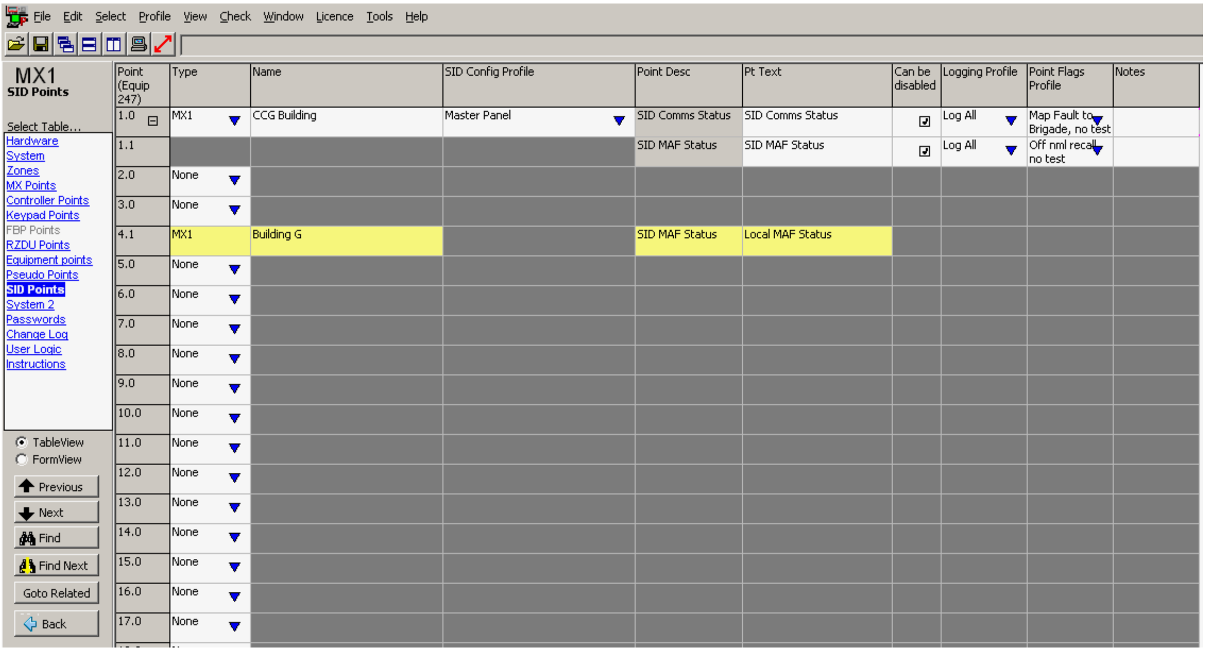

Figure 16.16 – SID Points Table in a Sub-Panel

There are many other configurations you can use. For further details on configuring the SID Points please consult the *MX1* Network Design manual LT0564.

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17 Appendices

17.1 Equipment Point Descriptions

17.1.1 Equipment 241 – *MX1* Controller

The following tables list the default Point text and a description of all the in-built points. Some *MX1* configurations may have these points changed or deleted.

Point Number	Point Text	Description
241.1	ALARM DEVICES	This point indicates the Alarm Devices status and is used to enable/disable the Alarm Devices. "Alarm Devices" are devices (e.g. sounders and sirens) that operate to signal to building occupants that a fire is present and the area should be evacuated. The state of the Alarm Devices is controlled by output logic, such that it is operated when there is an alarm on a non-disabled zone that is mapped to the Alarm Devices. When the Alarm Devices are disabled, the Alarm Devices point indicates disabled and the Alarm Devices Disabled/Fault LED on the *MX1* front panel is on steady, i.e. enabling/disabling this point enables/disables the alarm devices. If the Alarm Devices point is in fault, then the Alarm Devices Disabled/Fault LED on the front panel flashes (if the Alarm Devices point is not disabled). Do not disable the Alarm Devices to stop signalling of an Alarm Devices fault since this will also prevent the alarm devices from operating. Disable the source of the fault. This point does not indicate if Trial Evac or Silence Alarms are active. When the Alarm Devices are test operated, this point indicates a status of "TestOp".
241.2	GPIN1	Provides the status of the G.P IN 1 input (J2-1).
241.3	GPIN2	Provides the status of the G.P IN 2 input (J2-2).
241.4	GPOUT1	GPOUT1 is an open collector output (J7-1) with supervision capability. The Operate state of the output can be controlled by system or user logic. If supervision has been enabled in the configuration then the Fault state is determined and shown by the supervision input point GPOUT1S.
241.5	GPOUT1S	GPOUT1S is the supervision point for GPOUT1. If supervision is enabled on GPOUT1 then the Fault state of the output will show on this point. If GPOUT1 is not used then this point can be used as an input.
241.6	GPOUT2	GPOUT2 is an open collector output (J7-2) with supervision capability. The Operate state of the output can be controlled by system or user logic. If supervision has been enabled in the configuration then the Fault state is determined and shown by the supervision input point GPOUT2S.
241.7	GPOUT2S	GPOUT2S is the supervision point for GPOUT2. If supervision is enabled on GPOUT2 then the Fault state of the output will show on this point. If GPOUT2 is not used then this point can be used as an input.
241.8	ANC1	ANC1 is an ancillary relay with supervision capability (J4). The Operate state of the point can be controlled by system or user logic to energise the relay. If supervision has been enabled in the configuration then the Fault state is determined and shown by the ANC1S (241.9) point.
241.9	ANC1S	ANC1S is the supervision input (J4-5) for ancillary relay 1. If supervision is enabled on ANC1 then the Fault state of the output will show on this point. If supervision is not enabled on ANC1 then ANC1S is a clean contact input with states determined by the configuration.
241.10	ANC2	ANC2 is an ancillary relay with supervision capability (J5). The Operate state of the point can be controlled by system or user logic to energise the relay. If supervision has been enabled in

Point Number	Point Text	Description
		the configuration then the Fault state is determined and shown by the ANC2S (241.11) point.
241.11	ANC2S	ANC2S is the supervision input (J5-5) for ancillary relay 2. If supervision is enabled on ANC2 then the Fault state of the output will show on this point. If supervision is not enabled on ANC2 then ANC2S is a clean contact input with states determined by the configuration.
241.12	ANC3	ANC3 is an ancillary relay with supervision capability (J6). The Operate state of the point can be controlled by system or user logic to energise the relay. If supervision has been enabled in the configuration then the Fault state is determined and shown by the ANC3S (241.13) point.
241.13	ANC3S	ANC3S is the supervision input (J6-5) for ancillary relay 3. If supervision is enabled on ANC3 then the Fault state of the output will show on this point. If supervision is not enabled on ANC3 then ANC3S is a clean contact input with states determined by the configuration.
241.14.0	FIP Pwr Nml	This point is unused and included for future enhancement only. This point is intended to represent the "FIP PWR NORM-" PIN (J8-7) on the Brigade Signalling Interface. This open collector output is operated when power is supplied to the panel and de-operated when power is removed. There is no link between this point and the actual output.
241.14.1	FIP Comms OK	Provides the status of the "FIP COMMS OK-" PIN (J8-6) of the Brigade Signalling Interface. S/C to 0V gives the Normal state and O/C gives the Fault state.
241.14.2	Brigade Disable Relay	The Operate state controls the "FIP ISOL-" PIN (J8-8) on the Brigade Signalling Interface, the DISABLE/ISOL relay (J11) and the isolate component of the ASE+ signal on the ASE Interface (J12).
241.14.3	Brigade Alarm Relay	The Operate state controls the "FIP FIRE" PIN (J8-4) on the Brigade Signalling Interface, the FIRE/ALM relay (J11) and the fire component of the ASE+ signal on the ASE Interface (J12).
241.14.4	Brigade Fault Relay	The Operate state is OR-ed with the Fault state of the points RAM test, DB1 CRC Fault, DB2 CRC Fault, FW CRC, S/W Faults and also a check on whether output logic is running, and then controls the "FIP DEF-" PIN (J8-1) on the Brigade Signalling Interface, the FAULT/DEF relay (J10) and the fault component of the ASE+ signal on the ASE Interface (J12).
241.14.5	Brig Test	Provides the status of the "Brigade Test-" PIN (J8-2) of the Brigade Signalling Interface. S/C to 0V gives the ActiveInput state and an O/C gives the Normal state.
241.14.6	Brig Isol	Provides the status of the "Brigade Isol-" PIN (J8-3) of the Brigade Signalling Interface. S/C to 0V gives the state ActiveInput and an O/C gives the Normal state.
241.14.7	SGD Flt	Provides the status of the "SGD FLT+" PIN (J8-5) of the Brigade Signalling Interface. S/C to 0V gives the Normal state and O/C gives the Fault state.
241.15	Temperature	Point is unused but included for future enhancement.
241.16	LED1	LED1 is the "FAULT" LED (LD1). The Operate state can be controlled with system or user logic to turn the LED on or off. In the event that the system is started with no valid configuration data file then this LED is controlled by the system to toggle every 2 seconds (1/4Hz).
241.17	LED2	LED2 is the "A" LED (LD2). The Operate state can be controlled with system or user logic to turn the LED on or off.
241.18	LED3	LED3 is the "B" LED (LD3). The Operate state can be controlled with system or user logic to turn the LED on or off. This LED is currently used as a diagnostic LED by system logic.

Point Number	Point Text	Description
		It is toggled every 3 passes of logic to indicate output logic is running.
241.19	LED4	LED4 is the "C" LED (LD4). This LED is currently used as a diagnostic LED by the system. It is toggled approximately every 500ms to indicate the system is operating normally. This LED is not available for use by the user.
241.20	CALLPT	Shows the state of the manual call point input (J3-3). Fault is >0.95V (O/C), Normal is 0.35-0.95V (2K7 EOLR), Alarm is <0.35V.
241.21	DOOR	Provides the status of the door input which uses a clean contact switch to monitor the door open/closed status. Normal (closed) is S/C to 0V, ActiveInput (open) is O/C.
241.22	FW WR EN	Provides the status of the "Firmware Write Enable" jumper. ActiveInput when jumper is fitted, Normal when not fitted.
241.23	DB WR EN	Provides the status of the "Database Write Enable" jumper. ActiveInput when jumper is fitted, Normal when not fitted.
241.24.0	Batt Voltage	Point is unused but included for future enhancement.
241.24.1	PSU I	Point is unused but included for future enhancement.
241.24.2	PSU V	Point is unused but included for future enhancement.
241.25.0	Mains	Provides the state of the mains power supply to the panel. This point is placed into Fault when the mains power has failed, and Normal otherwise.
241.25.1	Batt Low	Indicates battery voltage low level. Point will be in Fault when the battery voltage drops below the threshold set in the configuration, and Normal otherwise.
241.25.2	Batt Conn	Indicates battery connectivity. The state is Normal if the battery is found to be connected or Fault if the battery is disconnected or very discharged.
241.25.3	Earth	Indicates earth monitoring fault condition. Point will be in Fault when an earth fault is detected, Normal otherwise.
241.25.4	Battery Test	Indicates battery test state. Point will be in ActiveInput when battery test is active, Normal otherwise.
241.25.5	VBF1 Fuse	Provides the status of the fuse (F3) protecting the ANC1 power supply (J4-1). Normal indicates the fuse is intact, Fault indicates that the fuse has blown or is not fitted.
241.25.6	VBF2 Fuse	Provides the status of the fuse (F4) protecting the ANC2 power supply (J5-1). Normal indicates the fuse is intact, Fault indicates that the fuse has blown or is not fitted.
241.25.7	VBF3 Fuse	Provides the status of the fuse (F5) protecting the ANC3 power supply (J6-1). Normal indicates the fuse is intact, Fault indicates that the fuse has blown or is not fitted.
241.25.8	RZDU Fuse	Provides the status of the fuse (F2) protecting the RZDU power supply (J24-1). Normal indicates the fuse is intact, Fault indicates that the fuse has blown or is not fitted.
241.25.9	Battery Capacity	Indicates that the long-term battery test has failed. Point will be in Fault while test is running and has failed, Normal otherwise.
241.25.10	VNBF Fuse	Provides the status of the fuse (F6) protecting the non-battery backed power supply (J15-1). Normal indicates the fuse is intact, Fault indicates that the fuse has blown or is not fitted.
241.25.11	Charger High	Provides indication of whether the charger voltage is higher than it should be. The threshold is determined by the Charger High voltage setting in the configuration. Normal indicates the charger voltage is less than the specified voltage, Fault indicates that the charger voltage is too high.
241.25.12	Charger Low	Provides indication of whether the charger voltage is lower than

Point Number	Point Text	Description
		it should be. The threshold is determined by the Charger Low voltage setting in the configuration. Normal indicates the charger voltage is higher than the specified voltage, Fault indicates that the charger voltage is too low.
241.25.13	Battery Fail	Provides indication of whether the battery voltage is at or below the level at which the battery is considered totally discharged. The threshold is determined by the Battery Fail voltage setting in the configuration. Normal indicates the battery voltage is higher than the specified voltage, Fault indicates that the battery voltage is too low, thus the battery is totally discharged and system performance may be affected.
241.25.14	Power Supply Supervision	Provides indication of whether the system voltage is at or below the level at which system operation cannot be guaranteed. The threshold is determined by the System Power Fail voltage setting in the configuration. Normal indicates the system voltage is higher than the specified voltage, Fault indicates that the system voltage is too low, thus system operation cannot be guaranteed.
241.26.0	Loop 1 Left S/C	Indicates a short circuit on the left hand side of the in-built *MX* Detector Loop connector (J31). The point state is Fault if a short circuit is detected between the AL+ (J31-1) and AL- (J31-2) terminals, otherwise the point is Normal.
241.26.1	Loop 1 Right S/C	Indicates a short circuit on the right hand side of the in-built *MX* Detector Loop connector (J31). The point state is Fault if a short circuit is detected between the AR+ (J31-3) and AR- (J31-4) terminals, otherwise the point is Normal.
241.26.2	Loop 1 O/C	Indicates that an open circuit fault has been detected on the in-built *MX* Detector Loop connector (J31). The point state is Fault if an open circuit is detected on either the +ve loop or the -ve loop, otherwise the point is Normal.
241.26.3	Loop 1 Overload	This point indicates an over-current fault on the in-built *MX* Detector Loop (J31). The point state goes to Fault while an *MX* Loop overload induced reset takes place and also if there have been 5 of these resets within the preceding 5 minutes, otherwise the point is Normal.
241.26.4	Loop 1 Polling Rate	Indicates an in-built *MX* Polling loop rate fault condition. A fault state on this point occurs when the *MX1* is unable to communicate with the *MX* loop devices quickly enough, which may affect correct operation of detectors and modules. The fault condition will remain for 30 minutes from when the *MX1* becomes able to communicate quickly enough. The fault condition can also be cleared by resetting this point – if the fault condition remains the point will re-enter the fault condition within a short period of time.
241.26.5	Common Foreign Point	Has a fault status if a device that is not programmed into the *MX1* configuration data file is detected on the *MX* loops. The fault status automatically clears when the presence of the foreign device is no longer detected.
241.26.6	Common Dirty Alert	Has a fault status if there are any non-disabled points with a status of dirty.
241.26.10	IR Mode On	Active when infrared mode is enabled for *MX* loop 1. When active, will put the *MX1* into an off-normal condition.
241.27.0	S/W Faults	This point indicates whether there have been any software faults detected. The point state is Fault if there are any software faults, otherwise Normal. Note that it is possible for a software fault to clear. Refer to the history and/or printer log for "Software Fault" events that give more detail as to the cause of the fault.
241.27.1	DB1 CRC Fault	Provides the status of configuration data file1. The point state is Fault if a CRC check of configuration data file1 fails, otherwise the state is Normal.

Point Number	Point Text	Description
241.27.2	DB2 CRC Fault	Provides the status of configuration data file2. The point state is Fault if a CRC check of configuration data file2 fails, otherwise the state is Normal.
241.27.3	FW CRC	Provides the status of the controller firmware. The point state is Fault if a CRC check of the firmware fails, otherwise the state is Normal.
241.27.4	RAM Test	Provides the status of the Controller boards RAM. The point state is Fault if an error is detected with the RAM, otherwise the state is Normal.
241.27.5	Auto Test	Point is unused but included for future enhancement.
241.27.6	Self Test	Point is unused but included for future enhancement.
241.27.7	Cold Start	Point is unused but included for future enhancement.
241.27.8	Warm Start	Point is unused but included for future enhancement.
241.27.9	Foreign RZDU	This point indicates that there are one or more foreign RZDUs detected in the system. The point state is Fault if a reply is received from an RZDU with an address that corresponds to an RZDU that is not enabled in the configuration data file. The fault will automatically clear if replies from the foreign RZDU stop being received.
241.27.10	Commission Test	Provides status of the *MX1* Commission Test function, for recall on the LCD and to light the Tests indicator on the keypad. When Commission Mode is active, the status of this point will show ActInput and TestOp. Otherwise it will show Normal.
241.27.11	Startup Flags	This point signals Fault for 12 seconds following restart of the panel. This includes cold starts, user initiated reboots, and system controlled or uncontrolled watchdog restarts. The Startup Flags status can be used to ensure that a fault is sent to the brigade signalling equipment, or not.
241.27.12	Output Logic	This point signals fault if the *MX1* has what appears to be an uncorrupted configuration data file but which contains compiled Output Logic with fatal problems. If this fault is signalled, the ability of the *MX1* to act as a fire alarm is severely compromised. The *MX1* firmware will force the System Fault and Faults indicators on, and will force the fault relay into its de-energised state. This fault can only be corrected by restarting the panel using a configuration data file with output logic compiled without the problem, which could be either the alternative configuration data file stored in the *MX1* or a newly downloaded configuration data file.
241.27.13	Panel Attended	This point signals when the AIF is in attended mode.
241.27.14	Printer output	This point is disabled if the printer output is disabled.
241.28	ISO Sys Fault	Point is unused but included for future enhancement.
241.29.0	Sil Alms	This point indicates whether any Silence Alarms keyswitches are active. The status of this point is determined by output logic in the system logic page. When the equation for ESA (External Silence Alarms) is true, this point indicates both ActiveInput and Fault. The default equation for ESA includes the local Silence Alarms keyswitch on the *MX1* front panel and the Silence Alarms keyswitches on any connected RZDUs. NZS 4512 requires a defect be signalled when any Silence Alarms keyswitch is active, which is why this point is assigned a status of fault (as well as ActiveInput) when the equation for ESA is true. The operation of Alarm Devices outputs are inhibited when Silence Alarms is true, though this will not prevent Trial Evac from operating the Alarm Devices.
241.29.1	Trial Evac	This point indicates whether any Trial Evac keyswitches are

Point Number	Point Text	Description
		active. The status of this point is determined by output logic in the system logic page. When the equation for TEV is true, this point indicates a status of ActiveInput. The default equation for TEV includes the local Trial Evac keyswitch on the *MX1* front panel and the Trial Evac keyswitches on any connected RZDUs.
241.29.2	Services Restore	This point indicates whether any Services Restore keyswitches are active. The status of this point is determined by output logic in the system logic page. When the equation for BSR (Building Services Restore) is true, this point indicates a status of ActiveInput. The default equation for BSR includes the local Services Restore keyswitch on the *MX1* front panel and the Services Restore keyswitches on any connected RZDUs.
241.29.3	Auto Dis. Zones Pres	This point will be set to Fault when there are zones automatically disabled due to the zones being in alarm at the time of a silence alarms keyswitch restoration to normal, otherwise the state is Normal.
241.30.0	Common Routing	Provides the common status of the routing outputs. The status will show Alarm when the Alarm routing output should be activated, ActInput when the Fault or Disables routing outputs should be activated. It will become disabled when all of the Alarm, Fault and Disables routing points are disabled. It cannot be enabled until at least one of those points becomes enabled.
241.30.1	Alarm Routing	Provides the alarm routing status. The status will show ActInput when the alarm routing output should be activated, Fault if an Alarm Routing Fault is present, Disable if the Alarm Routing is disabled (in which case the Alarm Routing output is not activated when this point has an ActInput status.)
241.30.2	Fault Routing	Provides the fault routing status. The status will show Active Input when the fault routing output should be activated, Fault if a Fault Routing Fault is present, Disable if the Fault Routing is disabled (in which case the Fault Routing output is not activated when this point has an Active Input status.)
241.30.3	Disables Routing	Provides the disables routing status. The status will show ActInput when the disables routing output should be activated, Fault if a Disables Routing Fault is present, Disable if the Disables Routing is disabled (in which case the Disables Routing output is not activated when this point has an ActInput status.)
241.31.0	Ancillary Disables, Ancil Group 0	The disable status of this point may be used to control the operation of site-specific ancillary functions.
241.31.1	Ancillary Disables, Ancil Group 1	The disable status of this point may be used to control the operation of site-specific ancillary functions.
241.31.2	Ancillary Disables, Ancil Group 2	The disable status of this point may be used to control the operation of site-specific ancillary functions.
241.31.3	Ancillary Disables, Ancil Group 3	The disable status of this point may be used to control the operation of site-specific ancillary functions.
241.32.0	I-HUB Panel Connection	Provides status of the *MX1* connection to the I-HUB. Fault indicates that communication is not possible – usually because the wrong serial port is used, the connection is broken, the I-HUB is turned off, or a non I-HUB device is connected. Refer to NETWORK CONNECTION STATUS below for descriptions of the text displayed.
241.32.1	I-HUB - Local PIB	Provides status of local PIB(s) that are directly connected to the I-HUB.
241.32.2	I-HUB -	Provides status of remote PIB(s) reported by local PIB(s) that

Point Number	Point Text	Description
	Remote PIB	are directly connected to the I-HUB.
241.32.3	I-HUB - Ring Channel 1 Break	Indicates fault when a ring break is present on I-HUB port 1.
241.32.4	I-HUB - Ring Channel 2 Break	Indicates fault when a ring break is present on I-HUB port 2.
241.32.5	I-HUB - Hardware	Indicates fault if the I-HUB has a hardware fault present (EEPROM checksum fault in the I-HUB).
241.32.6	I-HUB - PSU	Indicates fault if the I-HUB has detected a PSU fault through its PTT input.
241.32.7	I-HUB - Neighbour I-HUB Has No SID	Indicates fault if the local I-HUB has a physically adjacent neighbour I-HUB that has no programmed SID number of its own and has been unable to borrow a SID number from a locally connected *MX1*. This can happen if the neighbour I-HUB's *MX1* has been turned off or there is no *MX1* directly connected to the neighbour I-HUB.
241.32.8	I-HUB - Multi-Drop Port Access	Has an active status if the local I-HUB has detected multiple consecutive message collisions on a multi-drop port and is hence unable to transmit. This can be caused by an overloaded multi-drop network or by a wiring fault preventing the I-HUB from receiving its own transmissions.
241.32.9	I-HUB - Message Discard	Indicates fault if the I-HUB has discarded a message after not receiving confirmation of reception from the remote device despite multiple retries. This can be caused by a fault or failure of the device connected at the remote end, wiring faults, overloading, or noise. The port number that the fault has occurred on is indicated in a *MX1* system event.
241.32.10	I-HUB - Queue Overflow	Indicates fault if the I-HUB has had a queue overflow and message(s) have consequently been lost. This could be due to a wiring fault, device failure, noise, or other network performance problems. The port number that the fault has occurred on is indicated in a *MX1* system event.
241.32.11	I-HUB - Queue Warning	Has an active status if the I-HUB has had a queue exceed the configured queue warning level. This could be due to a wiring fault, or other network performance problems. The port number that the warning has occurred on is indicated in a system event.
241.32.12	I-HUB - Generic Fault	Indicates fault if the I-HUB has a generic fault. This is for use with future versions of the I-HUB firmware – connect to the I-HUB’s diagnostic port for more information.
241.32.13	I-HUB - Generic Warning	Has an active status if the I-HUB has a generic warning. This is for use with future versions of the I-HUB firmware – connect to the I-HUB’s diagnostic port for more information.
241.33.0	PIB Panel Connection	Provides status of the *MX1* connection to the PIB. Fault indicates that communication is not possible – usually because the wrong serial port is used, the connection is broken, the PIB is turned off, or a non PIB device is connected. This will also indicate fault when a PIB with V1.02 or below firmware is connected. Refer to NETWORK CONNECTION STATUS below for descriptions of the text displayed.
241.33.1	PIB - Reserved	Unused.
241.33.2	PIB - Remote PIB	Provides status of remote PIB(s) reported by the local PIB that is connected directly to the *MX1*.
241.33.3	PIB Ring Break (FAS1)	Provides the external fault status (usually wired to indicate a ring break on the IP network) of the local PIB that is connected directly to the *MX1*.

Point Number	Point Text	Description
241.33.4	PIB - Remote PIB External Fault (FAS1)	Provides the external fault status (usually wired to indicate a ring break on the IP network) of remote PIB(s) reported by the local PIB that is connected directly to the *MX1*.
241.33.5	PIB - PIB Internal / IP Connection	Indicates fault if the PIB has an internal fault (e.g. checksum failure), or the Ethernet / IP connection has failed.
241.33.6	PIB - PIB PSU	Indicates fault if the PIB has detected a PSU fault (voltage below minimum).
241.33.7	PIB - Reserved	Unused.
241.33.8	PIB - Reserved	Unused.
241.33.9	PIB - PIB PLink Message Discard	Indicates fault if the PIB has had to discard message(s) on the Panel-Link interface. This could be due to a wiring fault.
241.33.10	PIB - PIB Queue Overflow	Indicates fault if the PIB has had a queue overflow. This could be due to a wiring fault, or other network performance problems.
241.34.0	NIC Panel Connection	Provides status of the *MX1* connection to other network interface devices. Fault indicates that communication is not possible – usually because the wrong serial port is used, the connection is broken, the wrong baud rate is selected, or the network interface, device is turned off. Refer to NETWORK CONNECTION STATUS below for descriptions of the text displayed.

NETWORK CONNECTION STATUS	
DISPLAYED TEXT	**DESCRIPTION**
Normal	The connection to the I-HUB, PIB or Other network interface device is working correctly.
Disabled	The connection to the network interface has been disabled.
Fault Type Mismatch	The network interface detected does not match the interface configured in the *MX1* panel's database.
Fault	The connection to the network interface has failed.
Fault Duplicate SID	Another device on the network has the same SID number as the *MX1*.

17.1.2 Equipment 242 – Pseudo Points

The status of these points is generated by specific programming in the configuration

17.1.3 Equipment 243 – LCD/Keyboard

Point	**Point Description**	**Description**
243.1.0	Scan Fail	This point is placed into fault if the *MX1* does not receive valid replies from the LCD/keyboard.
243.1.1	Enable	This point determines whether the LCD/keyboard will be set up to ignore or accept keypresses from the keypad. If the operate state is true, the keypad will be enabled and accept keypresses.
243.1.2	LED Board	This point is placed into fault when the LCD/keyboard detects an LED board fault. Not used in New Zealand.
243.1.3	Keyboard	This point is placed into fault when the LCD/keyboard detects a fault on the numeric keypad.
243.1.4	Ext Fault	This point is placed into fault when the LCD/keyboard external fault input has been activated.
243.1.5	Micro Test	This point is placed into fault when the LCD/keyboard micro test fails.
243.1.6	CRC Fail	This point is placed into fault when the LCD/keyboard program CRC check fails.
243.1.7	RAM Test	This point is placed into fault when the LCD/keyboard RAM test fails.
243.1.8	Channel A	This point is placed into fault when communication channel A is detected to be in fault. Currently not implemented.
243.1.9	Channel B	This point is placed into fault when communication channel B is detected to be in fault. Currently not implemented.
243.1.10	Access Level 2	This point determines whether the menu will be in Access Level 2. If the operate state is true, menu level 2 access is enabled.
243.1.11	Alarm Buzzer	This point shows the state of the alarm buzzer on the LCD/keyboard, which is controlled directly by internal logic. It is also sent to any RDUs allowing the buzzer to be mimicked. ActInput indicates that the alarm buzzer is active.
243.1.12	Fault Buzzer	This point shows the state of the fault buzzer on the LCD/keyboard, which is controlled directly by internal logic. ActInput indicates that the fault buzzer is active. It is also sent to any RDUs allowing the buzzer to be mimicked.
243.1.13	LCD Fault	This point is placed into fault when the LCD/keyboard LCD fails.
243.1.14	Buzzer Disable	This point indicates as Disabled when the buzzer has been disabled, and TestOp when the buzzer is muted.
243.2.0 through to 243.19.0	Switch Input n	This point is placed into ActInput if switch input n on the keypad is active.
243.20.0 through to 243.35.0	Open Collector Output n	This point drives the open collector output n. Its operate state can be driven by the mapped zone's operate state or by logic.
243.36.0	FRC Monitor	This point is placed into fault when the FRC to the 26 way Switch Input connector is removed.
243.36.1	Switch Input set 0 Monitor	This point is placed into fault when the end-of-line resistor is missing from switch input set 0, which contains inputs 16-18.
243.36.2	Switch Input set 1 Monitor	This point is placed into fault when the end-of-line resistor is missing from switch input set 1, which contains inputs 1-3.
243.36.3	Switch Input set 2 Monitor	This point is placed into fault when the end-of-line resistor is missing from switch input set 2, which contains inputs 4-6.
243.36.4	Switch Input set 3 Monitor	This point is placed into fault when the end-of-line resistor is missing from switch input set 3, which contains inputs 7-9.
243.36.5	Switch Input set 4	This point is placed into fault when the end-of-line resistor is

	Monitor	missing from switch input set 4, which contains inputs 10-12.
243.36.6	Switch Input set 5 Monitor	This point is placed into fault when the end-of-line resistor is missing from switch input set 5, which contains inputs 13-15.
243.37.0	Fire Protection Active	When this point is placed into the Operate state by a logic equation the corresponding indicator on the keypad turns ON.
243.37.1	Smoke Control Active	When this point is placed into the Operate state by a logic equation the corresponding indicator on the keypad turns ON.
243.37.2	Spare Indicator	When this point is placed into the Operate state by a logic equation the corresponding indicator on the keypad turns ON.
243.37.3	Spare Indicator A	NOT SUPPORTED
243.37.4	Spare Indicator B	NOT SUPPORTED

17.1.4 Equipment 244 – RZDU Points

Point	Point Desc.	Description
244.x.0	Scan status	This point is in fault if the *MX1* does not receive replies from the RZDU.
244.x.1	Callpoint	This point is in alarm and/or fault if the MCP at the RZDU is in alarm and/or fault. Not used in New Zealand.
244.x.2	Batt Low	This point is in fault if the battery voltage is low at the RZDU.
244.x.3	Common Defect	This point is in fault if there is a fault at the RZDU. It will be necessary to review the fault at the RZDU itself.
244.x.4	Batt Fail	This point is in fault if the battery has failed at the RZDU.
244.x.5	Charger	This point is in fault if the charger is out of specification at the RZDU.
244.x.6	Mains	This point is in fault if the RZDU has no mains supply.
244.x.7	Silence Alarms	This point indicates if the Silence Alarms switch at the RZDU is active.
244.x.8	Trial Evac	This point indicates if the Evacuation switch at an RZDU is active.
244.x.9	Serv Restore	Not currently supported by *MX1* on an RZDU.
244.x.10	Self Test	This point is in fault if the RZDU has failed its self-test.

17.1.5 Equipment 245 – Equipment Points (Loop Cards, DSS)

Equipment 245 provides points to signal status associated with optional *MX1* equipment, separate to the indicating the status of any devices connected to that equipment.

For example, Equipment 245 signals the status of a loop card itself, separately from the signaling of status for the detectors and modules connected to that loop card.

Loop Cards

Point	Point Desc.	Description
245.x.0	Loop x Left S/C	Indicates a short circuit on the left hand side of the xth *MX* Detector Loop. The point state is Fault if a short circuit is detected between the AL+ (J1-1) and AL- (J1-2) terminals, otherwise the point is Normal.
245.x.1	Loop x Right S/C	Indicates a short circuit on the right hand side of the xth *MX* Detector Loop . The point state is Fault if a short circuit is detected between the AR+ (J1-3) and AR- (J1-4) terminals, otherwise the point is Normal.
245.x.2	Loop x Open Circuit	Indicates that an open circuit fault has been detected on the xth *MX* Detector Loop. The point state is Fault if an open circuit is detected on either the +ve wire or the -ve wire, otherwise the point is Normal.
245.x.3	Loop x Overload	This point indicates an over-current fault on the xth *MX* Detector Loop. The point state goes to Fault while an *MX* Loop overload induced reset takes place and also if there have been 5 of these resets within the preceding 5 minutes, otherwise the point is Normal.
245.x.4	Loop x Polling Rate	Indicates an *MX* Polling loop rate fault condition. A fault state on this point occurs when the *MX1* is unable to communicate with the *MX* loop devices quickly enough, which may affect correct operation of detectors and modules. The fault condition will remain for 30 minutes from when the *MX1* becomes able to communicate quickly enough. The fault condition can also be cleared by resetting this point – if the fault condition remains the point will re-enter the fault condition within a short period of time.
245.x.5	Loop x Left Relay Status	Display AL Relay status (open/close).
245.x.6	Loop x Right Relay Status	Display AR Relay status (open/close).
245.x.7	Loop x Communication Status	Indicates whether the loop card is operating or not. “Normal” = operating “Fault” = not operating or disconnected, or connected to the wrong port.
245.x.8	Loop x Flash CRC Status	The result of comparing the Expected and Actual CRC of the Loop Card Flash Memory - “Normal” or “Fault”
245.x.9	Loop x RAM Test Status	The result of the most recent RAM test on the Loop Card - “Normal” = passed “Fault” = failed
245.x.10	IR Mode On	Active when infrared mode is enabled for *MX* Loop x. Places the *MX1* into off-normal state.

These points are repeated for each configured *MX* Loop Card where x is the Loop Card number (2 onwards).

<u>Distributed Switch System (Fire Fan Controls)</u>

Point	**Point Desc.**	**Description**
245.248.0	Common Scan Fail	Indicates “Fault” whenever a programmed Fire Fan Control is not responding. This could be the Master AS 1668 Card not responding to *MX1* Controller polls, or Slave cards not responding to AS1668 Master card polls.
245.248.1	Common CRC Fault	Indicates “Fault” whenever a programmed Fire Fan Control has detected that its internal memory integrity check has failed.
245.248.2	Foreign Control	Indicates “Fault” whenever the Master AS 1668 Card has detected the presence of an unprogrammed Slave card.

17.1.6 Equipment 246 – Remote FPB

Point	**Point Description**	**Description**
246.1.0	Scan Fail	This point is placed into fault if the *MX1* does not receive valid replies from the Remote FBP.
246.1.1	Enable	This point determines if the keypad on the Remote FBP is enabled. If the operate state is true, the keypad will be enabled and accept keypresses.
246.1.2	LED Board	This point is placed into fault when the Remote FBP detects an LED board fault.
246.1.3	Keyboard	This point is placed into fault when the Remote FBP detects a fault on the keypad.
246.1.4	Ext Fault	This point is placed into fault when the Remote FBP external fault input has been activated.
246.1.5	Micro Test	This point is placed into fault when the Remote FBP micro test fails.
246.1.6	CRC Fail	This point is placed into fault when the Remote FBP program CRC check fails.
246.1.7	RAM Test	This point is placed into fault when the Remote FBP RAM test fails.
246.1.8	Channel A	This point is placed into fault when communication channel A is detected to be in fault. Currently not implemented.
246.1.9	Channel B	This point is placed into fault when communication channel B is detected to be in fault. Currently not implemented.
246.1.10	Access Level 2	This point determines whether the menu for the Remote FBP will be in Access Level 2. If the operate state is true, menu level 2 access is enabled.
246.1.11	Alarm Buzzer	This point shows the state of the alarm buzzer on the Remote FBP, which is controlled directly by internal logic. ActInput indicates that the alarm buzzer is active.
246.1.12	Fault Buzzer	This point shows the state of the fault buzzer on the Remote FBP, which is controlled directly by internal logic. ActInput indicates that the fault buzzer is active.
246.1.13	LCD Fault	This point is placed into fault when the Remote FBP LCD fails.
246.1.14	Buzzer Disable	This point indicates as Disabled when the buzzer has been disabled, and TestOp when the buzzer is muted.
246.2.0 through to 246.19.0	Switch Input n	This point is placed into ActInput if switch input n on the keypad is active.
246.20.0 through to 246.35.0	Open Collector Output n	This point drives the open collector output n on the Remote FBP. Its operate state can be driven by the mapped zone's operate

		state or by logic.
246.36.0	FRC Monitor	This point is placed into fault when the FRC to the 26 way Switch Input connector is removed.
246.36.1	Switch Input set 0 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 0, which contains inputs 16-18, for NZ RFBPs this includes brigade keyswitches.
246.36.2	Switch Input set 1 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 1, which contains inputs 1-3.
246.36.3	Switch Input set 2 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 2, which contains inputs 4-6.
246.36.4	Switch Input set 3 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 3, which contains inputs 7-9.
246.36.5	Switch Input set 4 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 4, which contains inputs 10-12.
246.36.6	Switch Input set 5 Monitor	This point is placed into fault when at the Remote FBP the end-of-line resistor is missing from switch input set 5, which contains inputs 13-15.
246.37.0	Fire Protection Active	When this point is placed into the Operate state by a logic equation the corresponding indicator on the Remote FBP turns ON.
246.37.1	Smoke Control Active	When this point is placed into the Operate state by a logic equation the corresponding indicator on the Remote FBP turns ON.
246.37.2	Spare Indicator	When this point is placed into the Operate state by a logic equation the corresponding indicator on the Remote FBP turns ON.
246.37.3	Spare Indicator A	NOT SUPPORTED
246.37.4	Spare Indicator B	NOT SUPPORTED

17.1.7 Equipment 247 – SID Points

Point	Point Description	Description
247.x.0	SID Comms Status	Provides the communication status of the remote SID.
247.x.1	SID MAF Status	Displays the MAF status of the remote SID.
247.x.2	NIC Fault Status	For SIDs that support this, displays the fault status of the remote network interface.
247.x.3	NIC Warning Status	For SIDs that support this, displays the warning status of the remote network interface.

Value x is the SID number.

17.1.8 Equipment 248 – Distributed Switch System (Fire Fans Controls)

The Distributed Switch System (DSS) provides the core functionality of the *MX1* Fire Fan Control System. However, the DSS can also be used for many applications requiring general purpose switch and indication functions, which can be duplicated across the *MX1* network.

The DSS has no points – all programming interaction takes place within the Output Logic (using Logic Blocks where available).

However, as Equipment 248 the DSS does provide its common status as points incorporated into the Equipment 245 “Equipment Points”. See Section 17.1.5.

17.2 Appendix B - Associated Documentation

17.2.1 Other Documents

These documents are referred to in this manual and contain more detailed information about the use of these specific products.

17A-03-VLC – Installation Commissioning and Servicing of the VLC-800 sensor (Johnson Controls UK publication).

17A-13-D – System 800 Intrinsically Safe *MX* Addressable Fire Detection System (Johnson Controls UK publication).

17A-02-ISLOOP – *MX* Intrinsically Safe System – Loading Calculations (Johnson Controls UK publication).

120-415-400 – S200+ Series Triple IR Flame Detectors User Manual

120.515.123 – FLAMEVision FV400 Series – Triple IR Flame Detectors Product Application and Design Information Manual

120.515.124_FV-D-400-F – FV400 Series Triple IR Flame Detectors Fixing Instructions

120.515.203 – FLAMEVision FV421i IS Triple IR Flame Detector Product Application and Design Information Manual

120.515.204 – FV421i IS Triple IR Flame Detector Fixing Instructions

LT0088 – QE90 Installation Manual

LT0206 – TPI User Manual

LT0726 – QE20 System Design Manual

Additionally each *MX* module and most add-on modules for the *MX1* have their own installation or user guide.

User Manuals are also available for the third party networking products: Moxa fibre switch, Westermo Ethernet Extender and OSD fibre modems.

17.3 Appendix C – Glossary of Terminology

The following terminology is used throughout this manual:

Alarm Device	Audible or visual device for warning building occupants of a fire alarm.
Alerting (tone)	Tone pattern produced by an alarm device intended to warn building occupants of a fire .
Analogue Loop	The wiring that allows an *MX1* to communicate with and supply power to the addressable devices and detectors.
Ancillary Equipment	Equipment external to the System that is controlled by the Fire Alarm System
Ancillary Relay	Relay to switch ancillary equipment.
Baud	Bits per second.
Control Output	Output from Fire Alarm System to other equipment.
Default	Pre-programmed option or logic equation, i.e., one that exists without the user configuring or programming it.
Detector	Addressable device used to detect fires that interfaces to the *MX1* via the Analogue Loop. It contains one or more sensors.
Evacuation (tone)	Tone pattern produced by an alarm device intended to instruct building occupants to evacuate the building.
Mapping	Programmable causal relationship between inputs and outputs.
Module	Addressable I/O device that interfaces to the *MX1* via the *MX* Loop.
Point	A representation of a part or component of the fire alarm system, e.g., an addressable device (detector or module) with a unique address that is connected to the *MX* loop, a relay output, or an internal part of the control equipment such as a fuse.
Sensor	Part of a detector which senses the environment, e.g., smoke or temperature or CO level.
SID	A unique number in the range 1-254 (address) allocated to each panel or device on the network.
Zone	Fire searchable area of building represented by a unique number and name in the Fire Alarm System.

17.4 Appendix D - Glossary of Abbreviations

AC	Alternating Current.
ACZ	Ancillary Control Zone.
AL	Alarm Load (of the fire alarm system)
AVF	Alarm Verification Facility, or alarm check.
CO	Carbon Monoxide
CV	Current Value (Filtered reading from detector)
DC	Direct Current.
DSS	Distributed Switch System – used for fan controls and other switch control/indication functions.
EOLR	End of Line Resistor.
EWIS	Emergency Warning and Inter-communication System
FIP	Fire Indicator Panel
LCD	Liquid Crystal Display (usually alphanumeric)
LED	Light Emitting Diode (Visual Indicator).
MCP	Manual Call Point (break glass switch).
NA	Not Applicable.
NAL	Non-alarm load (of the fire alarm system)
NBL	Non-battery load (system load powered only by the power supply, not the battery)
NC	Normally Closed, Relay Contact.
NO	Normally Open, Relay Contact.
O/C	Open Circuit.
PCB	Printed Circuit Board.
PSTN	Public Switched Telephone Network.
PSU	Power Supply Unit.
ROR	Rate of Rise.
RF	Radio Frequency.
RZDU	Remote Zone Display Unit.
SLV	Step limited (or slope limited) value.

17.5 Appendix E - Associated Product Documentation

The following manuals are available for *MX1*:

LT0229 I-HUB User Manual	Design, Installation, Configuration and using the I-HUB.
LT0332 SmartConfig PLUS User Manual LT0468 SmartConfig User Manual	Provides details on creating and downloading an *MX1* datafile using the SmartConfig program.
LT0344 *MX1* Operator Manual	Describes the use of the front panel display and keyboard.
LT0360 *MX1* Installation Guide	Mounting and wiring details for *MX1* and initial commissioning of the system.
LT0366 *MX1* Service Manual	Detailed maintenance and service information for *MX1*.
LT0443 MX Loop Card Installation Instructions	Installation instructions for the MX Loop Card.
LT0462 *MX1*-NZ Gas Panel Users Guide	Details design, wiring and configuration of NZ gas systems using *MX1*.
LT0519 PIB User Manual	Design, Installation, Configuration and using the PIB.
LT0545 *MX1* Remote FBP Users Guide	Describes installing, wiring and configuring the NZ Remote Fire Brigade Panel.
LT0547 FP1012 Installation Instructions	Installing the FP1012 bracket.
LT0551 FP1013 Installation Instructions	Installing the FP1013 bracket.
LT0563 FP1032 Installation Instructions	Installing the FP1032 bracket and wiring OSD fibre optic modem.
LT0564 *MX1* Network Design Manual	Details for designing and configuring *MX1* networks.
LT0587 *MX1* Fan Control Installation Instructions	Details for installing the *MX1* AS1668 Fan Control Doors and Modules

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