VIGILANT

MX1-Au FIRE ALARM SYSTEM
Service Manual

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The *MX1* Fire Indicator Panel provides a configuration programming facility which may be accessed through 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 an installation from meeting statutory requirements.

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

Electromagnetic Compatibility

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Firmware Compatibility

Except where otherwise stated, this manual refers to controller firmware version 1.80. Information provided in this manual may remain valid for different versions of controller firmware. However, if a different version of firmware is installed, a more appropriate version of this manual may be required.

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"How Do I":	**Section**	**Title/Description**
Check that all loop devices are communicating correctly?	LT0439	Any points showing as Device Fail in the LCD Faults Recall.
	LT0439	Use Devices command in *MX* Loop Status screen to scan for devices present on each loop.
	6.8.9	DP Command (Diagnostic Poll)
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	6.8.3	"Selecting Points for Monitoring and Display" - Px or SPx command
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Change the address of a device on the analogue loop?	6.8.10	CA Command (Change Address)
Find foreign (unprogrammed) devices on the analogue loop?	LT0439	Use Devices command in each *MX* Loop Status Screen to scan for FRGN devices on that Loop.
		Review the History for foreign point events.
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	6.8.9	DP Command (Diagnostic Poll)

Quick Reference Index (Continued)		
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	7.13	Confirming the local connection

LT0439 = Refer to the *MX1*-Au Operator Manual (LT0439).

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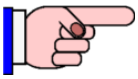
Warning Symbols Used in this Manual

Danger! Failure to comply may lead to serious injury and/or property damage.

Caution – failure to comply may result in incorrect, unpredictable or unstable operation.



Indicates useful or important information.

Amendment Log

1.0	30 April 2009	Original Issue.
1.1	27 October 2011	Updated throughout for firmware V1.40 operation; PA1081 Controller, *MX* Loop Card Rev 3 onwards.
1.2	19 November 2013	Updated for AS 1851-2012, firmware V1.50, networking, 850 series *MX* devices, CO expiry checks, and *MX* device substitution.
1.3	26 February 2015	Updated for firmware V1.60, AS1668, Quad I/O, DDM800, and AS4428.3-2010.
1.31	8 August 2017	Re-branded manual to Johnson Controls Updated for firmware V1.70, SIO800.
1.32	7 December 2017	Updated for T-Gen2.
1.33	12 May 2020	Updated for *MX1* firmware V1.80.
1.34	10 April 2025	Addition of 14 A PSE to MX1 Panel; Re-Approval to AS ISO 7240.2:2018, AS ISO 7240.4:2018, As 4428.3:2020 Update for MX1 Firmware V2.00 Update for SmartConfig. Plus V3.0.0

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1 Overview

1.1 In this Section

About *MX1* – About this Manual - Introduction and Scope – ISO Terms Compared – SmartConfig – Terminology – Cautions – Laptops, Computers and Serial Ports

1.2 About *MX1*

The *MX1* is Control and Indicating Equipment (c.i.e.) that forms the heart of a fire alarm system using *MX* addressable analogue detectors.

It complies with the requirements of AS ISO 7240.2:2018 "Fire Detection and Alarm Systems – Control and Indicating Equipment", AS ISO 7240.4:2018 "Fire Detection and Alarm Systems – Power Supply Equipment" and AS 4428.3:2020 " Fire Detection, Warning, Control and Intercom Systems – Control and Indicating Equipment – Fire Brigade Panels", and so can be used in systems that are to comply with AS 1670.1:2018, Section 7.

Up to 250 *MX* devices (detectors and addressable input/output modules) may be connected to the inbuilt and optional additional detection loops. The *MX* DIGITAL communication protocol used on the detection loop provides high reliability and fault resistance. The *MX1* evaluates the analogue values returned from the detectors using software algorithms.

There is also an option of adding AS1668 fan controls as part of the *MX1* Distributed Switch System (DSS) for applications such as Fire Fan Control or customised output logic controls. Each AS1668 control has three buttons with LED indications and four LED indicators for output status. The maximum number of AS1668 controls is limited to 126 (equivalent to 63 AS1668 Control PCBs).

1.3 About this Manual - Introduction and Scope

This manual describes procedures for maintenance and repair of the VIGILANT *MX1* as used in Australia.

Maintenance and repair of a fire alarm system based on the *MX1* Fire Alarm Controller is a specialised activity which must be attempted by only competent and qualified personnel.

This manual does **not** cover *MX1* general operating procedures or system design. For general operating procedures refer to the "*MX1*–Au Operator Manual" (LT0439). For system design refer to the "*MX1*–Au System Design Manual" (LT0441). Wiring diagrams for *MX* devices and add-on options for *MX1* are contained in LT0442.

Schematic diagrams are **not** included in this manual.

Additional information is available to Johnson Controls employees on the ***Fireplace*** website (http://www.vigilant-fire.com.au). Other users must consult their Johnson Controls sales representative.

1.4 ISO Terms Compared

In general, this manual uses terminology taken from AS 7240.1 and AS 7240.2. This table matches these with other common industry terminology.

ISO Term	Equivalent industry term
Alarm	Alarm
Fault	Fault
Disable/Enable	Isolate/De-isolate
c.i.e	Fire Indicator Panel (FIP)

Note that when referring to the control of points and zones, “isolate” is the term traditionally used in Australia, while the ISO-standard term “disable” is becoming more widely used.

1.5 SmartConfig

Unless otherwise stated, this manual assumes version V2.00 firmware or later in the *MX1* panel and SmartConfig V3.0.0 or later is used.

1.6 Terminology

For specific terminology refer to the *MX1*-Au Operator Manual, LT0439.

1.7 Cautions

This equipment contains **STATIC SENSITIVE DEVICES.**

Use Antistatic Procedures when handling.

Some of the operation of the *MX1* as described in this manual is dependent on site-specific configuration performed by the field engineer. If the configuration is non-standard, then operation may differ from this manual and compliance to local installation Standards may be invalidated.

The *MX1* has facilities to protect against unauthorised use of operator controls by means of Access Levels. The configuration of your system may result in Access Levels that differ in some respects from this manual.

Certain test and maintenance procedures described in this manual may lead to a brigade callout. It is necessary for the tester or service person to take adequate measures to prevent this.

100 V a.c. audio line wiring is defined as LV Telecommunications circuits and is subject to the Australian Standard AS/ACIF S009:2006.

Ensure that this wiring is appropriately separated and insulated from LV power wiring, ELV and other customer cabling such as detection and control

circuits.

1.8 Laptops, Computers and Serial Ports

Programming of *MX1* site-specific configurations and firmware uses SmartConfig and other PC programs and a serial port connection to *MX1*, and Loop Cards. A real serial port, not a USB adaptor, works best, but many modern computers and laptops no longer have physical serial ports – so a USB adaptor must be used. Not all USB serial adaptors are the same, so it is necessary to try the adaptor with *MX1* and the PC programs. Some adjustment of the settings for the USB adaptor may be necessary – for example, Device Manager, Select USB Adaptor, Properties and reduce or turn off the use of FIFO buffers.

2 System Structure

2.1 In this Section

System Structure - Overview – *MX* Loop Card – AS1668 Control PCB (DSS Modules) – Internal Controls – System Operation – SID – Points – Zones – System Processing – Alarm Confirmation

2.2 System Structure - Overview

This section describes the makeup and operation of the *MX1* system, and explains some of the underlying concepts that must be understood to make the best use of *MX1*'s flexible configuration abilities.

The internal controls of the *MX1* are described, followed by the relationship between the system software (firmware) and the configuration data in the *MX1*.

This is followed by descriptions of the concept of points and zones and how these are used in configuration of an *MX1* system.

Figure 2-1 shows the structure of the standard *MX1*, and the functional interconnections between the hardware modules in the cabinet.

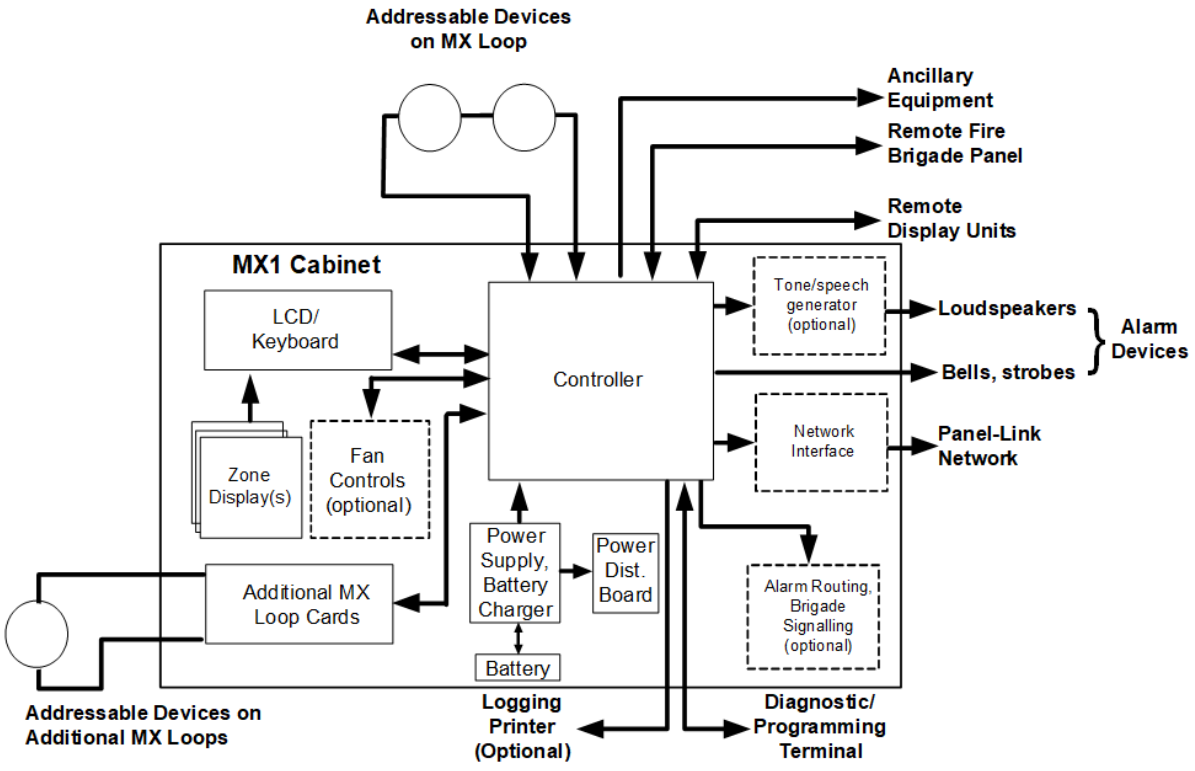

Figure 2-1 – Block Diagram of MX1

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

- contains nearly all 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 optional 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 optional *MX* Loop Cards
- communicates with optional AS1668/DSS controls

- 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
- generates 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 controls information about which indicators and sounders on the LCD/Keyboard are active. The controller also sends a stream of information about which zone indicators are 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.

The Remote FBP operates independently of the front panel LCD/Keyboard, but uses the same core information such as zone states, buzzer on/off, and mute.

The *MX* Loop provides the electrical connection to the *MX* analogue addressable detectors and input/output modules, using a digital signalling protocol.

2.3 *MX* Loop Card

Additional *MX* Loop Cards can be fitted up to the system limit. These connect to the controller for power and communications.

These additional *MX* Loops have the same capabilities and functionality as the on-board *MX* loop. Each loop permits the connection of up to 250 *MX* devices to the *MX1*.

The *MX* Loop Card is described in Section 7.7.

2.4 AS1668 Control PCB (DSS Modules)

AS1668 Fan Control Modules can be installed to provide for AS1668 fan controls or other DSS applications. Replacement instructions are contained in Section 7.13.

The DIP switch on the AS1668 fan control module must be set during installation. Full installation instructions are contained in LT0587, "*MX1* Fan Control Installation Guide".

2.5 Internal Controls

Inside the *MX1* cabinet are these controls:

- Mains ON/OFF – switches the mains supply to the power supply/battery charger.
- RESET on the controller – forces the system software (firmware) to restart execution.
- DATAFILE WRITE ENABLE – this link on the controller allows the site-specific datafiles to be rewritten. Note that a new datafile can be loaded into the *MX1* without having to stop alarm processing, but the system must be restarted to use the new datafile.
- FIRMWARE WRITE ENABLE – this link on the controller allows the system software

(firmware) to be updated. This must be fitted only when software 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 fully discharged battery. Under normal circumstances, it must not be fitted. However, to start recharging a very flat battery it is necessary to fit the link for a few seconds to override the battery low voltage disconnect circuit.
- LOOP SIGNAL ADJUST (VR1) – this control is set at the factory and must not be adjusted.
- LCD Contrast – this adjustment potentiometer on the LCD/Keyboard allows the contrast of the LCD to be adjusted. This is factory set, but Section 7.5.5 describes how this can be adjusted for best readability over a wide temperature range.

For control locations, refer to Figure 7-2 (Controller board layout) and Figure 7-4 (LCD/Keyboard layout).

Other optional 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.

2.6 System Operation

Modern software-controlled fire alarm systems use digital processors 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 or rules used by the digital processor to define and control the intended range of possible system behaviours. System software is common to the make and model of the fire alarm system. It is loaded into the system during manufacture, but can be upgraded in the field using the firmware download process.

- Site-specific configuration data (datafile or database) – this information is used by the system software (firmware) to determine which of the allowed rules must be used and where they must 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 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 contravene the requirements of 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 complex, the points that are used to represent them in the system software (firmware) are relatively simple and consistent in behaviour.

MX1 panels can be networked together in a variety of ways normally using copper data cable or fibre optic cable. Depending on the system design requirements the network interface is either VIGILANT Intelligent Hubs (I-HUBs) or Panel-Link IP Bridges (PIBs). I-HUBs are usually interconnected in a ring using RS485 data copper cable, but can also be interconnected with fibre optic cable with the addition of OSD139 Fibre Optic modems (not ActivFire listed to AS7240.2). PIBs are typically used with Fibre Optic switches, Ethernet Extenders, or shielded Ethernet (STP) cables.

2.7 SID

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

2.8 Points

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

- A part of an *MX* detector, such as the 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.

2.8.1 Points

Many devices, and in particular *MX* Loop devices, consist of combinations of inputs and outputs. Each of these inputs and outputs can be referred to as a point. Points can have their own individual state. Examples are points representing more complex parts of system components such as addressable detectors with multiple sensors and outputs

2.8.2 Point Numbering

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

- ***Eq*** is the equipment number, which indicates which equipment part of the system is involved.
- ***Dev*** is the number of the physical device connected to, or within, the particular equipment. It relates to a specific part of the system such as a detector or power supply.
- ***Sub*** is the 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*, equipment numbers are:

- 1 – the *MX* Loop connected to the controller.

- 2 onwards – the optional additional *MX* Loops, if installed.
- 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 – RZDU status. All RZDUs and RDUs are on one equipment number (244).
- 245 – for the optional additional *MX* Loop Cards, if installed.
- 246 – for the Remote Fire Brigade Panel, if fitted.
- 247 - Network Status points.
- 248 - AS1668/DSS Controls. Points for each control are not provided (but status points are allocated under equipment number 245 as 245.248.x).

Refer to the *MX1*-Au Operator Manual (LT0439) and to the SmartConfig User Manual for a detailed list and description of “internal” points for equipment numbers 241 to 247.

A “device” refers to the collection of all points, from point 0 to the largest required point number. A “device” number E.D can be used in some LCD/keypad entry screens to effect a command (such as enable, disable or reset) on all points of a detector without the operator needing to know how many points there are.

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 enter the fault state, but only sub-point 0 logs these events.

Disabling sub-point 0 prevents the logging and the signalling of fault by sub-point 0, but does not prevent the fault being signalled on the other sub-points. When disabling an *MX* device that is in Device Fail or Type Mismatch it is necessary to disable the device, or all sub-points of the device, to remove the fault indication.

2.8.3 Addressable Detectors and Modules

Addressable devices, such as detectors, are the most complex type of device, having points of several different types. For example, an *MX* 814CH detector has:

- An analogue input point for the CO sensor.
- An analogue input point for the heat sensor.
- An output point for the in-built LED.
- An output point for the remote indicator.
- An output point for a functional base.

2.8.4 Point Values

All points have a state, but some points can also have analogue values, the interpretation of which drives the point status. The raw analogue value is usually a whole number between 0 and 255. The meaning of the raw analogue value and the conversion factor to normal units, such as %obscuration/metre, or °C, depends very much on the particular type of point. For a smoke detector point, 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.

2.8.5 Point States

For each point in the system, there is a status. This point status is a combination of states, which are derived from the condition of the component represented by the point. The point status can be a combination of one or more of:

- **Normal** – the component is operational and no other condition is present.
- **Pre-Alarm** – the component is a detector that is in a condition suggesting an impending alarm.

- **Alarm** – the component is a detector and has detected an alarm. Generally, this calls the fire brigade.
- **Active Input** – the component is an input device that is being driven out of its normal condition, but is not in alarm or fault.
- **Operate** – the component is an output device, such as a relay, or transistor, and has activated.
- **Dirty** – Component is in a state that requires maintenance/attention. For the CO subpoint of an *MX* detector this means the CO cell has exceeded its rated lifespan.
- **Fault** – the component is in a condition that may adversely affect its ability to function correctly.
- **Device Fail** – communication with this 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.
- **Disabled** – the point has been disabled by the operator to prevent it from affecting system operation.
- **Test Operate** – the component is under test and attempting to put the component into an operate state. Note: This does not mean that the component is operated.
- **Auto Reset –** the component is undergoing an auto reset test
- **Alarm Test** – the component is undergoing an alarm test.
- **Alarm Test Fail –** the component has undergone an alarm test and failed. This state clears after a successful alarm test.

Not all of these states apply to all points. For example, input points are never in the operate state, and output points are never in the active input state.

2.9 Zones

2.9.1 General Specifications

In its most general sense, a zone is an area or region of the physical site being protected by the fire alarm system. 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.

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.

2.9.2 Mapping Points to Zones

The *MX1* can support up to 999 zones, with each one 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 points in the zone and the state of the zone itself, 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 datafile. Refer to the User Logic Section of the SmartConfig User Manual.

2.9.3 Zone States

Like points, the *MX1* maintains a status for each zone defined in the configuration. The zone status 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.
- **First alarm** – An AAM zone has gone into alarm but is not yet in an alarm state as the timer is running.
- **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 operates.
- **Fault** – a point mapped to the zone is in a Fault state (includes Device Fail, Type Mismatch conditions).
- **Disabled** – the zone itself has been disabled. The state of the zone, such as alarm, or fault, is not affect the rest of the system.
- **Test Operate** – all outputs mapped to the zone are put into test operate state.
- **Auto Reset** – all inputs mapped to the zone are put into auto reset test.
- **Alarm Test** – the zone is undergoing an alarm test.
- **Alarm Test Fail** – the last alarm test conducted on the zone failed. This state clears after the next successful alarm test.
- **Fault Test** – the zone is undergoing a fault test.

2.9.4 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, and makes these states available for output logic equations to use. This can be used to drive LED indications to show a common alarm type.

2.10 System Processing

MX1 uses points to represent most of its internal and external components. The site-specific configuration data controls the way these points interact to provide the required system operation.

Figure 2-2 shows the flow of information within the *MX1* system. The system software:

- Interacts with the internal system hardware and external hardware.
- Maintains a table of points which includes point and subpoint 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.
- Which points are mapped to which zones.
- Which zones are mapped to which zone groups for default behaviours.
- Logic equations to provide special behaviour and interaction between points, zones and logic tokens, including behaviour required to comply with local standards and codes.

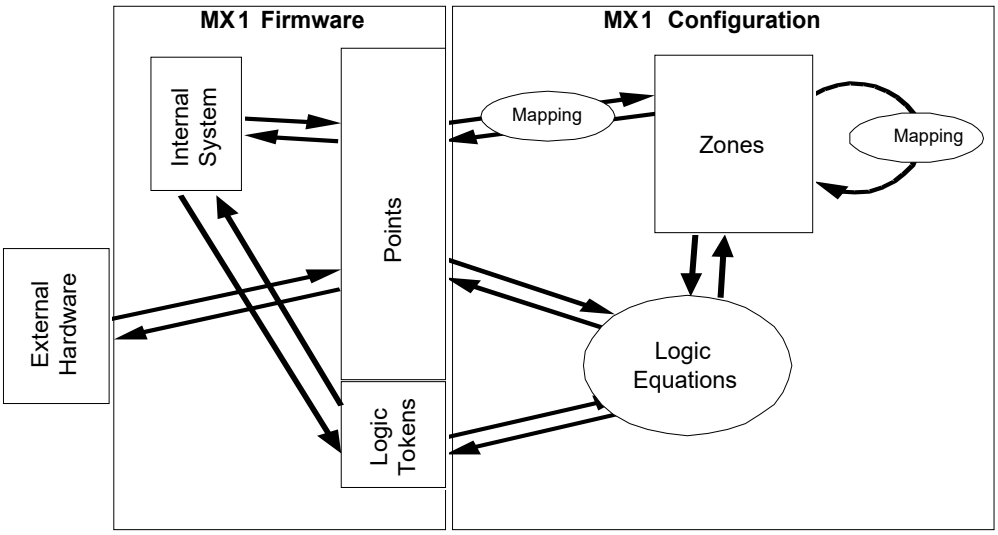

Figure 2-2 – Block Diagram of MX1's Internal Processing

The site-specific configuration is created and maintained using the software tool SmartConfig. The on-line help and manual for SmartConfig describe the available points and possible states and how these can be combined to provide the required alarm processing functions.

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.

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.

Refer to the SmartConfig User Manual and on-line help menu for more detail about templates and the general use of SmartConfig.

2.11 Alarm Confirmation

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

If early detection was the only requirement, then this could be easily achieved by making the detectors as sensitive to smoke, heat or carbon monoxide as possible. However, this would lead to numerous 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, reducing detector sensitivity alone is not sufficient to remove all nuisance alarms.

MX1 employs a number of methods to confirm alarm detection, and thus reduce nuisance alarms. Alarm Verification, Algorithms, Alarm Acknowledgement Facility, and Alarm Investigation Facility are some of these.

2.11.1 Alarm Verification Facility (AVF) for Conventional Detectors

For conventional point type smoke detectors, the alarm 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 to reduce nuisance alarms from this type of detector is to reset the detector to its normal state after the first alarm is detected, and start a timer running. The timer is typically set for about 2.5 minutes. If the detector activates again during this period, this is immediately taken to be proof of a real fire situation, and alarm processing is done, that is, activation of 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 is ignored.

In *MX1*, AVF for conventional detectors applies only to the DDM800 and DIM800, and can be viewed and adjusted with the configuration tool SmartConfig.

For the DDM800 the AVF delay, if enabled, is only applied when the conventional detection circuit is in the alarm band, because it is probably smoke, but not the fast alarm band, because it is probably MCPs or heat detectors.

2.11.2 Algorithms for Analogue Addressable Detectors

Analogue Addressable detectors have a more detailed range of responses to combustion 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 and can report these separately.

Since the detector response is more detailed, the algorithms used by the fire alarm system to determine an alarm condition can also be more detailed.

For heat detectors, a common algorithm includes "rate-of-rise", referring to the rate at which the measured temperature increases, along with the actual temperature. Filtering and thresholds are applied to both the temperature reading and the rate-of-rise to decide when a real fire situation has been detected.

MX FASTLOGIC is a fuzzy logic-based algorithm that can be applied to photoelectric and heat-enhanced photoelectric smoke detection. It is designed to discriminate between the smoke and temperature patterns of real fires and typical causes of nuisance alarms. It uses a set of filters and thresholds to produce a pre-alarm and final alarm decision.

By default, *MX*1 uses *MX* Fastlogic for 850P, 850PH, 814P, and 814PH photoelectric devices.

SMARTSENSE is a field-proven, reliable detection algorithm, reducing nuisance alarms, compensating for ambient conditions, with a wide range of programmable sensitivity settings. It can be applied to all of the detector types.

MX FASTLOGIC and *SMARTSENSE* provide:

- Detector prealarm sensing for early warning of a potential alarm.
- Compensation for soiling and changes in ambient conditions.
- Logging of “detector dirty alert” when compensation limits are about to be exceeded, to allow service to be scheduled.

COUNT OF 3 FILTER is a simple, reliable detection algorithm that is approved for use with the intrinsically safe and 850 series detectors.
A counter is incremented for each reading above the alarm threshold, and decremented for each reading below the alarm threshold. The alarm condition is raised when the counter is 3 or higher.

A sudden increase in a detector reading is more likely to represent a nuisance alarm condition than a gradual increase, therefore the requirement of 3 readings above the threshold is changed to 10 when there is an increase of 150 or more between two successive readings (an increase of 75 for the ionisation detectors where the sum of the two sensors is divided by 2). This constant of 10 is changed back to 3 when the counter counts down to 0 (or when the value read from the detector drops below the alarm threshold).

2.11.3 Alarm Acknowledgement Facility (AAF)

The Alarm Acknowledgement Facility is a nuisance alarm reducing mechanism that originated from defence requirements. It is intended for use where a trained person can be made responsible for a particular zone, for example an apartment. AAF operates by first generating a local alarm in the zone (e.g., sounder in the apartment) and by delaying the zone from going into alarm. The occupant then has a certain time period to acknowledge the alarm and then clear the source of alarm (e.g. smoke). If the alarm is not acknowledged or the smoke cleared by the end of the delay then a general alarm is created and the alarm devices and alarm routing are activated.

2.11.4 Alarm Investigation Facility (AIF)

The Alarm Investigation Facility provides for a programmed delay between the annunciation of alarm on the LCD of the *MX1* and activation of the alarm devices and fire brigade alarm routing outputs. This delay allows a suitably trained operator time to acknowledge the alarm and then investigate the situation and deal with nuisance alarms.

AIF may be enabled (“Attended Mode”) when a suitably trained operator is in attendance and disabled (unattended) when there is no-one qualified to handle the alarm.

In Attended Mode an alarm from a smoke detector in a zone configured for AIF is treated as an AIF alarm. If a subsequent alarm occurs while the AIF alarm is present, then the AIF delay is cancelled and both alarms are treated as ordinary alarms.

Alarms from MCPs and most other detector types are not configured for AIF.

In Unattended Mode, the *MX1* operates normally and transmission of alarms to the brigade is not delayed.

2.11.5 Alarm Delay Facility (ADF)

The Alarm Delay Facility is a nuisance alarm reducing mechanism that is defined in AS 1670.1:2015. It is intended for use where a trained person can be made responsible for a particular zone, for example an apartment. ADF operates by first generating a local alarm in the zone (e.g., sounder in the apartment) and by delaying the zone from going into alarm. The occupant then has a certain time period to clear the source of alarm (e.g. smoke). If the smoke is not cleared by the end of the delay then a general alarm is created and the alarm devices and alarm routing are activated.

3 Routine Servicing

3.1 In this Section

AS 1851 Testing Requirements - AS 1851 Testing Requirements - Other Test Facilities Within the *MX1* - Power Supply Status and Battery Testing - Automatic Tests – *MX* Device Substitution

3.2 AS 1851 Testing Requirements

3.2.1 AS 1851 Testing – Guide for *MX1*-Specific Test Methods

The *MX1* and its associated equipment must be tested at regular intervals. Test criteria, service intervals and record keeping requirements are specified in the appropriate Standard, AS 1851-2012 and amendments.

In addition to this, *MX1* automatically performs regular self-tests to help ensure detectors are operational and able to generate alarms, and the battery is connected and has a certain level of capacity.

It is anticipated that the features *MX1* provides, as described in the Operator's Manual, are sufficient to allow a service person to perform many of the requisite inspections and tests.

The following sections describe how service persons may perform some of the required tests, where the method may not be immediately obvious or where special operation or features are required. The references in the tables to "AS 1851 Item Number" refer to Tables 6.4.1.2 to 6.4.1.5 in AS 1851-2012.

This is not intended to be used as a complete list of AS 1851 maintenance requirements, nor as a complete test schedule.

Attention is drawn to the notification requirements in AS 1851 Clause 1.5.6.1 on the finding of critical and non-critical defects during testing. A critical defect would include failures that made the system inoperative or incapable of warning the occupants when a fire is detected.

3.2.2 Monthly Tests

FIRE DETECTION AND ALARM SYSTEM, SPECIAL HAZARD SYSTEMS AND SMOKE HAZARD MANAGEMENT SYSTEMS

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
1.4	Fire Alarm	SIMULATE an alarm condition and confirm that all required common or general visual and audible indications operate and the external alarm is activated. Where the system is monitored ensure the alarm has activated the alarm signalling equipment. Where CIE is a sub-indicator panel, confirm that the alarm condition is indicated at the FIP.	Refer LT0439 *MX1-Au* Operator Manual, Section 6, Alarm Test. Note; you need to enable the zone to activate the various outputs. Failure of this test is a critical defect. Failure of the alarm relay must be treated as a critical defect – refer AS 1851-2012, Section 1.5.6.

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
1.5	Occupant warning system	SIMULATE an alarm and confirm the alarm initiates the occupant warning system including any visual warning devices (VWD).	Failure must be treated as a critical defect – refer AS 1851, Section 1.5.6.
1.6	Isolate/Disable	INITIATE an isolate/disable condition at the fire indicator panel and confirm that all required common or general visual and audible indications operate. Where the system is monitored, ensure the isolate is received by the monitoring service provider alarm signalling equipment. Where the panel is an SIP, confirm that the isolate/disable condition is indicated at the FIP as either a fault or isolate/disable.	Refer LT0439 *MX1*-Au Operator Manual Section 6, “Disabling or Enabling a Zone or a Zone Range”.
1.9	Baseline data documentation	Check that the *MX1* datafiles have not been changed.	Refer Section 3.3.6.

3.2.3 Annual Tests

Before proceeding with Annual Tests, check that the installed *MX1* firmware is up to date (refer Section 9.13). If it is not, consider installing the current version of firmware.

Also check the site specific configuration details are up to date and in the log book. Use the Database CRC Recall function – See section 4.2. If these do not match the database most recently commissioned and recorded in the log book – then ascertain why and correct as necessary.

FIRE DETECTION AND ALARM SYSTEM, SPECIAL HAZARD SYSTEMS AND SMOKE HAZARD SYSTEMS

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
3.5	Panel switches and keypads	TEST the operation of each control.	Refer Section 3.2.8.
3.6	Visual indicators	TEST the operation of each visual indicator and alphanumeric displays.	Display Test as in Operator Manual Section 8.
3.7	Battery	MEASURE system quiescent and maximum alarm currents in accordance with Appendix F of AS 1851. Calculate the required battery capacity and CHECK the nominal capacity of the installed batteries is not less than the calculated capacity. Verify that the measured currents are the same as recorded in the baseline data.	The *MX1* battery test functions do not meet the requirements of this test. A separate test method must be used. Refer Section 3.2.5.
3.8	Fire Detectors	TEST detectors as specified in Appendix G of AS 1851 and confirm correct alarm zone indication. Where the detectors are used as part of special hazards systems 100% of the detectors shall be functionally tested yearly.	Detector sensitivity checking is described in Section 3.2.7. Zone auto reset mode may be used to speed up testing of devices in a zone. Refer Section 3.3.4. Commissioning mode may be used to speed up testing of all devices in a system. Refer Section 3.3.7.

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
3.9	Audibility	TEST the occupant warning system and check the signals are distinctly audible in all areas of the building. NOTE: In order to reduce the disturbance to occupants an acceptable means of conducting this test is to provide an audio signal other than the warning signal at a reduced sound pressure level. Where the FIP is connected to a sound systems and intercom systems for emergency purposes (AS 1670.4) or EWIS (AS 2220.2) test in accordance with Table 6.4.3.2.	If a T-Gen2 or T-GEN 50 is used to generate the alert tone you can either select the low level test tone or play background music through the background music input.
3.15	Service life	Inspect detectors, equipment or other items having a defined service life and report where the service life is exceeded or exceeds before the next scheduled service.	See section 3.5.5 for analogue addressable CO detectors. For conventional CO detectors unless accurate records have been kept of the installed detectors, their location and manufacture date, these detectors require manual inspection to determine their expiry date. Refer to manufacturer's data.
3.18	Interfaced system initiation	Simulate alarms to verify that each interface transmission path initiates the corresponding interfaced systems in accordance with the approved design	Referring to the baseline data check that a test alarm on each appropriate zone activates the required output device.

SMOKE HAZARD MANAGEMENT SYSTEMS—ADDITIONAL ACTIVITIES
CAUTION: TAKE PRECAUTIONS TO PREVENT UNACCEPTABLE VENTILATION SYSTEM CHANGES

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
3.19	FFCP latching and reset	CHECK that after initiation by a signal from the FIP, the FFCP remains operating in the fire mode until reset by the reset switch on the FFCP.	Trigger the FFCP with zone alarm test on the FIP. Then reset the FIP and check the FFCP is still operating in fire mode. Press FFCP fire mode reset to clear.
3.20	Manual override controls	CHECK that manual override ON-AUTO-OFF control operates. NOTE: Manual override should function in normal mode and fire mode.	Check operation between the FFCP and the field equipment.
3.21	Airflow fault indicator	CHECK the operation of the airflow fault indicator	
3.22	Open-circuit fault indicator	CHECK the operation of the air-handling equipment interconnecting cable open-circuit fault indicator.	
3.23	Closed-circuit fault indicator	CHECK the operation of the air-handling equipment interconnecting cable closed-circuit fault indicator.	
3.24	Electrical	CHECK the operation of the electricity phase-fail fault indicator.	
3.25	Fan-running indicator	CHECK the operation of the fan-running indicator.	
3.26	Fan-stopped indicator	CHECK the operation of the fan-stopped indicator.	
3.27	Fan fault indicator	CHECK the operation of the fan-fault indicator.	

3.2.4 Five-Yearly Tests

FIRE DETECTION AND ALARM SYSTEMS

AS 1851 Item No	Description	Action required and pass/fail criteria	Test Facility, Procedure, Notes
4.2	Supervised circuits	TEST each input and output supervised circuit for any condition that prevents the transmission of the required signal and ensure a fault is registered at the FIP.	Apply o/c and s/c faults on the field wiring where appropriate and verify faults are generated at the FIP.
4.3	Fault	SIMULATE a circuit fault condition at the FIP and confirm that all required common or general visual and audible indications operate. Where such faults are monitored, ensure the fault has activated the alarm signalling equipment. Where the panel is an SIP confirm that the fault condition is indicated at the FIP.	Refer LT0439 *MX1-Au* Operator Manual Section 6, Fault Test. Note; you need to enable the zone to activate the various outputs. Failure of the fault relay must be treated as a non-critical defect – refer AS 1851-2012, Section 1.5.6.
4.5	Power supply supervision	Where the system is monitored, REDUCE the CIE operating voltage to trigger a power supply supervision fault and CONFIRM that it is received by the monitoring service provider. Where the panel is an SIP or a distributed power supply, confirm that the power supply supervision fault condition is indicated at least as a fault at the FIP.	This test requires equipment external to the *MX1*. Refer Section 3.2.6.
4.7	Interface and control test	CONDUCT a functional test with each system interface in accordance with the building's systems interface diagram and CHECK that each interfaced system responds to the signal in accordance with the approved design. See Appendix D.	Refer to the baseline data for details. See Appendix D of AS 1851-2012.
4.9	Monitoring connection	Where the system is monitored, TEST that the loss of each of the monitoring links is indicated at the monitored site.	For networked systems break/short each communication line between a sub FIP to the main FIP and check that a fault is indicated at each FIP. If the FIP is fitted with an ASE consult the monitoring company regarding testing the fault monitoring of the ASE's communication links.
4.10	Alarm verification facility	TEST one detector of each type for a circuit with alarm verification facility enabled to check that it functions in accordance with the approved design.	To test AVF put the detector into alarm using appropriate test apparatus (e.g., test smoke/gas or Solo in-situ tester) and check the following: i) The detector's indicator turns on ii) The indicator turns off for at least 5 seconds iii) The indicator turns on again within 60 seconds and the FIP goes into alarm.

3.2.5 Battery Load Discharge Testing (AS 1851 Item 3.7)

The *MX1* Fire Alarm panel has no provision for load discharge testing of the battery at the levels required for yearly testing to AS 1851-2012.

A load discharge method separate from the panel must be arranged in order to meet this requirement. For example, apply an external test load to the battery and operate the *MX1* with mains power off for 30 minutes. Check the battery voltage at the end of the test.

3.2.6 PSU Supervision (AS 1851 Item 4.5)

MX1 does not include built-in facilities to carry out this test. A suitably rated bench power supply connected to the *MX1* battery terminals with main power turned off may be used instead.

Reducing the bench power supply output voltage to below the minimum operating voltage permits observation of the PSU supervision signalling.

If the PSU supervision signal is monitored, confirm that it is received at the monitoring service or at the main CIE. If the PSU supervision signal is not monitored, the status of the PSU supervision signal can be recalled on the display using point 241.25.14 “Power Supply Supervision”, which indicates a fault when the system voltage falls below the minimum operating voltage.

3.2.7 Detector Sensitivity Test (AS 1851 Item 3.8)

Item 3.8 of AS 1851-2012 requires that the sensitivity of all smoke, CO and flame detectors be checked to ensure each is within the required range.

For collective, conventional, smoke detectors this usually means the detector must be tested using a calibrated test medium that can confirm the sensitivity of the detector for checking against the manufacturer’s data or the listed sensitivity. If accredited test equipment is not available or suited to do this testing in the field, or it is preferred to not do the testing in the field, the detectors could be sent to a clean and calibrate service.

For analogue addressable smoke detectors on *MX1*, it is not necessary to actually test each detector with a calibrated medium to confirm its sensitivity as *MX1* has built-in functions that assist in doing this. *MX1* maintains a constant sensitivity for each detector, tracking any changes in the clean air value, with no smoke, as the detector ages or becomes contaminated by dust, for example. If the detector’s clean air value has shifted so far that *MX1* cannot compensate any further, the detector is put into a Dirty condition, indicating it needs cleaning or replacing. This sensitivity verification does not replace the need to test the detectors in-situ using an un-calibrated medium for a go/no-go test.
To satisfy the sensitivity test of analogue smoke detectors it is necessary to check:

1. Each detector is still programmed with its approved design sensitivity. Use the *MX1*’s Datafile CRC recall function (refer Section 4.2) to confirm the database CRC and file details for the panel are the same as that most recently commissioned. If they are not, determine why, but in any case, check that the currently programmed sensitivity of each detector is as required. These can be displayed using the SP command described in step 2 below.

2. Each detector has not reached, nor is close to reaching, its Dirty limit. *MX1* has a built-in service function that lists all programmed detectors together with their %Dirty, programmed sensitivity, current values and other information. This is the device status print report available with the diagnostic terminal SP command – see section 6.7.10.

This report lists all devices grouped by zone, and includes sensitivity settings, contamination levels and raw values. The format of the report is designed to permit loading into a spreadsheet for further analysis.

Print or capture this report from the *MX1* and search the printout for any detectors that are dirty (D appears in the Dirty column) or the level of contamination (Cont% figure) is close to 100% (e.g., say above 80%). Replace the detectors with new or cleaned detectors and repeat the process to make sure all detectors are now well within range.

For detectors with CO sensors, a dirty state indicates that the CO cell has exceeded its specified service life.

The report also shows the programmed sensitivity (AS(nom) column) and algorithm setting (ALG DAY and ALG NIGHT columns) so these can be verified as well.

3. Each detector can generate an alarm condition. A zone alarm test confirms each *MX* addressable photoelectric and ionisation smoke, CO, flame and VLC800*MX* detector can generate an alarm using the internal remote test function.

4. All detectors need to be in-situ tested with a suitable method, such as test gas, to ensure they can detect an alarm.

3.2.8 Keyboard Test (AS 1851 section 3.5)

Usually, pressing keys on the *MX1* keyboard affects the operation or status of the system. The following sequence can be used to test the keyboard to minimise these effects. Press each key in order and check that for each keypress the buzzer beeps. Some keys may generate two beeps. The first indicates the keypress, the second indicates an error - this is acceptable, as the key sequence intentionally does not produce valid commands.

CANCEL	Zone	1	2	3	4	5	6	7	8	9	.	MENU	OK

CANCEL	Zone	F1	F2	F3	F4	Sil Buzzer	Sil Alarms	Reset	Disable

Tests	Disables	AIF	AIF

The only effect of this sequence on the system is to temporarily change the AIF Attended status for the limited number of systems which are configured for AIF operation.

3.3 Other Test Facilities Within the *MX1*

3.3.1 Disabling the Internal Buzzer

During tests and service operations the *MX1* internal sounder may operate repeatedly. If required, you can disable or mute the buzzer. Two methods are available:

- temporarily muting the buzzer for 24 hours through the **TESTS** menu, or
- by disabling the buzzer sub-point at access level 3.
  If you use this method, the buzzer does not operate until it is manually re-enabled, at level 2.

To disable the buzzer at access level 3, press the **DISABLE** key, then **MENU**, then **BUZZER←F1**, then **F4**. The buzzer is disabled.

To enable the buzzer at Access Level 2, press the **DISABLES** key and press the **NEXT** key until the Buzzer Disable point is shown. Press **F1** to enable the buzzer.

3.3.2 Confirming the Address of Detectors

To confirm the point address of an installed addressable detector, determine the point address believed to correspond to the detector, then perform an operate test on the LED subpoint.

If the LED does not light, check that the subpoint is not disabled and that the correct detector is being observed.

For further confirmation, remove the detector from the loop and observe the *MX1* panel for faults generated.

3.3.3 Ascertaining the Mapping of Points and Zones

There are several ways to do this:

- View the configuration file using SmartConfig and observe the mapping.
- Recall history and look for the point event that immediately precedes the zone event (it is likely that this point triggered the zone condition).
- Disable all points in fault, then reset the zone. Enable the disabled points one by one and watch for the zones going into fault. The point just enabled maps to the zones.

3.3.4 Zone Auto Reset

In Auto Reset test mode, the zone is automatically disabled, but each time a point within the zone goes into alarm (or Active Input) the alarm devices are operated briefly. This way, input points within a zone can be tested for their alarm contribution to a zone.

The alarm devices do not operate if they are disabled.

The events are recorded in the event history log and event printer, if you have configured event logging for each point.

Stopping Auto Reset mode automatically re-enables the zone. If the zone is in alarm, whether latched or driven by a point, stopping this test re-enables the zone and causes alarm devices and alarm routing to activate. If this is not required, you must reset the zone first to take it out of the alarm state.

Auto Reset test mode automatically cancels itself if no new alarm is received for two hours. In this case, the zone automatically reverts to the state it was, whether enabled or disabled, when Auto Reset mode was started. Note that this may cause an alarm if the zone is in alarm at the end of the 2-hour period.

If the test is stopped, times out, or even is reset to end the test, and a point is in alarm, with the call point left operated, then an alarm is generated at the conclusion of the test. To avoid this being a nuisance alarm, it is recommended the zone be disabled before the test, and enabled again only after checking the zone status doesn't show an alarm for 1-2 minutes after the conclusion of the test.

3.3.5 Analogue Input Point Tests

The test options for analogue input points, such as sensors, call points, CIM, or DIM, are:

ALRM TST←F1 starts an alarm test with full algorithmic processing. Any programmed delays for the point are included.

FAST←F2 starts an alarm test, bypassing any delays in algorithms and bypassing the prealarm step.

RESET←F3 resets the point.

The Point Alarm and Fast tests do not automatically disable the point or any mapped zones, and all alarm devices and alarm routing operates as though for a real alarm. Disabling the point before the test prevents these operating and events being logged on the printer and the history, and only the Recall Point Status Display on the LCD shows the alarm.

The actual time taken for an Alarm or Fast test is dependent on the type of device being tested, and on detailed settings in the system configuration. For example, heat and smoke detectors with nuisance alarm rejection algorithms reacts more slowly to an Alarm test than to a Fast test, whereas a contact input point reacts quickly to both Alarm and Fast tests.

3.3.6 CRC Datafile Confirmation

To help to verify that system programming has not been changed, which prevents correct operation of the system, it is suggested that the Database 1 and Database 2 CRCs must be recalled at each monthly test and the value compared with that recorded at commissioning or on completion of the last authorised changes. Any unauthorised change to the CRC must be noted in the Test Report and flagged as an item requiring investigation.

The Test System command allows the *MX1* firmware version, firmware CRC, and the two configuration datafile CRCs, to be viewed on one screen. This allows easy recording and checking.

From the base display press TESTS, then the **INITIATE←**F4 option, MENU twice and the **SYSTEM←**F1 option to show the following screen.

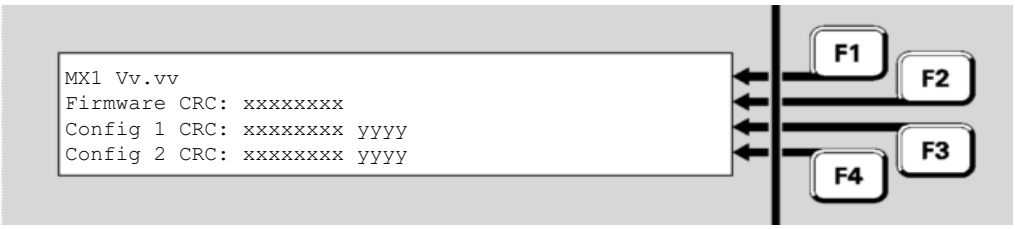

Figure 3-2 – Tests System Screen Shows Firmware and Config CRCs

The top line shows the *MX1* Controller firmware version, Vv.vv. The second line shows the firmware CRC. The third and fourth lines show the internal checksum (xxxxxxxx) and CRC (yyyy) for the two configuration datafiles. The CRC of the datafiles is the CRC as shown by the SmartConfig Show CRC command and can be used to confirm the datafiles are identical or the same as the file on the PC.

3.3.7 Commissioning Mode

Commissioning Mode reduces the time required for detector tests and setup procedures to be performed, by removing all processing algorithms. This means that smoke detectors go into alarm almost immediately if smoke or other test gas is applied to them.

For details of how to initiate Commissioning Mode, refer to the *LT0439 MX1-Au Operator Manual*, section 8.

3.4 Power Supply Status and Battery Testing

3.4.1 Battery Terminal Voltage on Powerup

On power up with mains power only, no battery connected, the battery terminals are left open circuit through a relay until a charged battery is connected or LK3 is shorted. During this time the battery terminal voltage is about 12 V.

If a charged, greater than about 19 V, battery is connected, or LK3 is shorted, the relay is energised and the charging voltage is applied to the battery.

3.4.2 Setting the Charger Voltage

The *MX1* includes a battery charger that charges the battery at a nominal voltage of 27.3 V at 20ºC, while automatically compensating for temperature changes by -36 mV/ºC, increasing the voltage at low temperature and decreasing the voltage at high temperature. *MX1* also includes the display of this voltage and a means to adjust the charger voltage if necessary.

To view the charger voltage and current, display the PSU status screen by pressing the **MENU** then **POWER←F4** buttons. Refer to the *MX1 Operator Manual (LT0439)*, section 8. This shows the PSU voltage and current, the internal temperature, the battery voltage and current, and the results of the last battery test.

Note the voltage and currently are only approximate (≈±1%), so an accurate multi-meter is required if there is a need for adjusting the charger voltage.

The battery voltage is in fact the best value to observe to check the charger setting as the PSU voltage represents a slightly different output to the charger.

To adjust the charger voltage:

- Check the PSU current consumption is not excessive, < 5 A, on the PSU status screen.
- Disconnect the batteries. Insulate the end of the leads so they do not short out or touch other metallic items.
- Check the battery temperature sensor is not damaged. This is located on the end of a twin-wire cable from the PSU module and is usually positioned in the battery area. If it is open circuit the PSU voltage is high, > 28 V.
- Place an accurate voltmeter across the BATT+ and BATT- terminals on J13 on the controller.

- Check the charger voltage is 27.3 V at 20°C, adding 0.3 V for each 10°C below 20°C or subtracting 0.3 V for each 10°C above 20°C.

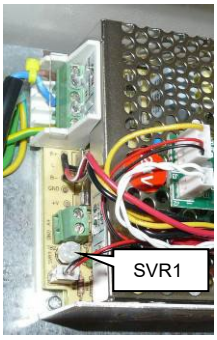

Figure 3-3 SVR1 location on PSU

Temperature	10ºC	13ºC	17ºC	20ºC	23ºC	27ºC	30ºC
Voltage	27.6	27.5	27.4	27.3	27.2	27.1	27.0

- If the charger is out of spec, adjust the charger voltage through SVR1 located on the PSU module as shown in figure 3-3.

Notes:

1. If the *MX1* is powered up without any batteries connected, or the connected batteries are very flat, then the battery protection relay on the controller is open and the voltage at the battery terminals (J13) is around 12 V. The BATT-CONN LED LD6 is off. Temporarily connect some charged batteries or short out LK3 beside the LED to energise the relay to present the charging voltage to J13. The BATT-CONN LED turns on.

2. If shorted or reversed voltage batteries are connected to the *MX1* the battery voltage reads 0 V on the PSU status screen and the Battery Connect relay and LED is off.

   Fix the wiring or batteries before attempting to connect them by shorting LK3.

3.5 Automatic Tests

3.5.1 Automatic Battery Tests

MX1 is normally configured to perform automatic battery tests. The scheduling and duration of these tests are determined as part of the *MX1* configuration, and require no operator intervention under normal conditions.

If the battery fails, the automatic test the FAULTS indicator lights and the failure is logged in the Event History. Refer to the *LT0439 MX1-Au Operator Manual*, section 4. Where available, the service company is notified.

3.5.2 Battery Connection Test

The *MX1* tests that a battery is connected to the system. To perform this, test the battery charger voltage is momentarily dropped, at regular intervals, to less than the acceptable battery-low voltage. If the battery is correctly connected and fully charged, the system voltage does not drop very much. If it is not connected, the system voltage falls to below the battery-low voltage, and the test is failed.

The time between connection tests is set by the configuration, but must not exceed 60 seconds. The duration of the test is set by the configuration. The status of this test is shown by a controller point, Battery Connection.

Note that a deeply discharged battery may result in failed Battery Connection tests until the battery becomes sufficiently charged. This is normal.

3.5.3 Battery Capacity Test (Long-term)

The *MX1* checks the charge capacity of the battery. To perform this check, at regular intervals the battery charger output is dropped to below the “acceptable” battery-low voltage, and the system is powered from the battery. If the battery voltage falls below the battery-low voltage during the test, the test is failed, and the charger is set back to normal voltage. The result of the most recent test is shown by a controller point, Battery Capacity. The duration of the test and the period between tests is set by the configuration. The default value is a 60-minute test at 9am every weekday morning.

A manual battery test can be started from the *MX1* front panel, as described in the *MX1 Operator Manual*. The duration of this test is also set by the configuration, but defaults to 1 minute.

3.5.4 Automatic Detector Tests

The *MX1* can be configured to automatically perform a system-wide detector alarm test at a specified time on specified days of the week. The automatic detector alarm test is applied to only those devices that are capable of this test. These are:

- 850H
- 850P
- 850PC
- 850PH
- 814PH
- 814P
- 814CH
- VLC800MX
- 814I
- 801PHEx
- 801CHEx
- 801F/801FEx
- S271i+
- S271f+
- FV411f / FV412f / FV413f

During automatic tests, the *MX1* activates the remote test facility inside the detector and monitors the analogue values to check that they go above the required value. For 850 series multi-sensor detectors (e.g. 850PH) the test is applied to all sensors. For all other multi-sensor detectors, the test is applied to only the photo or CO sensor.

The detector under test is unable to respond to a real fire condition while the test is in progress. The actual time taken for a test is dependent on the type of device being tested, and on detailed settings in the system configuration. In all cases the duration of the test must be no more than one minute.

If a detector fails, the test it is put into a Fault state and the occurrence is logged.

Note that if a detector fault is logged, and a manual point test is subsequently carried out to investigate it, the point MUST be disabled first so that a real alarm is not triggered. Alternatively, disable the zones that the point maps to.

This test method using the remote test facility is also used in zone and point alarm tests for those points that support it. For those points that do not support the remote test, the alarm condition is simulated in software.

3.5.5 CO Date Expiry Check

The CO sensor cell present in the 801CHEx, 814CH, and 850PC *MX* addressable detectors has a service life of 10 years from its date of manufacture. Each detector is labelled with its date of manufacture, and this is also stored electronically inside the detector.

To provide an automatic indication as to when detectors must be replaced after this service life has been exceeded, when *MX* addressable detectors that have CO sensors have their alarm functionality tested as part of the automatic system-wide test, their manufacture date is compared against the current date. If more than ten years less one month has elapsed since manufacture, then the detector's CO subpoint is put into the Dirty state. To clear this state the detector must be replaced with a new detector.

3.5.6 AS1668/DSS Lamp Test

A lamp test can be conducted on all AS1668/DSS controls (for Fire Fan Control or customised output logic controls). The test can be started by a button press on the AS1668 control whose button function is configured by SmartConfig to do the lamp test. Once pressed all LEDs on all AS1668 control modules are turned on for about 15 seconds.

3.6 *MX* Device Substitution

3.6.1 Introduction

The *MX1* permits some *MX* devices to be installed in place of certain other configured *MX* devices without a type mismatch error, that is, no re-configuration of the panel database is required. The permitted substitute devices for each originally configured device are as shown in the table below:

Original Configured Device	Substitute Devices Allowed
814CH	850PC
814H	850H
814P	850P
814PH	850PH
CP820	CP830, MCP820, MCP830
CP830	MCP830
S271f+	FV411f / FV412f / FV413f

When a substituted device is present, whenever the *MX1* displays the device model number it shows the new model name and has an asterisk appended to it.

Note that most substitutions permit new models of like devices to be used where older models are programmed.

One exception to this is where an 850PC is substituted in place of an 814CH detector. In this case the smoke sensor of the new detector is inactive and no smoke subpoint is present. This could cause some confusion to testers, auditors, and the fire brigade as an apparent smoke detector does not generate an alarm for smoke. Take care on sites where this substitution is carried out so that all users are aware that the new detectors are not operating as smoke detectors.

No automatic substitution is permitted which would allow replacement of 814I detectors with another detector from the 850 series.

Where necessary, the *MX1* automatically substitutes different *MX* device profiles from those configured for the original *MX* device. Note that these substitute profiles cannot be customised. They are built into the *MX1* firmware and are not part of the database even though they may have the same name as profiles in the database.

3.6.2 850 Series Detector Substitution

To allow the older 814 detectors to be easily replaced by the newer 850 series, *MX1* allows substitution of the 814 with like 850 devices. The 850 series detectors have not been listed for use with the SmartSense algorithms that the 814 series were. To allow the 850 series detectors to be installed in place of the earlier detectors without re-configuration of the panel database, where the configured profile is inappropriate for use with an 850 series detector, the panel automatically uses a substitute profile.

The FastLogic smoke profiles are the same for both 814 and 850 series detectors. No change of the profile used on the smoke subpoint occurs.
Smoke profiles that use the SmartSense algorithm are changed to appropriate profiles that use the Count-of-3 algorithms instead, as shown in the table below:

Configured Profile Meets Conditions		**Template Profile that Meets Conditions (not limited to this)**	**Automatically Substituted Profile**
Alarm	**Enh Multiplier**		
otherwise	0		Count High Sens
≥ 20	0	8%	Count Normal
≥ 60	0	12%	Count Low Sens
otherwise	> 0		Count High Sens Enh
≥ 20	> 0	8% Enh	Count Normal Enh
≥ 60	> 0	12% Enh	Count Low Sens Enh

For heat subpoints, where the configured profile uses the SmartSense algorithm (such as the four pre-defined Type A/B/C/D AS1603.1 profiles) a substitute profile is built on-the-fly by the *MX1*. The PreAlarm and Alarm thresholds from the original profile are retained, as well as the ROR enabled/disabled state. Where the original alarm threshold is 80 °C or below, the rest of the data fields are as from the A2S 63C and A2R 63C profiles as appropriate. The profile name displayed by the *MX1* doesn't contain the "63C" part however, as it may not be accurate. Where the alarm threshold is above 80 °C, data from the CS and CR profiles is used.

For CO subpoints where an 814CH is configured, but an 850PC is present, and the algorithm in the configured profile is SmartSense (and the low gain setting is false), the profiles are changed as follows:

Configured Profile Meets Conditions	**Template Profiles that Meets Conditions (not limited to this)**	**Automatically Substituted Profile**
Alarm		
Otherwise	23ppm, 38ppm, 23ppm Enh, 38ppm Enh	CCO 850PC *(33ppm)*
≥ 115	66ppm, 66ppm Enh	Count 66ppm

Similarly for CO points where an 814CH is configured, but an 801PC is present, the profile change also takes place, using the same rules, but the CCO profile is used instead of the CCO 850PC profile as appropriate.

The CO profile substitution does not occur if the algorithm is SmartSense, and the low gain setting is true. This is because the toxic gas profile for the 850PC uses SmartSense.

3.6.3 Call point Substitution

A MIM800 is permitted in place of a configured MIM801, provided that the selected profile for the MIM801 is the predefined “N/C Int SC Flt OC Alm”, otherwise a type mismatch is generated. The MIM800 automatically operates with the MIM800 profile of the same name.

A type mismatch error is given for any attempt to use a MIM800 device in place of a MIM801 device configured with any other profile.

No automatic profile changes are performed when a CP830, MCP820, or MCP830 is installed in place of a CP820 or CP830.

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4 Changing the Configuration

4.1 In this Section

Viewing Datafile Details – Requirements – Disabling Earth Fault – Effect of Changing Configuration – Temporary Access Password

4.2 Viewing Datafile Details

The *MX1* system stores the site-specific configuration datafile, also called database, in non-volatile memory on the controller PCB. This contains all the configuration information that is specific to a particular installation, such as point types and addresses, zone and point text, and user access codes.

It is usual for this datafile to be changed in response to changed requirements for the installation site, for example, building extensions, changes of building use. The software tool SmartConfig must be used to make the necessary changes to the configuration file, and to download this updated datafile into the *MX1* Controller.

MX1 has space for two datafiles. One datafile is the working copy, active, and the other a spare, inactive. Generally, both copies must be the same. However, while changes are being made and tested, it is usual to keep a known good copy in one datafile as new trial versions are loaded into the other file.

To recall the datafile details (Figure 4-1);

Press **MENU** three times.
Press **MEMORY←F3**.
Press **DATAFILE←F2** to display the status of Datafile 1.
Pressing **FILEx←F2** now allows toggling between the two datafiles. If you are logged on to Level 3, **F1** gives the option of rebooting with this datafile as the active one.

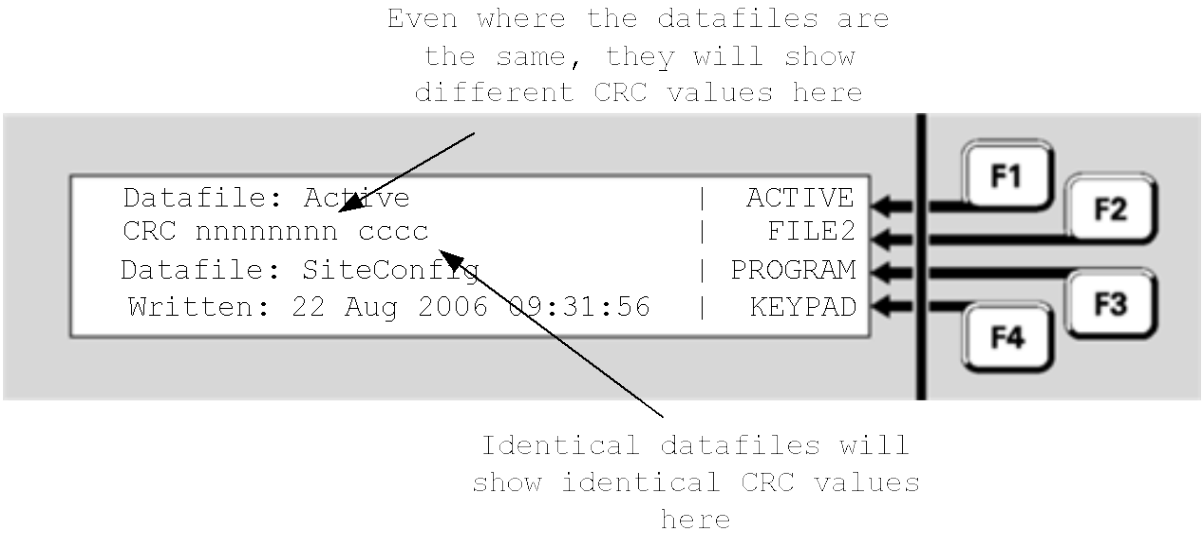

Figure 4-1 – Viewing the *MX1* Datafile

This screen shows the filename and details of the datafiles stored. The Active/Inactive state shows whether the datafile is currently being used by *MX1*.

Two CRCs are shown on line 2 for each datafile.

The first CRC (8-characters) is the internal CRC value calculated over the entire datafile. This CRC is dependent on which datafile (1 or 2) the data is stored in, so it shows different

values for an identical file downloaded to datafile 1 and datafile 2. This value is used by *MX1* to check that the datafile has not been corrupted.

A second CRC (4-characters) is provided as a means for checking that the configurations are identical. It is the same CRC value as calculated and displayed by the version of SmartConfig used to create the datafile. Where both CRCs are identical, the datafiles can be assumed to be identical in their configuration setup.

The Test System command allows the *MX1* firmware version, firmware CRC, and the two configuration datafile CRCs, to be viewed on one screen. This allows easy recording and checking.

From the base display press TESTS, which shows the following screen.

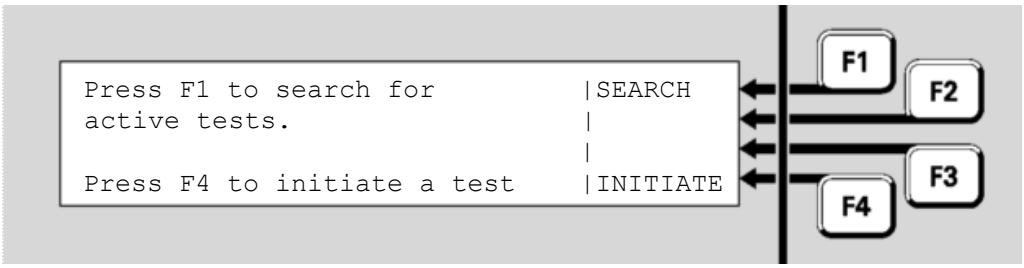

Figure 4-2 – Tests Screen

Press the **INITIATE**←F4 option and MENU twice so that a **SYSTEM**←F1 option is shown. Press F1 to show the following screen.

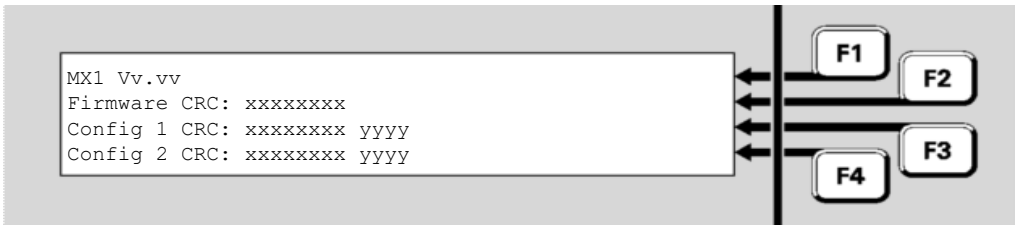

Figure 4-3 – Tests System Screen Shows Firmware and Config CRCs

The top line shows the *MX1* Controller firmware version, Vv.vv. The second line shows the firmware CRC. The third and fourth lines show the internal checksum (xxxxxxxx) and CRC (yyyy) for the two configuration datafiles. The CRC of the datafiles is the CRC as shown by the SmartConfig Show CRC command and can be used to confirm the datafiles are identical or the same as the file on the PC.

4.3 Requirements

1. A PC or laptop with the configuration software tool SmartConfig installed.

2. A “null-modem” or crossover serial cable to connect the PC to the *MX1*. LM0076 is suitable.

3. A copy of the site-specific configuration datafile to be downloaded.

4. The datafile access username and password for the *MX1* system to be updated. If the new datafile is up to date with the installed system, this username and password can be viewed with SmartConfig.

5. The “WRITE ENABLE DATAFILE” link LK1 must be fitted.

Details of the download process are contained in the *MX1* section of the SmartConfig User Manual or its on-line help.

4.4 Disabling Earth Fault

Connecting a PC or terminal to the *MX1* serial port is likely to generate an earth fault. This does not affect system processing, but the fault indication may be a nuisance that puts the panel into fault. You can temporarily disable Earth Fault monitoring to hide this fault before the PC is connected, as follows:

1. Press **DISABLE**.
2. Press **POINT←F2**.
3. Enter 241.25.3, being the point number of the Earth Fault point.
4. Press **OK**.
5. Press **DISABLE ←F1** and **OK** to confirm. Check the display shows the point as disabled. Press **CANCEL** to return to the base menu.

Note that following disablement of the Earth Fault point, any Earth faults are still visible in the Faults list but does not put the panel into a fault state.

Do not connect a mains-powered PC to the *MX1* if an Earth fault is present as this may damage the PC and the *MX1*.

To re-enable earth fault monitoring after disconnecting the PC:

1. Press **DISABLES** to display the list of disabled items.
2. Press **NEXT** to step through the list to the earth fault point (241.25.3).
3. If the point is in fault, there is an Earth Fault present, and this needs to be fixed.
4. Press **DISABLE** (to enable) and **OK** to confirm.

Alternatively, an RS232 isolator may be used to prevent the earth fault.

4.5 Effect of Changing Configuration

You can download a new datafile to the *MX1* without affecting normal operation. *MX1* stores two versions of the datafile: an active copy and an inactive copy. SmartConfig only downloads a new datafile over the inactive copy. The new datafile does not become active until the system is restarted, either by using SmartConfig or pressing the **RESET** button on the Controller PCB. The datafiles can also be switched between active and inactive using the Level 3 operator functions from the *MX1* front panel or from within SmartConfig.

There is a break of several seconds in system processing while the new datafile is made active. During this time, the alarm signalling, brigade ,fault outputs is made active.

When the new datafile is made active, it must be tested to confirm that it is producing the correct system operation.

If zones and/or points have been added to the configuration, check their enable/disable status is as desired, because for new devices this is undefined.

If there is a problem with the new datafile, the *MX1* can be switched back to the previous

datafile using SmartConfig or from the front panel, and a revised datafile can then be downloaded over the one previously tested. It is a good idea to keep one untouched copy of the old datafile stored in the *MX1* while new datafiles are being tested, so that it can be used if problems are found.

When the new datafile has been tested and found to be good, it must be downloaded over the other datafile in the *MX1* so that both versions stored in the *MX1* are the same.

See section 5.5 if downloading a datafile for a new version of *MX1* firmware or if a new version of SmartConfig is being used.

4.6 Temporary Access Password

A valid username and password combination is required for access to the diagnostics terminal.

In situations where the password has been lost, it is possible to gain access by using a Temporary Access Password, or TAP.

Entry of an invalid username/password combination displays an error message which incorporates an Error Code consisting of 8 hexadecimal characters. This sequence is a Recovery Code which can be supplied along with other supporting information to authorised Johnson Controls staff who use it to produce a TAP.

Entry of any username along with the TAP allows access to the system. The type of access is determined by the TAP.

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5 Upgrading Software

5.1 In this Section

MX1 Software – Upgrading PA1081 Controller Board Firmware – Upgrading PA1057 LCD/Keyboard Firmware – Updating Site-Specific Configurations – Upgrading *MX* Loop Card Firmware – Upgrading AS1668/DSS Fan Control Firmware

5.2 *MX1* Software

The *MX1* system has several software (firmware) elements which are contained in non-volatile flash memory devices. This firmware can be upgraded in an installed system to take advantage of improved features and fixes to software defects, as these upgrades become available.

On the PA1081 controller, the application firmware is in U1, U4 and U5, and the programmable logic device (PLD) software in U8.

On the PA1057 LCD/Keyboard, the application firmware is in MCU1.

On the PA1052 *MX* Loop Card, the application firmware is in U1.

Section 9.13 lists the current (at time of publishing) firmware versions and any incompatibilities between them. It may be necessary to upgrade multiple items in the *MX1* at the same time, including the site-specific configuration.

Refer to the notice, for example, the Product Bulletin or web page, detailing the availability of new firmware. This includes information about what, if any, site-specific configuration changes are needed.

Note:

1. An antistatic earthing wrist strap must be worn during these upgrade operations.

2. The system operation is interrupted during these upgrade operations. Disconnect or otherwise disable connections to Alarm Signalling Equipment (ASE), Alarm Devices, and Building Services before making these upgrades, to prevent nuisance operation. Notify building owners and occupiers and the brigade that the system is offline.

3. Connecting a PC or terminal to the *MX1* controller serial port (or other serial diagnostic/ programming ports on the LCD/keyboard or *MX* Loop Card) is likely to generate an earth fault indication. This does not affect system processing, but the fault indication may be transmitted to the remote monitoring centre. The earth fault monitoring can be temporarily disabled to hide this fault before the terminal is connected, refer Section 4.4.

4. If any of the firmware and/or site configuration is updated, information regarding the changes must be noted in the system logbook, including the CRCs for the firmware and two CRCs applicable to each of the stored databases. These are recallable on the LCD. See section 4.2 for details on how to recall this information.

5.3 Upgrading PA1081 Controller Board Firmware

The *MX1* firmware is stored in non-volatile Flash memory on the controller Board.

On occasion, Johnson Controls may provide a new version of the *MX1* Controller firmware. It can be updated in the field as described below.

5.3.1 Equipment Required

- PC with SmartConfig installed.
- Null-modem serial cable such as programming lead LM0076 or equivalent.

5.3.2 Files Required

The following file is supplied for a *MX* Controller firmware version update;

"[filename].mxf" Controller Board flash contents in special format.
In general, use the latest release unless installing a new controller as a replacement for a faulty unit with older firmware.

5.3.3 Procedure

Ensure the datafile is available on the computer before upgrading the firmware as when the firmware has been upgraded it may not be possible to extract the datafile from the panel, for example if it is incompatible with the new firmware.

- The "WRITE ENABLE FIRMWARE" link LK2 must be fitted.
- Connect the PC to the *MX1* programming port J22 with the programming lead.
- Run SmartConfig (by double clicking SmartConfig.exe in Windows Explorer or My Computer).

1. In SmartConfig, click on the "Tools | Program-Firmware" menu headings and select "*MX1*". Browse to and select the particular file to download and click Open. On-screen instructions appear.

2. Follow the instructions given on the PC screen.

   - **Note:** During this process, the *MX1* keyboard activates its sounder. Press **SILENCE BUZZER** to silence the sounder.

3. Once the software download is complete, remove the "WRITE ENABLE FIRMWARE" link and press the *MX1* Controller board "RESET" switch. The *MX1* then restarts automatically.

   Check the display on the terminal emulator, see section 6, or the *MX1* front panel LCD display, to ensure the program runs and the new version is installed.

   As the *MX1* reboots, the following text appears in the Terminal Emulator window:

   ```
   MX1 Vx.xx [Site Name]
   ```

   followed by a request for login name and password.

4. Write the new firmware version on the label of the Flash IC, U1, and in the logbook.

After you update the firmware, it is possible that the site-specific configuration also needs to be updated, MX1 V2.00 requires panel configuration using the latest Smart Config V3.0.0.

If the existing site-specific configuration in the panel is incompatible with the firmware, the following are indicated:

- The LCD displays “No database present. Program *MX1* with a valid database”, and the System Fault and Fault LEDs and the buzzer are on.

- The internal LEDs of the *MX1* show: Fault, A and B on steady and C flashes very slowly, 0.5Hz.

Upgrade the datafile and download it. See section 5.5.

5.4 Upgrading PA1057 LCD/Keyboard Firmware

Updating the firmware in a PA1057 LCD/Keyboard is achieved either by:
- replacing the PA1057 PCB with a new board programmed with the required firmware, see section 7.5, or by
- reprogramming the existing board. Details of this procedure are given below.

5.4.1 Equipment Required

To upgrade the PA1057 LCD/Keyboard application firmware (MCU1), the following items are required:
- SF0361 AVR Firmware Upgrade Kit. This consists of:
  - Atmel AVRISP Module and serial cable
  - Installation instruction sheet
  - Software to perform the upgrade.
- A PC or laptop with Windows 95/98/ME or NT/2000/XP installed.
- New versions of the appropriate software files for the *MX1* on the PC’s hard disc or on a CD. Refer to the ***Fireplace*** or a Johnson Controls representative for the latest versions of these files. See section 1.3.

5.4.2 Procedure

5.4.2.1 Preparation

1. Power down the *MX1* system. Ensure that the power supply module is switched off. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Ensure that the controller board power indicator LD5 is extinguished.

3. Connect the AVR module to J10 on the LCD/Keyboard PA1057 as shown in the instructions.

Connect the AVR module to the PC serial port with the supplied serial cable.
Power up the *MX1* by switching on the *MX1* power supply module. The indicator on the AVR module flashes red then shows green.

5.4.2.2 Download

Run the update software package on the PC. Installation instructions are supplied with the package.

The software version sticker is alongside MCU1 on the LCD/Keyboard pcb. Overwrite the old firmware version number with the new number.

5.4.2.3 Restoration

Power down the *MX1*, see section 5.4.2.1. Disconnect the AVR module from the PA1057 and the PC.

Power up the *MX1* by switching on the *MX1* power supply module. Check that the new version number is displayed on the LCD immediately after startup, before the normal system display is shown.

Reconnect the battery.

5.5 Updating Site-Specific Configurations

The site-specific configuration (datafile) may need to be updated for several reasons:

1. The site configuration changes - for example detectors are added/deleted or occupancy requirements change.

2. A new version of SmartConfig is used with new capabilities or datafile format changes.

3. The *MX1* controller firmware is updated, and the site configuration has not been changed.

4. The *MX1* controller firmware is to be updated and the new features available in the latest template are needed.

Some of these update situations can be handled automatically by SmartConfig, others require you to make some simple updates, while others may require you to make extensive changes or even to completely re-enter the configuration data.

Once the datafile has been tested in the *MX1* and confirmed correct it must be backed up (copy the SmartConfig file) to a central storage location.

Once the datafile has been loaded and verified, information regarding the changes should be noted in the system log book, including the two CRCs applicable to each of the stored databases. These are recallable on the LCD - see section 4.2.

5.5.1 Site Configuration Change

Site configuration changes can be made simply by using the latest version of SmartConfig with the existing datafile, downloading the new configuration to the *MX1* and then testing for correctness.

5.5.2 New SmartConfig Version

New versions of SmartConfig are released from time to time to provide support for new versions of *MX1* firmware.

In general, these new versions of SmartConfig support earlier datafiles unchanged. In some cases though, SmartConfig prompts that certain existing settings are no longer appropriate

and that they must be changed.

The version of *MX1* firmware that the datafile is to be built for and downloaded to, is retained, and the datafile sent to the *MX1* remains compatible with that existing panel/firmware. However, the datafile can be changed to a newer firmware version when the *MX1*'s Controller firmware is updated. When the panel firmware version is changed in SmartConfig the datafile is automatically updated to include new features.

It is important to note that SmartConfig does not automatically update the datafile to match/use any newer templates. In this way, a new version of SmartConfig can generate an identically operating site-specific configuration as did the prior version used.

See section 5.5.5 for the changes SmartConfig makes for specific releases and for any manual changes needed.

5.5.3 *MX1* Controller Firmware Updated

If new *MX1* Controller firmware is installed that is compatible with the installed datafile, no changes must be required to the datafile, and a newer datafile does not have to be downloaded. If desired, the datafile may have its *MX1* version updated to match the new version. This is done by changing the version number on the System page.

If the new *MX1* controller firmware loaded is not compatible with the installed datafile, then the *MX1* does not run until a compatible datafile is loaded.

The older datafile must be loaded into a version of SmartConfig that supports the firmware version to be used and the version number on the System page changed to match the new firmware. SmartConfig automatically updates the older datafile and adds any new configuration defaults needed. As noted in the previous section, SmartConfig does not update the datafile to match the default template for the new firmware version. The updated defaults and the existing logic and substitutions must be carefully checked for correctness. See section 5.5.5 for items that require specific checking.

5.5.4 *MX1* Controller Firmware Updated and New Template Features Required

In response to new firmware features and/or market requirements, new *MX1* templates may be released. These may contain features useful when updating an existing system.

To make use of a new template for an existing system, it is, in general, necessary to start a new datafile using the new template, and copy as much as possible of the existing data into the new datafile. Programming then proceeds manually.

This process must be attempted by experienced SmartConfig users only – those who know the differences between the old and new templates and can translate between them. See section 5.5.5 for the detailed changes between versions.

In general terms the process proceeds as follows:

1. Create a new site-specific configuration using the new template and open the existing configuration, noting it may be updated as explained in section 5.5.2.

2. Transfer, by copy/paste where possible, the applicable zone, point, system and user logic settings from the old configuration into the new configuration. Alternatively, the Merge command can be used in SmartConfig to replace certain data tables in the configuration.

3. Carefully cross check the use of Logic Substitutions in system logic, and correct any errors arising from the use of profiles (e.g. profile names may have been changed). Use the new profiles where possible, but if necessary copy any non-standard zone and point profiles from the old datafile to the new one, and carefully re-check these for correctness.

4. Save the new site-specific configuration, and download it into the *MX1*, updated with its new controller firmware beforehand, if necessary. Thoroughly test the system as if it were a new job.

5.5.5 Specific Checking Required when Updating Site-Specific Configurations

This section describes specific processes, checks and changes required when updating combinations of site-specific configurations and *MX1* Controller firmware.

5.5.5.1 Updating from V1.3X to V1.4X

Existing panels using V1.3X firmware may be upgraded to V1.4X firmware to take advantage of the new features, such as additional Loop Cards, Remote FBP and new LCD commands. If the existing PA1011 controller is retained, then the upgraded system can support at most 3 *MX* Loop Cards and 1000 *MX* devices (lower limits may apply to some versions). Existing gearplates can support at most 3 *MX* Loop Cards, so special drilling and mounting of the *MX* Loop Cards is required if more than 3 are required.

Table 5.5.5.1 shows the steps involved, based on using SmartConfig V2.3.

Table 5.5.5.1 – Upgrading Existing *MX1*

1.	Upgrade the *MX1* Controller (PA1011) firmware to V1.40 or higher. Section 5.3 describes this. OR Purchase a PA1081 *MX1* Controller and replace the PA1011 in the panel. Mounting and wiring is unchanged. Upgrade this to V1.40 firmware if needed. See section 5.3.
2.	Upgrade any existing *MX* Loop Card firmware to V2.02 or higher, or purchase a new *MX* Loop Card (FP0950). Section 5.6 describes the firmware upgrade process.
3.	Upgrade the site-specific configuration to V1.40. Open the datafile in SmartConfig and on the System page change the Panel Version to V1.4X. SmartConfig prompts that it needs to make changes to the datafile – click "Yes, Proceed with Change". SmartConfig updates the datafile to a V1.4 format by including points for the additional *MX* Loop Cards and Remote FBP, plus make some other inclusions. Save the datafile under a new name (so that the old file still exists).
4.	Add any additional *MX* Loop Cards (FP0950). The gearplate has 3 positions – 2 on the RHS fold and 1 in the top left-hand side – if other modules are not fitted there already. If so, special drilling and mounting needs to be done to fit the Loop Cards. Mount and wire to the controller as in the *MX Loop Card Installation Instructions (LT0443)*.
5.	Program the site-specific configuration and re-test as a new system.

5.5.6 Upgrading to *MX1* V1.50 Firmware and SmartConfig V2.4.0

5.5.6.1 General Information about V1.50 Firmware

MX1 V1.50 firmware supports Panel-Link networking and *MX* 850 series detectors and requires SmartConfig V2.4.0.

- **More RAM is used.**
  MX1 V1.50 uses more RAM, memory, than previous firmware so if the panel being upgraded has the older version of the controller board (PA1011) then it is necessary to check whether this needs to be replaced with the new controller (PA1081), which has more memory. This can be done by upgrading the database, see step 3 in section 5.5.5.1, then use the “Check Tables” command (from the “Check” menu) in SmartConfig. This indicates in the “Results” window if a PA1081 controller is needed. If the “ALL OK” result is given then PA1011 can be used. A PA1011 controller with V1.50 firmware and network enabling supports approximately 3 *MX* loops (2 loop cards) and 700 *MX* devices. If networking is not enabled, then the PA1011 controller supports 4 *MX* loops and 1000 *MX* devices.

- **The database must be upgraded**
  MX1 V1.50 does not operate with earlier databases. After installing V1.50 firmware in the panel, the database must be upgraded using SmartConfig V2.4.0, then loaded into the panel.

  SmartConfig V2.4.0 provides support for converting an existing database, however, the older the database, the more manual checking and manual modification may be required.

  The changes made to a V1.4X database, or in addition to those made when upgrading a V1.3X database, are as follows.
  1. System Logic is completely replaced.
  2. Some existing profiles have new entries added.
  3. Some completely new profiles and controller points are added to support networking.
  4. A new equipment number (247) is assigned to support the programming of the other network SIDs that this panel needs to know about.
  5. Some new logic substitutions are added, see section 5.5.6.3.

- **System Logic has changed**
  The System Logic required by V1.50 firmware is significantly different to the System Logic used with previous firmware. When SmartConfig converts the database, *the System Logic is completely replaced* with System Logic suitable for V1.50 firmware. If the System Logic in the existing database had been changed from the default (unlikely - would need to have been deliberately changed), then it is necessary to manually check what the changes were and make the same changes to the System Logic in the converted database if they are still necessary.

5.5.6.2 Procedure for upgrading the database for V1.5X firmware

1. **Install the V1.5X firmware in the panel.**
   When the panel restarts, it won't run the existing database and waits for a new database to be uploaded. The existing database may be extracted from the panel if necessary, using SmartConfig.

2. **Run SmartConfig V2.4 and open the existing database.**
   On the System Page change the "Panel Version" to 1.5X. When prompted, click on "Yes, but save a copy first" so that the original file is saved using a special name. Click Save in the dialog box that appears and SmartConfig converts the database. The database must then be saved using a new name.

3. **Use "Check Tables" on the upgraded database.**
   The "Check Tables" command must be used to check for anomalies in the upgraded database. If any errors are reported, these need to be fixed. SmartConfig may suggest some changes which you are asked to accept. You must click "Yes / accept" for all of these.

4. **Check System Logic.**
   If the System Logic in the original database had been changed from the default, those changes may need to be re-applied to the new System Logic.

5. **Make any other programming changes.**
   For example, enable networking or other new features available in V1.50.

6. **Perform functional testing on the upgraded panel.**
   The upgraded panel must be thoroughly tested. It is recommended that a zone alarm test be done on every zone to ensure that the correct outputs operate and that the alarm is reported/ signalled correctly. A sample of detectors and devices must also be tested.

7. **Record Database details**
   Once the system is operating correctly, make sure that both MX1 databases contain the same file and save this file for safe keeping. Record the CRC in the log book.

5.5.6.3 Check Logic Substitutions

The automatic upgrade process adds a number of new logic substitutions to the end of the list of the existing logic substitutions, unless the logic substitution is already present, in which case the old logic substitution is replaced with the new one.

The names of the substitutions that are added or amended are as follows. The only issue that could arise is if any of these names had already been added by a user to the database (unlikely). This can be checked before doing the software version change.

```
$LOCAL_STROBE_ACTIVATE
$LOCAL_ADA
$CHARGER_FAULT
$BATTERY_FAULT
$FUSE_BLOWN
$POWERUP_FAULT
$MEMORY_FAULTS1
$MEMORY_FAULTS
$FBP_MEMORY_FAULTS
$LOOPCARDS_MEMORY_FAULTS
$LC2_MF
```

```
$LC3_MF
$LC4_MF
$LC5_MF
$LC6_MF
$LC7_MF
$LC8_MF
$SOFTWARE_FAULTS
$LOCAL_AS4428SYSFLT
$LOCAL_PSUFLT
$COMMON_ADA
$CZADALM_INPUT
$CZBRALM_INPUT
$BRALM_INPUT
$BRFLT_INPUT
$BRALM_DELAY_EXPIRED
```

5.5.7 Upgrading to *MX1* V1.60 Firmware and SmartConfig V2.5.0

5.5.7.1 General Information about V1.60 Firmware

MX1 V1.60 firmware supports AS1668/DSS fan controls and the DDM800 and Quad IO modules. It requires SmartConfig V2.5.0 or later for programming.

- **More RAM is used.**
  MX1 V1.60 uses more RAM (memory) than previous firmware so if the panel being upgraded has the older version of the controller board (PA1011) then it is necessary to check whether this needs to be replaced with the new controller (PA1081), which has more memory. This can be done by upgrading the database (see Step 3 in Section 5.5.5.1), then using the “Check Tables” command (from the “Check” menu) in SmartConfig. This indicates in the “Results” window if a PA1081 controller is needed. If the “ALL OK” result is given then PA1011 can be used.

- **The database must be upgraded**
  MX1 V1.60 does not operate with earlier databases. After installing V1.60 firmware in the panel, the database must be upgraded using SmartConfig, then loaded into the panel.

  SmartConfig provides support for converting an existing database, however, the older the database, the more manual checking and manual modification may be required. If the existing database is V1.5X, simply changing the ‘Panel Version’ field on SmartConfig’s System page to V1.60 converts it for use with *MX1* V1.60 firmware.

  The changes made to a V1.5X database, or in addition to those made when upgrading a V1.4X database, are as follows.
  1. A new equipment number (248) is assigned for AS1668/DSS controls.
  2. New profiles added for DDM800.
  3. New profiles for QIO, QMO and QRM modules.

5.5.8 Upgrading to *MX1* V1.70 Firmware and SmartConfig V2.6.0

5.5.8.1 General Information about V1.70 Firmware

MX1 V1.70 firmware provides support for the SIO800 single input/ output device and has a number of other improvements. It requires SmartConfig V2.6.0 or later for programming.

- **More RAM is used.**
  MX1 V1.70 uses more RAM (memory) than previous firmware so if the panel being upgraded has the older version of the controller board (PA1011) then it is necessary to check whether this needs to be replaced with the new controller (PA1081), which has more memory. This can be done by upgrading the database (see Step 3 in Section 5.5.5.1), then using the "Check Tables" command (from the "Check" menu) in SmartConfig. This indicates in the "Results" window if a PA1081 controller is needed. If the "ALL OK" result is given then PA1011 can be used.

- **The database must be upgraded**
  MX1 V1.70 does not operate with earlier databases. After installing V1.70 firmware in the panel, the database must be upgraded using SmartConfig, then loaded into the panel. SmartConfig provides support for converting an existing database, however, the older the database, the more manual checking and manual modification may be required. If the existing database is V1.5X or later, simply changing the 'Panel Version' field on SmartConfig's System page to V1.70 converts it for use with *MX1* V1.70 firmware.

  The changes made to a V1.6X database, or in addition to those made when upgrading a older database, are as follows.
  1. New SID type profiles
  2. New SID Config profiles.
  3. New flame detector profiles with interrupt mode enabled.

- **Mains fail monitoring must be enabled**
  In the user logic it is necessary to uncomment the following two lines by removing the leading semi-colons.
  ```
  ;PP1/0FA = T999
  ;TM999(1440,1)FO = P241/25/0FA
  ```

  The value 1440 must be changed to 90 so that a fault is signalled to the Brigade when mains has been failed for 90 minutes.
  ```
  PP1/0FA = T999
  TM999(90,1)FO = P241/25/0FA
  ```

- **Adjust the System Logic**
  The following equation must be changed from this
  ```
  NETTX-AS4428-SYSFLT = $LOCAL_AS4428SYSFLT
  ```
  to this
  ```
  NETTX-AS4428-SYSFLT = $LOCAL_AS4428SYSFLT OR  BRFLT-NON-MX-POINTS
  ```

  The following equation must be changed from this
  ```
  NETTX-WSSIL = ADDIS-IS-SIL  AND  ADDIS
  ```
  to this
  ```
  NETTX-WSSIL = (ADDIS-IS-SIL  AND  ADDIS)  OR AD-FBP-SIL
  ```

  The System Logic is a "locked" page so to make changes, you need to temporarily uncheck the "Lock" checkbox located on the left-hand side of the SmartConfig window.

5.5.9 Upgrading to *MX1* V1.80 Firmware and SmartConfig V2.9.0

5.5.9.1 General Information about V1.80 Firmware

MX1 V1.80 firmware provides support for the new MX VAD devices - P80SB, P80AVB, P81AVB, P80AVR, and P80AVW. It requires SmartConfig V2.9.0 or later for programming.

- **The database must be upgraded**
  MX1 V1.80 does not operate with earlier databases correctly. After installing V1.80 firmware in the panel, the database must be upgraded using SmartConfig, then loaded into the panel. SmartConfig provides support for converting an existing database, however, the older the database, the more manual checking and manual modification may be required. If the existing database is V1.5X or later, simply changing the 'Panel Version' field on SmartConfig's System page to V1.80 converts it for use with *MX1* V1.80 firmware.

  The changes made to a V1.7X database, or in addition to those made when upgrading an older database, are as follows.
  1. New VAD / VID Sounder profiles
  2. New VAD / VID Beacon profiles.

5.5.10 Upgrading to MX1 V2.00 Firmware and SmartConfig V3.0.0

5.5.10.1 General Information about V2.00 Firmware

1. MX1 V2.00 firmware includes changes like 'DISABLE' key functionality changes as in the AS4428.3:2020 standard.
2. Support for 14 A power supply
3. Database changes for output to the fire alarm signaling function as in the AS7240.2:2018 standard, clause-4.4.8.1.

It requires SmartConfig Plus V3.0.0 or later for programming.

The database must be upgraded
MX1 V2.00 does not operate with earlier databases correctly. After installing V2.00 firmware in the panel, the database must be upgraded using SmartConfig Plus, then loaded into the panel. SmartConfig Plus provides support for converting an existing database, however, the older the database the more manual checking is required, and manual modification to make it compatible with new Smart Config Tool.

5.6 Upgrading *MX* Loop Card Firmware

Updating the firmware in an *MX* Loop Card is achieved either by

- replacing the Loop Card PCB with a new board programmed with the desired firmware (see Section 7.7), or by
- reprogramming the existing board. Details of this procedure are given below.

Prior to updating the loop card firmware, check if there are any changes that require adjustment to settings on the dipswitches. After the updating of the firmware, ensure any necessary adjustments are made.

5.6.1 Viewing *MX* Loop Card Firmware Version

The optional *MX* Loop Card contains firmware in the Flash IC U1. A label near or on this indicates the firmware version installed.

You can view the version number through the LCD by using the *MX* Loop command to display the Loop Card Status, or through the *MX1* diagnostics terminal, see section 6.7.9). For example, for Loop Card 2:

```
main>>dg->lc->ver 2
```

If the loop card is configured and working correctly the display shows the version number, such as Loop Card 2 version = 2.00.

5.6.2 Equipment Required

- PC with FlashSimple installed (available from the ***Fireplace*** website).
- Null-modem serial cable such as programming lead LM0076 or equivalent.

5.6.3 Procedure

- The following file is supplied for a *MX* Loop Card firmware version update: “SF0392_vx.xx.mot”.

- Use the latest release contained in SF0392.ZIP, available from the ***Fireplace***.

While the firmware update is being done, the *MX* Loop Card does not perform its usual communication function with devices in the field. You must take appropriate precautions and notifications to building occupants.

- Run FlashSimple.exe on the PC.
- Click on Flash / Settings. Select H8/3067F, Direct Connection, the serial port that is to be used, 19200, BOOT. OK.
- Click Browse. Select the SF0392_vx.xx.mot file extracted from SF0392.ZIP.
- Connect the serial cable to the PC serial port and to the *MX* Loop Card DIAGNOSTICS PORT (J4). When Loop Cards are tightly packed on their brackets on the gearplate it may be necessary to remove the lower mounting screws and swing the Loop Cards apart to gain access to J4. Be careful to ensure the brackets do not short to the heatsinks on adjacent Loop Cards.
- Fit the jumpers to short the pins for the FIT TO BOOT link (LK2) and the FLASH WRITE link (LK1), and set all dipswitches to OFF. Refer Figure 7-6.
- Reset the *MX* Loop Card using the RESET switch (SW2). This puts the microprocessor into reprogramming mode – the *MX* communication LEDs stop blinking – freezing either ON or OFF.
- On the PC / FlashSimple program, click "Flash Program" to start downloading the new software. Note that while the flash is programmed and verified there are pauses of approximately 1 minute duration at around 24% and 53% as shown on the progress indicator.
- If there is an error, check the PC serial port and its connection to the *MX* Loop Card DIAGNOSTICS PORT (J4) and check that both LK1 and LK2 links on the *MX* Loop Card are inserted and making good contact. Press the Reset button firmly again and then try FlashSimple again.
- When FlashSimple indicates that programming is completed, set the dipswitches to their required settings. Check the release notes for the firmware as it is possible that different settings may be required. Remove the BOOT and FLASH WRITE links and the Loop Card restarts.

- The LEDs flash as the controller polls devices through the loop card and receives their responses; the communication error point (P245.2.7) becomes normal.
- Update the label on U1 on the *MX* Loop Card with the new version number. Make sure that the version number matches the version number displayed through the *MX1* LCD *MX* Loop Command (refer to *MX1* Operator Manual LT0439).
- Re-fit any mounting screws to secure the Loop Card brackets.

5.7 Upgrading AS1668/DSS Fan Control Firmware

5.7.1 Replacement

The firmware on the FP1057 AS1668 Fan Control module cannot be field upgraded. The module must be replaced with one that has the newer firmware version required.

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6 Diagnostic Terminal Operation

6.1 In this Section

Introduction – User Access Rights – Access and Login Procedure – Menu of Commands – Date/Recall Menu – Diagnostics Menu – *MX* Loop Diagnostics Menu (“NX”) – *MX* Loop Card Diagnostics – Using Tandem Mode

6.2 Introduction

The *MX1* provides diagnostic functions through its serial port (J22) with a terminal or PC connected. Commands may be entered that:

- View the history log.
- Display the analogue values, such as raw values, and filtered values, of selected devices.
- Determine the CO expiry status of *MX* detectors with CO sensors.
- Select devices for such display.
- Display and reset error counters.
- Determine all the devices and their types, as seen from each end of the loop.
- Change an addressable device’s address.
- Perform advanced diagnostics.
- Set the time and date.

The *MX1* diagnostic serial port operates at 19200 baud, 8 data bits, no parity, 1 stop bit with Xon/Xoff flow control. A null modem serial cable with a female DB9 connector at each end is needed. This can be ordered as a fully assembled cable using part number LM0076.

Connecting a PC to the *MX1* controller serial port (or other serial diagnostic/ programming ports on the LCD/keyboard or *MX* Loop Card) is likely to generate an earth fault indication. This does not affect system processing, but the fault indication may be transmitted to the remote monitoring centre. The earth fault monitoring can be temporarily disabled to hide this fault before the terminal is connected, see section 4.4, or an RS232 isolator could be used.

To use the colour logging facility an ANSI terminal emulator mode is required.

The terminal built into SmartConfig is recommended as it can automatically share the *MX1* connection between its terminal and its datafile management module. However, other terminal software such as WinComms or HyperTerminal may be used.

6.3 User Access Rights

Depending upon the access rights that have been assigned to the username and password being used, not all menus or menu options shown in this document may be visible.

The user access rights settings are stored in the Date/Recall, Diagnostics, and Tandem settings in the Passwords table in the current datafile.

Generally, all 3 options must be ticked, unless the user is to be limited to specific areas – for example a site manager may have access to just Date/Recall to be able to recall the history and change the time and date.

The Date/Recall option gives access to the Date/Recall menu (see Section 6.6), the Diagnostics option gives access to all the diagnostics menus (see Section 6.7), and the Tandem option allows Tandem Mode access (see Section 6.10).

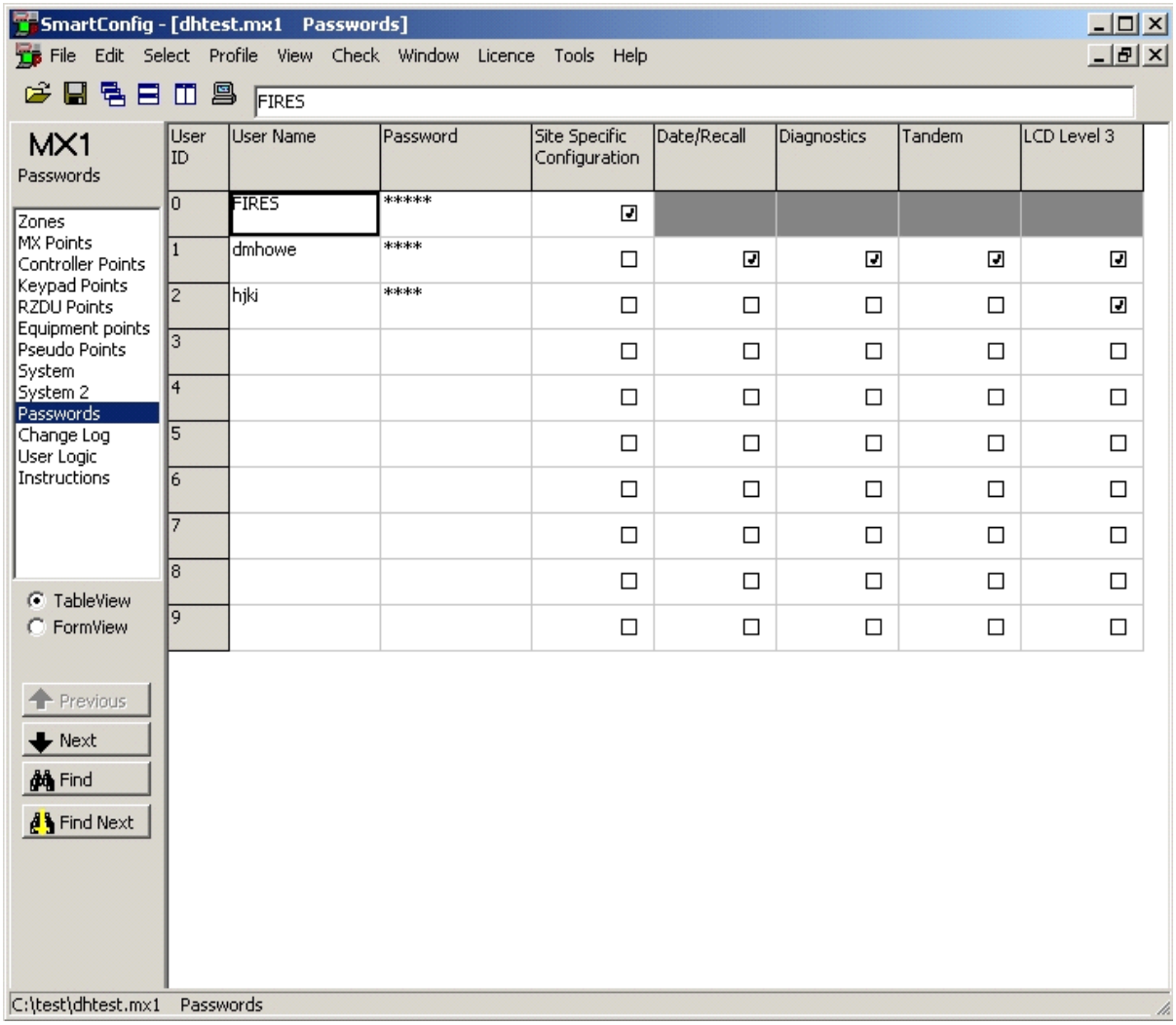
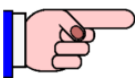


Figure 6-1 – SmartConfig Password Settings

6.4 Access and Login Procedure

6.4.1 Using SmartConfig



It is recommended that the latest version of SmartConfig must always be used.

From Windows, open SmartConfig. (“Start | All Programs | Vigilant | SmartConfig”).

From the File Menu, select “Terminal Window | MX1, MXP(19200)”

A terminal window opens. Select the correct COM port, if needed. To get a login prompt, press [Enter] to raise the prompt. Enter a valid diagnostics username and password as set up in the configuration of the *MX1* panel.

If the username and password are valid, the diagnostics terminal is now active and you can use it as described in section 6.5.

6.4.2 Using WinComms

From Windows, run WinComms and select “SETTINGS | SERIAL” to access the serial port settings.

Configure Serial settings as follows:

- Select the COM port that *MX1* is connected to the computer on
- 19200 Baud
- Data: 8-bits
- Parity: None
- Stop: 1-bit
- select Tx Xon/Xoff
- select Rx Xon/Xoff
- set “Tx Line Delay (msec)” to 0
- unselect “Disassert RTS When not TX”
- click OK.

To get a login prompt, press [Enter]. Enter a valid diagnostics username and password as set up in the configuration of the *MX1* panel.

If the username and password are valid, the diagnostics terminal is now active and you can use it as described in Section 6.5.

6.4.3 Using HyperTerminal

From Windows, run HyperTerminal by double-clicking the executable file, or through the desktop shortcut (if installed).

Configure Serial settings as follows:

- Select the COM port that *MX1* is connected to the computer on
- 19200 Baud
- Data: 8-bits
- Parity: None
- Stop: 1-bit
- Flow Control: Xon-Xoff (note that the HyperTerminal default is “Hardware”, which does not work)

To get a login prompt, press [Enter]. Enter a valid diagnostics username and password as set up in the configuration of the *MX1* panel.

If the username and password are valid, the diagnostics terminal is now active and you can use it as described in section 6.5.

6.5 Menu of Commands

In all menus, to see the menu of commands available, type “H” <Enter>, “HE” <Enter> or “HELP” <Enter>.

“Q” (Quit) terminates the current process, if any, and returns the user to the previous, higher, menu level.

From the main menu, “Q” logs the user out.

Diagnostic Terminal commands are not case-sensitive.

Note: The following message is displayed on logging in if the non-volatile memory IC that stores the zone and point disable states and history is corrupted.

`There was an error restoring NV History. Dump memory and attempt to reset? (Y/N)`

Pressing Y attempts to display the history, then initialise the memory so that it can be used thereafter. Press any key to stop the display. Pressing N leaves the memory corrupted.

Figure 6-2 shows the structure of the most important Diagnostic Terminal menu options.

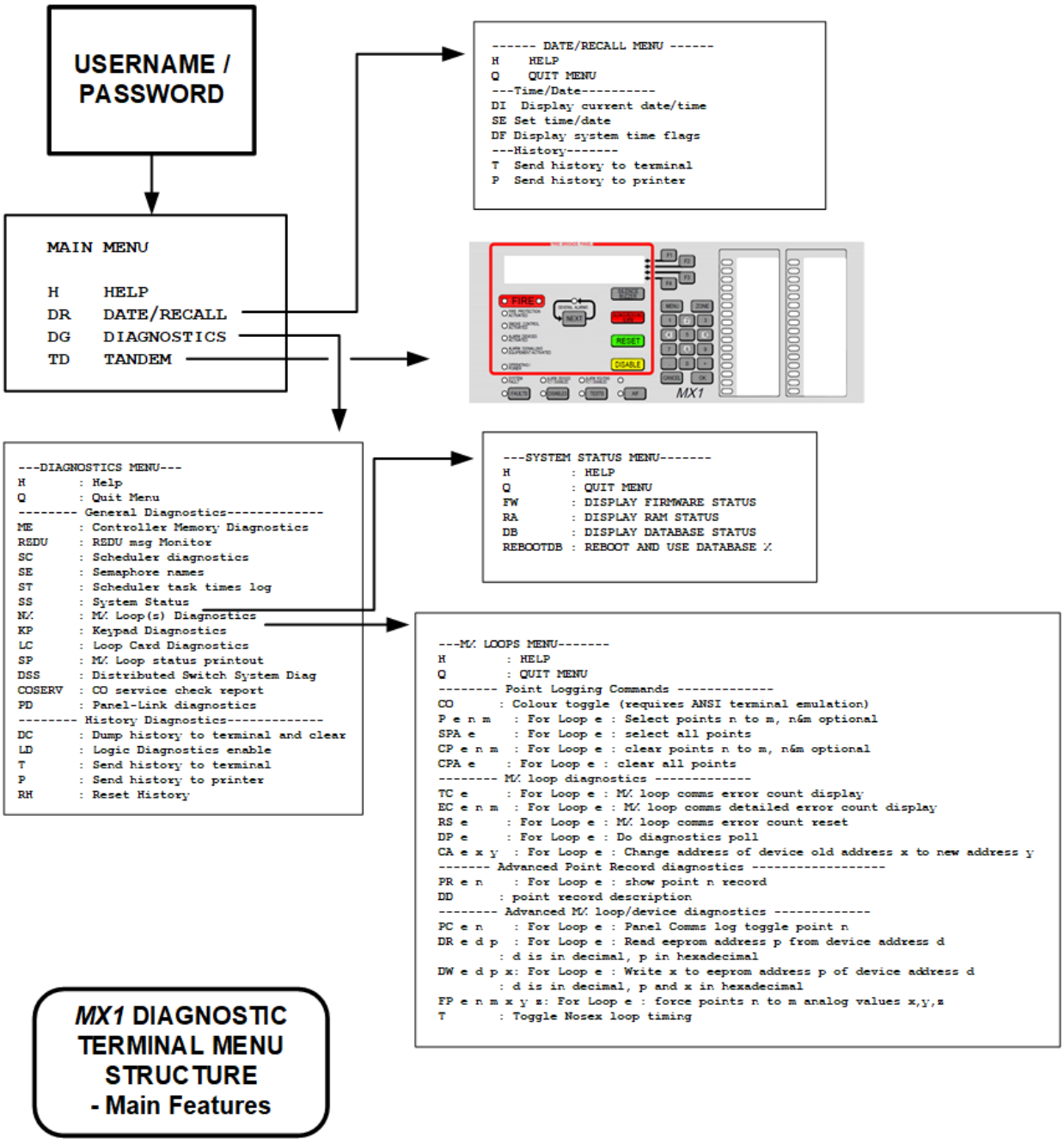


Figure 6-2 – Diagnostic Terminal Menu Structure – Main Options

6.5.1 Main Menu

The following menu is initially shown:

```
***  MX1 Diagnostics [Vx.xx]  ***

---MAIN MENU---------
H   : HELP
DR  : DATE/RECALL
DG  : DIAGNOSTICS
TD  : TANDEM
main>>
```

[Vx.xx] indicates the *MX1* firmware version.

6.5.2 H - Help

Redisplays the Main Menu as shown above.

6.5.3 DR - Date/Recall

The “Date/Recall” menu enables system time and date options to be viewed. It also enables History files to be sent to the terminal or printer. See section 6.6.

6.5.4 DG - Diagnostics Menu

This menu provides technical information about the functioning of the system. See section 6.7 “Diagnostics Menu” below.

6.5.5 TD - Tandem

“Tandem” starts a session of a “virtual” front panel. This menu option is best used in conjunction with PanelX terminal emulator, V3.00 or later, which provides a graphical indication of the *MX1* Keyboard.

See section 6.10.

6.6 Date/Recall Menu

From the main menu enter “DR” <enter>, then “H” <enter>. The following menu appears:

```
***  MX1 Diagnostics [Vx.xx]  ***

---DATE/RECALL MENU---
H     : Help
Q     : Quit Menu
---Time/Date----------
DI    : Display current time and date
SE    : Set time and date
DF    : Display system time flags
--------History------------
T     : Send history to terminal
P     : Send history to printer
date/recall>>
```

6.6.1 DI – Display Current time and Date

This displays the current time and date.

6.6.2 SE – Set Time and Date

Displays the current system clock time and date, and prompts for a new time and date. Empty entries leave the time or date unchanged.

6.6.3 DF – Display System Time Flags

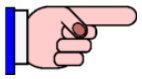
The *MX1* has several logic tokens that change value according to the time of day or the day of the week. This command displays the values of these logic tokens for the current system clock.

6.6.4 T – Send history to terminal

Displays the history on the PC screen, allowing it to be captured for example.

6.6.5 P – Send history to printer

Sends the history to a printer, if any, connected to the *MX1*'s serial port 1.



If no printer is connected, the Diagnostic Terminal program may appear to "hang". If this happens try pressing ESC on the Diagnostic terminal program to regain control, otherwise restart the *MX1* by pressing the SW1 Reset switch on the controller. Check the printer software and hardware settings.

The default printer settings are set by the configuration and are: Xon/Xoff flow control, 8 data bits, no parity, 1 stop bit, 9600bps.

6.7 Diagnostics Menu

From the main menu enter "DG" <enter>, then "H" <enter>. The following menu appears:

```
***  MX1 Diagnostics Vx.xx  ***

---DIAGNOSTICS MENU---
H       : Help
Q       : Quit Menu
-------- General Diagnostics-------------
ME      : Controller Memory Diagnostics
RZDU    : RZDU msg Monitor
SC      : Scheduler diagnostics
SE      : Semaphore names
ST      : Scheduler task times log
SS      : System Status
NX      : MX Loops Diagnostics
KP      : Keypad Diagnostics
LC      : Loop Card Diagnostics
SP      : MX Loop status printout
DSS     : Distributed Switch System Diagnostics
COSERV  : CO service check report
PD      : Panel-Link diagnostics
-------- History Diagnostics-------------
DC      : Dump history to terminal and clear
LD      : Logic Diagnostics enable
T       : Send history to terminal
```

```
P       : Send history to printer
RH      : Reset History
diagnostics>>
```

6.7.1 ME – Memory Diagnostics

This diagnostics menu is intended for use by, or under the instructions of, Johnson Controls RandD staff.

Use of these commands has the potential to cause the system to fail, or to generate nuisance alarm conditions, or to fail to annunciate a real alarm condition.

6.7.2 RZDU – RZDU Message Monitor

Enables monitoring of the communication between the *MX1* and any RZDU repeater panels connected on the RZDU bus.

Sample output:

`RZDU fail counts – 15 0 0 0 0 0 0 0  - counts cleared.` *[Each of these digits corresponds to one of up to eight RZDU units, and indicates the number of times that that unit has failed to respond.]*
`TX  12FF000012000000000100000224OOFF964B` *[LED data transmission from MX1]*
`RX  700000` *[reply from RDU address 0]*

To terminate the RZDU Message Monitor, press any key. Note that the **Escape** key also quits the current menu level.

6.7.3 SC – Scheduler Diagnostics

This diagnostics menu is intended for use by, or under the instructions of, Johnson Controls RandD staff.

6.7.4 SE – Semaphore Names

This diagnostics menu is intended for use by, or under the instructions of, Johnson Controls RandD staff.

6.7.5 ST – Scheduler Task Times log

This diagnostics menu is intended for use by, or under the instructions of, Johnson Controls RandD staff.

6.7.6 SS – System Status

Use “H” <enter> to display the menu.

This menu provides the following commands:

`FW – DISPLAY SOFTWARE STATUS`
Displays software CRC errors (if any) and the internal flash memory CRC.

`RA – DISPLAY RAM STATUS`
Displays RAM errors (if any).

`DB – DISPLAY DATAFILE STATUS`
Displays information about the installed datafiles, as shown below:

```
*Site Specific Datafile Status*

Datafile 1 is active

Datafile 1 checksum is correct.
DB2 Active ID = 109
DB2 CRC = OA31586E         F830
DB2 Version = 00000001

Datafile 1 install details :
PC File C:\Program Files\Vigilant\dhtest.mx1
PC File Date: 12 Jul 2007 4:22:36pm
Created with SmartConfig version 2.0.999.0 10/07/2007 12:28:56 p.m.
Operating System:Windows XP/NT/2000/Vista Version 5.1 Service Pack 2
Datafile downloaded: 12 Jul 2007 4:22:52pm
  By user logged in as:
  Datafile download size: 31751

  Datafile 2 checksum is correct.
  DB2 Active ID = 18
  DB2 CRC = 5555AD00 558D
  DB2 Version = 00000001

  Datafile 2 install details :
  PC File  C:\Program Files\Vigilant\dhtest.MX1
  PC File Date: 12 Jul 2007 4:13:40pm
  Created with SmartConfig version 2.0.999.0 10/07/2007 12:28:56 p.m.
  Operating System:Windows XP/NT/2000/Vista Version 5.1 Service Pack 2
  Datafile downloaded: 12 Jul 2007 4:19:00pm
  By user logged in as:
  Datafile download size: 31748 system>>


REBOOT DB – REBOOT AND USE DATAFILE X
```

Options for “X” are:

- 0 – use neither datafile

WARNING – the system is not operational and does NOT respond to alarm conditions under this option.

- 1 – use datafile 1
- 2 – use datafile 2
- 100 – use oldest datafile
- Any other number (3-99) uses the newest datafile.

Example; `system>>rebootdb 2`

The system reboots through the normal startup and login sequence.

Note that the active datafile can also be selected from the LCD panel of the *MX1*, or by using SmartConfig.

This is used, for example, to restore system operation or update the site-specific configuration.

6.7.7 NX – *MX* Loop Diagnostics

The NX command provides advanced *MX* loop diagnostics. See section 6.8, *MX* Loop Diagnostics Menu.

6.7.8 KP – Keyboard (Keypad) Diagnostics

This menu is intended for use by Johnson Controls RandD staff. It provides information for troubleshooting Keyboard functions.

6.7.9 LC – Loop Card (*MX*) Diagnostics

The LC command provides diagnostic functions for the optional *MX* Loop cards.

The VER command allows the firmware version of a loop card to be retrieved.

The Relay Control Request (RC) command provides a means to isolate one or both ends of its *MX* Loop for diagnostic purposes. A value of 1 forces the *MX* Loop Card to connect to its loop through the left connections only, 2 uses the right connection only, 3 disconnects the loop totally, and 4 connects through both left and right sides. A value of 0 instructs the loop card to resume its automatic management of the loop connections.

In these commands the <LC Id> parameter is the loop card ID, which must be 2 or higher.

```
----- Loop Card Diagnostics -----
HELP                          : H
Quit Menu                     : Q
Software Version Request      : VER <LC Id>
Memory CRC Request            : CRC <LC Id>
Memory Read Request           : MR <LC Id> <HEX ADDRESS> <BYTES NUM>
Memory Write Request          : MW <LC Id> <HEX ADDRESS> <NN> <NN> <NN> ...
Relay Control Request         : RC <LC Id> <RELAY_CONTROL : 1=LEFT_ONLY,
2=RIGHT_ONLY, 3=BOTH_OPEN, 4=BOTH_CLOSED>
```

6.7.10 SP – Status Printout Command

The SP command produces a report on the diagnostic terminal describing the status of all *MX* addressable devices.

The report groups the *MX* devices by zone and displays the following columns of information for each point.

Point	Point number. Only *MX* device sensor points are shown (e.g., LED, remote output points are excluded). A truncated version of the point location text.
Type	Shows the *MX* device type.
Dirty	D is shown if the device is dirty, i.e., contamination is greater than 100% and thus needing cleaning or replacement, blank otherwise. For detectors with CO sensors dirty is shown if the detector has exceeded its service life (ten years less one month have elapsed since manufacture).
Cont%	This shows the level of contamination (0-100%) for those devices that may become “dirty”.
CL	Shows the current level (real-world) value of the sensor. This shows the smoke concentration %/m for photo sensors, the MICX value for Ion sensors, the ppm of CO for CO sensors, the temperature in centigrade for heat sensors and the % of alarm for flame and VLC800MX sensors.
Unit	Shows the units of the current level.
ALG Day	Shows the name of the algorithm profile used in day operation. Typically this describes the detection type, such as Fast Logic Med or AS 1603.1 Type B.
ALG Night	Shows the name of the algorithm profile used in night operation. If blank or none, then the ALG DAY profile is also used at night.

AS (NOM) The alarm sensitivity for the algorithm currently in use (day/night) for the sensor in real world units, such as, %/m, MICX, ppm, °C, % of Alarm. Note for some devices and algorithms, like FastLogic, 801F, this is blank as there is no appropriate fixed real world alarm sensitivity to show.

AS The alarm sensitivity for the algorithm currently in use (day/night) for the sensor in raw *MX* values (0-255).

RAS The Rate of Rise sensitivity in raw *MX* values (0-255).

CV The Current Value of the sensor in raw *MX* values (0-255).

TV The Tracked Value (long term average) of the sensor in raw *MX* values (0-255). Note on some devices, such as 801F, this shows something else.

HH The Historical Highest value of the CV.

HL The Historical Lowest value of the CV.

RORHH The Historical Highest value of the rate of rise of CV.

H% This shows the highest current level expressed as a percentage of alarm, for those devices that support it. For example, on an 814P it is the highest

$$\frac{\text{CV-TV}}{\text{AS}} \times 100\%$$

```
------------------------------------
MX1 Loop Status Report
Severn Network 5
FRI 23/01/09 16:55:08
------------------------------------


Active Database: 1
Active Database CRC: F87FD499    1AAD
Database install details :PC File C:\Templates\Severn Network 5.mx1
PC File Date: 23 Jan 2009 4:50:00pm
Created with SmartConfig version 2.0.999.0     21/01/2009 12:06:48
Operating System:Windows 2000 Version 5.0 Service Pack 4
Data File downloaded: 23 Jan 2009 4:50:12pm
by user logged in as: Joe
Data File download size: 41818


Zone 1

Point               TYPE   DIRTY Cont%  CL   UNIT  ALG DAY      ALG NIGHT    AS(nom) AS    RAS  CV   TV   HH   HL   RORHH H%
2/1/0 Network Cabin 801PC
2/1/1 Network Cabin 801PC           3   00.0 %m    Universal    Resilient       -     180    0  27   27   27   26     0    0
2/1/2 Network Cabin 801PC                 0 ppm   Universal    Resilient        82   200    0  21   22   22   21     0    0
2/1/3 Network Cabin 801PC                24 C     Universal    Resilient        57    57    0  24    0   24   24     0   42

Zone 2

Point               TYPE   DIRTY Cont%  CL   UNIT  ALG DAY      ALG NIGHT    AS(nom) AS    RAS  CV   TV   HH   HL   RORHH H%
2/2/0 Entrance      814PH
2/2/1 Entrance      814PH           0   00.0 %m    FastLogic Me FastLogic Hi     -     -     0  25   27   28   24     0    0
2/2/2 Entrance      814PH                24 C     Type B AS160 Type A AS160     63    63   14  24    0   24   24     0   38
2/3/1 Entrance Tamp MIO800                       N/O Int SC A N/O Int SC A

Zone 3

Point               TYPE   DIRTY Cont%  CL   UNIT  ALG DAY      ALG NIGHT    AS(nom) AS    RAS  CV   TV   HH   HL   RORHH H%
2/3/2 Network Heat  MIO800                       N/O Int SC A N/O Int SC A
2/4/0 Oil Pump Flam 801F
2/4/1 Oil Pump Flam 801F                  0 %Alm  801F(Ex) Dev 801F(Ex) Dev    -       0    0   0  141    0    0     0    0
```

Figure 6-3 – Example of SP Status Printout

6.7.11 DSS – Distributed Switch System Command

The DSS command provides diagnostic functions for the optional AS1668/DSS control boards installed. These commands are created for engineering purposes or for use under the direction of Johnson Controls RandD.

6.7.12 COSERV – CO Service Check Report Command

This command outputs a CO service check report to the terminal. All detectors that have a CO sensor are listed with their loop number, address, device type, manufacture date, service alert status, and service critical status.

Service alert status is active if more than nine years have elapsed since detector manufacture. Detectors with this status soon needs to be replaced.

Service critical status is active if more than ten years less one month have elapsed since detector manufacture. Detectors with this status must be replaced immediately.

```
CO Service Check Report as at Fri 20 Sep 2013
                              Manufacture    Service    Service
Loop   Address   Type         Date           Alert      Critical
1       56       814CH        01 Jan 2003    Y          Y
1       100      850PC        01 Aug 2013
```

Figure 6-4 – Example of CO Service Check Report Printout

6.7.13 PD – Panel-Link Diagnostics

The Panel-Link diagnostics can be used to show messages sent and received on the network.

The spacebar can be used to pause/ resume message monitoring. Exiting the PD menu does not stop the monitoring. Exiting the main menu does stop the message monitoring. Monitoring of messages received is turned on/ off with the “R” command and the “T” command is for monitoring transmitted messages. If messages are being sent or received at a fast rate, some messages may not appear in the diagnostics output. There is also a sub-menu “NEC” which is used to show system wide network error counters.

1. ER – shows and resets diagnostic error counts and total received messages, for example. Includes quart and SCI port errors –framing, and overrun.
2. RS – select which SIDs to do receive monitoring for.
   RS 0 selects all SIDs.
   RS xxx - monitor SID xxx only, plus other SIDs for which RS xxx has been done.
3. RA – select which applications to do receive monitoring for.
   RA 256 - monitor all applications.
   RA xx 0 - don’t monitor app xx
   RA xx 1 - do monitor app xx
4. TA - select which applications to do transmit monitoring for – as for receive.
5. N - turn all monitoring off
6. R - toggle receive monitoring on / off
7. T - toggle transmit monitoring on / off
8. SS - display current monitoring selections.
9. ST - toggle show time with every message.
10. NEC - selects the Network Error Counters menu – described below.

<u>Network Error Counters menu</u>
I-HUBs and *MX1* panels maintain a set of network error counters. The “ER” command (described above) can be used to show the network error counters for the local *MX1* panel. The following commands can be used to show the network error counters for all panels (including the local panel) that can receive application six broadcasts from this panel. On the I-HUB diagnostic terminal, there is an option to display the network error counters for the local I-HUB. The following commands can be used to show the network error counters for all I-HUBs that can receive application six broadcasts from this panel.

GS - get SID (*MX1*) error counters
CS - clear SID error counters

GI - get I-HUB error counters
CI - clear I-HUB error counters
DC - display error counters
DA - display all counters
DS xxx - display error counters for SID xxx

During the output of data to the terminal for the following commands, the SPACE key can be used to pause / resume the output.

1. GS – get SID error counters
   Broadcasts a “request SID error counters” message using the command / control application six. Currently the only devices which respond to this message are *MX1* panels. It counts the number of responses that are received and indicates if any SID responded twice (this would indicate a duplicate SID). When you think all responses have been received, press any key to show the error count data that has been received. Only non-zero errors are shown. If you want to see the totals (non errors) of messages sent and received by that SID you can next use the DA or DS commands. You can use the DC command to display the error counts last received at any time.

2. CS – clear SID error counters.
   Broadcasts a “clear SID error counters” message using the command / control application six. Currently the only devices which respond to this message are *MX1* panels. It counts the number of responses that are received and indicates if any SID responded twice (this would indicate a duplicate SID).

3. GI – get I-HUB error counters.
   Broadcasts a “request I-HUB error counters” message using the command / control application six. Only I-HUBs respond. It counts the number of responses that are received and indicates if any SID responded twice (this would indicate a duplicate SID number). When you think all responses have been received, press any key to show the error count data that has been received. Only non-zero errors are shown. If you want to see the totals (non errors) of messages sent and received by a specific I-HUB you can next use the DA or DS commands. You can use the DC command to display the error counts last received at any time. An I-HUB that uses a borrowed SID number sends its response using the borrowed SID number.

4. CI – clear I-HUB error counters
   Broadcasts a “clear I-HUB error counters” message using the command / control application six. Currently the only devices which respond to this message are I-HUBs. It counts the number of responses that are received and indicates if any SID responded twice. This would indicate a duplicate SID.

5. DC – display error counters
   Re-displays the error counter data that was received by the last GS or GI command.

6. DA – display all counters
   Displays the error counter and totals data that was received by the last GS or GI command. This displays all data, including totals and counters that have a value of zero.

7. DS xxx – display error counters for SID xxx.

6.7.14 DC – Dump History to Terminal and Clear Command

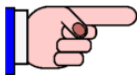
Dump raw history data in hexadecimal format to the terminal, then clears the history in the non-volatile memory.

6.7.15 LD – Logic Diagnostics Enable Command

This diagnostics command is intended for use by, or under the instructions of, Johnson Controls RandD staff.

6.7.16 T, P Commands

Use the T and P commands to display the history file through the diagnostic terminal or through the printer port (serial port 1) respectively.



If no printer is connected, the Diagnostic Terminal program may appear to "hang". If this happens try pressing ESC on the Diagnostic terminal program to regain control, otherwise restart the *MX1* by pressing the SW1 Reset switch on the controller. Check the printer software and hardware settings.

6.7.17 RH – Reset History Command

Resets (clears) the non-volatile panel history, that is, the history of events as shown by the T and P commands of the Diagnostics menu.

6.8 *MX* Loop Diagnostics Menu ("NX")

6.8.1 Menu and Commands

These diagnostic commands:

- show information from each polled addressable device
- enable problems with the *MX* loop devices to be identified and resolved
- show communication and other errors
- enable loop devices to be checked.

Note the TC and EC commands – these must be checked as a matter of course with new installations and during annual testing, and are detailed in sections 6.8.7.1 and 6.8.7.2 respectively.

The *MX* Loop Diagnostics is accessed from the Diagnostics Menu with the command "nx". The following menu appears:

```
***  MX1 Diagnostics Vx.xx.xxxx  ***
     ---MX LOOPS MENU-------
     H        : HELP
     Q        : QUIT MENU
     -------- Point Logging Commands -------------
     CO      : Colour toggle (requires ANSI terminal emulation)
     P e n m   : For Loop e : Select points n to m, n&m optional
     SPA e     : For Loop e : select all points
     CP e n m  : For Loop e : clear points n to m, n&m optional
     CPA e    : For Loop e : clear all points
     -------- MX loop diagnostics -------------
     TC e     : For Loop e : MX loop comms error count display
     EC e n m  : For Loop e : MX loop comms detailed error count display
     RS e     : For Loop e : MX loop comms error count reset
     DP e     : For Loop e : Do diagnostics poll
     CA e x y  : For Loop e : Change address of device old address x to new address y
     ------- Advanced Point Record diagnostics ------------------
     PR e n    : For Loop e : show point n record
     DD      : point record description
```

```
-------- Advanced MX loop/device diagnostics -------------
PC e n    : For Loop e : Panel Comms log toggle point n
DR e d p  : For Loop e : Read eeprom address p from device address d
          : d is in decimal, p in hexadecimal
DW e d p x: For Loop e : Write x to eeprom address p of device address d
          : d is in decimal, p and x in hexadecimal
FP e n m x y z: For Loop e : force points n to m analog values x,y,z
T         : Toggle Nosex loop timing
RD e      : For Loop e : Relay diagnostics
```

Advanced Point Record diagnostics and Advanced *MX* loop/device diagnostics are intended for use by Johnson Controls RandD staff, and are beyond the scope of this manual.

6.8.2 Colour Logging

Where an ANSI-compatible terminal emulator is used, colour logging may be selected with the "CO" command to make the displayed log clearer. Green is used for heat sensors, yellow for photo sensors, magenta for CO sensors, cyan for ionisation sensors, and white for ancillaries. A brown/yellow background is used for values in fault, a green background for values in prealarm, and a red background for values in alarm.

6.8.3 Selecting Points for Monitoring and Display

Before the *MX1* can display analogue values received from points, the user must select the points to be monitored. This is done using the following commands from the *MX* Loop menu:

`SPA e`	Adds all points to the list of points to be monitored.
`SP e nnn`	Adds point nnn to list.
`P e nnn`	Adds point nnn to list
`SP e nnn mmm`	Adds points nnn to mmm.
`P e nnn mmm`	Adds points nnn to mmm.
`CPA e`	Clears all points from monitoring list.
`CP e nnn`	Clears point nnn from list.
`CP e nnn mmm`	Clears points nnn to mmm from list.
`SP`	Displays all points selected to be monitored.

"e" refers to the loop number (1-8). The values nnn and mmm must be in the range of 1-250.

Note that if more than about 50 points are monitored at once, the diagnostic terminal may be flooded with information and some data may be discarded.

When finished monitoring be sure to deselect all points ("cpa"). Monitoring a large number of points may have a detrimental effect on processing time, resulting in sluggish performance by the *MX1*, for example, slower Keyboard response or slower panel response to alarm conditions. Therefore, unless extended monitoring is required, enter the "cpa" command before disconnecting the laptop.

Exiting the menu with **Esc** or **Q** also disables logging.

6.8.4 Displaying Device Analogue Values - CV, TV

When you select points for display, the *MX1* displays at least one line for each selected point, each time the point replies to a poll, or sends an interrupt message.

For those devices with multiple sensors, for example 814PH or 814CH with both sensors configured, multiple lines are displayed, one for each sensor – for example, one line for temperature and another line for smoke or CO.

An example line of the displayed values is

```
T=165; P= 1.2; HEAT= 20; Fl= 20; SL= 20; RoR= 0; SLRoR= 0
```

"T=xxxx" refers to the time in seconds since the *MX1* was powered up.
"P=xxx" shows the sensor's loop and device numbers in the format loop device.

The format is designed to be both human readable and suitable for capturing and importing into a spreadsheet. In the latter case, it is suggested that "delimited" text import is used, with "=" and ";" being used as delimiters.

Also displayed is a status line for each point displaying a number of Sx = xxxx fields. These show the internal status conditions of the point and are for Johnson Controls RandD use. For each of the following types of sensors, the processing algorithm selected for the sensor in SmartConfig affects the format and meaning of parts of the display.

6.8.5 Expected Analogue Values

"Normal" values for any given type of sensor or call point may vary according to the conditions prevailing at that particular installation, as well as the settings which have been selected during installation. For example, prevailing local atmospheric conditions determines the values normally returned by an ionisation sensor, and wiring characteristics may influence the precise values returned by an input module.

For this reason, a precise indication of expected values or ranges cannot always be given. Where possible, likely ranges for each type of device are indicated below. Refer to the manufacturer's data for more detailed information about specific loop devices, and to the Profiles menu in SmartConfig to view the ranges set for the installation at hand.

The following values and ranges represent typical readings to be expected from new detectors. The values shown are "raw" values on a scale of 0-255, and are processed by the *MX1* using algorithms that compensate for contamination.

The raw values for any particular detector can be viewed by using:

- *MX1* Diagnostic Terminal (SP command), or
- Raw Point display on the *MX1* LCD.

Expected Clean Air Values				
Sensor Type	**Minimum Clean-Air Value**	**Typical Value (New Sensor)**	**Maximum Clean-Air Value**	**Notes**
Photo (850P/850PH)	10	**15-35**	56	Value increases as sensor becomes dirtier.
Photo (814P/814PH)	10	**20-35**	56	Value increases as sensor becomes dirtier.
Photo (850PC)	10	**10-35**	56	Value increases as sensor becomes dirtier.
CO (814CH)	10	**20-40**	50	-
CO (850PC)	10	**15-35**	40	-
Ionisation	15	**50-90 in clean still air**	120	Value: • decreases with airflow.

				• may increase as sensor becomes dirtier. • increases with altitude and varies according to prevailing atmospheric pressure.
Heat	See Section 6.8.6.5			

Expected Values for Flame Detectors				
Model	**Minimum Tracked Value (TV)**	**Typical Value (New Sensor)**	**Maximum Tracked Value (TV)**	**Notes**
801F/801FEx	112	130-150	165	None
S271f+/S271i+/ FV411f/FV412f/ FV413f	60	65-75	80	None

Interpretation of this raw data for each type of detector is shown in the following examples. Unless otherwise indicated, the values shown were recorded under “normal” indoor conditions.

6.8.6 Example Device Displays

6.8.6.1 Carbon Monoxide Sensor (8xxCH, 8xxCHEx, 8xxPC)

Algorithm; SmartSense

T=165; P= 1.2; CO= 25; Cal= 25; TV= 30; CV-TV= -4; SL-TV= -4;

Algorithm; Count of 3

T= 107; P= 1.46; CO= 27; Cal= 27; TV= 29; ACnT=0/3; PCnT=0;

“CO=xxx” gives the raw value received from the detector (0…255), typically 15 to 40 in clean air.

“Cal=xxx” gives the “calibrated” value (the raw value adjusted to compensate for the varying outputs of different detectors with the same CO level).

“TV=xxx” gives the tracked value (or long term average pedestal). This is the value that is assumed to be the output of the detector with no CO present. (Note that as this value is measured in the factory, stored in the detector and then not subsequently adjusted, it is constant for each detector.)

“CV-TV=xxx” gives the filtered calibrated value less the zero CO value (TV). CV-TV is the value that is compared to the threshold to decide if a prealarm exists.

“SL-TV=xxx” gives the filtered and slope limited value less the zero CO value (TV). SL-TV is the value that is compared to the threshold to decide if an alarm exists.

Refer to the Carbon Monoxide Sensor profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.2 CIM800 **Contact Input Module**

```
T=229; P= 1.5; CIM A=90; B=89;
```

“CIM A=xx; B=xx” gives the raw values for the two supervised circuits.

Refer to the CIM800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.3 CP820/CP830/MCP820/MCP830 Call Point

```
T=539; P= 1.99; CP820= 225;
```

The value the MX call point device name is shown equalling is the raw value received from the call point.

Refer to the call point profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.4 CP840Ex Call Point

```
T= 790; P= 1.38; CP840Ex= 0;
```

“CP840Ex=xxx” gives the raw value received from the call point.

Refer to the CP840Ex profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.5 Heat Sensor (8xxH/PH/CH/HEx/CHEx/PHEx/PC)

Algorithm: Smart Sense

```
T= 71; P= 1.46; HEAT=17; Fl= 17; SL= 17; RoR= 0; SLRoR= 0;
```

“HEAT=xxx” gives the raw value received from the detector converted to °C.

“Fl=xxx” gives the filtered temperature (CV) in °C. This is the value that is compared to the threshold to decide if a prealarm exists.

“SL=xxx” gives the filtered and slope limited temperature (SLV) in °C. This is the value that is compared to the threshold to decide if an alarm exists. This item is not displayed if there is no fixed temperature alarm configured, for example if the heat sensor is used only to enhance the smoke or CO sensor.

Rate-of-Rise (RoR)

“RoR= xx” gives the rate of rise in °C/minute. This is the value that is compared to the threshold to decide if a rate of rise prealarm exists, and the value that is used to enhance smoke or CO processing. This item is not displayed if there is no rate of rise alarm configured and there is no enhancement of smoke or CO.

“SLRoR= xx” gives the slope limited rate of rise in °C/minute. This is the value that is compared to the threshold to decide if a rate of rise alarm exists. This item is not displayed if there is no rate of rise alarm configured.

RoR is disabled, so not displayed, if the profile in use has the threshold set to 0.

Algorithm: Count of 3

```
T= 71; P= 1.46; HEAT=17; Alm Ctr= 0; PreAlm Cntr=0;
```

“HEAT=xxx” gives the raw value received from the detector converted to °C.
“Alm Ctr” = xxx shows Alarm count status.
“PreAlm Ctr” = xxx shows Prealarm count status

These counters increment for each poll where the measured value exceeds the threshold, and decrement for each poll where the measured value is less than the threshold.

Note that the number of counts for alarm is normally 3, but switches to 10 when a sudden large increase in level is measured. This is because this sudden increase is a typical nuisance alarm scenario.

Refer to the Heat Sensor profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.6 Photo Sensor (8xxPH, 8xxxPHEx, 8xxP, 8xxPC)

Algorithm: Fast Logic

```
T=96; P= 1.5; OPT= 26 Cal= 26; TV=27; Fzy Mode=Medium; Result=0;
```

Algorithm: Smart Sense

```
T= 171; P= 1.5; OPT= 26; Cal= 27; TV= 25; CV-TV= 0; SL-TV= 0;
```

Algorithm: Count of 3

```
T= 86; P= 1.5; OPT= 27; Cal= 27; TV= 27; ACnT=0/3; PCnT=0;
```

“OPT=xxx” gives the raw value received from the detector (0 … 255), typically 15 to 35 in clean air.

“Cal=xxx” gives the “calibrated” value (the raw value adjusted to compensate for the varying outputs of different detectors with the same smoke level).

“TV=xxx” gives the tracked value (or long term average pedestal), that is, the value that is assumed to be the output of the detector in clean air.

“Fzy Mode=xxxx” refers to the Fast Logic sensitivity selected in SmartConfig.

“Result = 0” gives the FastLogic result that can be interpreted as follows:

< 64	= Normal
64 to 127	= Prealarm
>128	= Alarm

“CV-TV=xxx” gives the filtered calibrated value less the clean air value (TV). “CV-TV” is the value that is compared to the threshold to decide if a prealarm exists.

“SL-TV=xxx” gives the filtered and slope limited value less the clean air value (TV), and is the value that is compared to the threshold to decide if an alarm exists.

“ACnT= 0/3” alarm counter is zero, 3 counts are required for alarm.

“PCnt= 0” prealarm count is 0.

These counters increment for each poll where the measured value exceeds the threshold, and decrement for each poll where the measured value is less than the threshold.

Note that the number of counts for alarm is normally 3, but switches to 10 when a sudden large increase in level is measured. This is because this sudden increase is a typical nuisance alarm scenario.

6.8.6.7 Ionisation Detector 814I

Algorithm; Smart Sense

```
T=165; P= 1.20; ION= 74; TV= 74; CV-TV=  0; SL-TV=  0;
```

Algorithm; Count of 3

```
T=93; P= 1.23; ION= 82; Cal= 82; TV= 82; ACnT=0/3; PCnT=0;
```

“ION=xxx” gives the average of the two raw values received from the detector (0...255), typically 50 to 90 in clean still air. The “ION” value is affected by the dirtiness of the sensor; at the point where ION=(“Dirty Limit”-10) the sensor is in fault. “Dirty Limit” is set in Profiles in SmartConfig.

“CAL=xxx”: For ionisation detectors the calibrated value (CAL), if shown, is always the same as the averaged raw value (ION).

“TV=xxx” gives the tracked value (or long term average pedestal). This is the value that is assumed to be the average of the two detector sensors in clean air.

“CV-TV=xxx” gives the filtered calibrated value less the clean air value (TV). CV-TV is the value that is compared to the threshold to decide if a prealarm exists.

“SL-TV=xxx” gives the filtered and slope limited value less the clean air value (TV). “SL-TV” is the value that is compared to the threshold to decide if an alarm exists.

“ACnT=0/3; PCnT=0” these counters increment for each poll where the measured value exceeds the threshold, and decrement for each poll where the measured value is less than the threshold.

Note that the number of counts for alarm is normally 3, but switches to 10 when a sudden large increase in level is measured. This is because this sudden increase is a typical nuisance alarm scenario.

6.8.6.8 IF800Ex Input Module

```
T=19874; P= 1.61; IF800Ex= 0;
```

“IF800Ex=xxx” gives the raw value received from the input monitor.

Expected value ranges are; Normal 0-50, Fault 51-150, Alarm 151-255.

6.8.6.9 MIO800 Multi Input Output Module

```
T= 1794; P= 1.244; MIO A=xxx; B=yyy; C=zzz.
```

“A=xxx” gives the raw value for the module input B1, “B=yyy” gives the raw value for the module input B2, and “C=zzz” gives the raw value for the module input B3.

Refer to the MIO800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.10 MIM800 Mini Input Module

```
T=165; P=1.21;  MIM=100;
```

“MIM=xxx” gives the raw value received from the module.
Refer to the MIM800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.11 MIM801 Mini Input Module

```
T=63; P=1.1;  MIM801=3;
```

“MIM801=xxx” gives the raw value received from the module.

Refer to the MIM801 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.12 S271i+, S271f+, FV411f, FV412f, FV413f Flame Detector

```
T=790; P=1.38;  S271= 68;
T=790; P=1.38;  FV41X= 68;
```

“S271= xxx” or “FV41X=xxx” gives the value received from the flame detector.

Refer to the flame profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.13 801F and 801FEx Flame Detector

```
T=65; P=1.130; 801F CV=0 TV=143
```

“CV” is the current value received from the flame detector, “TV” shows the current fault level.

6.8.6.14 SAB801

```
P=247 S0=0000 S1=0000 S2=0000 S3=0000;
```

This is not an input device and returns no meaningful input data other than being polled and replying.

6.8.6.15 SAM800

```
P=8 S0=02000 S1=02000;
```

This is not an input device and returns no meaningful input data other than being polled and replying.

6.8.6.16 VLC800 VESDA Laser Compact High Sensitivity Smoke Detector

```
T=1694; P=1.212; VLC= 0; DI= 0xe3; Normal Normal
```

“VLC=xxx” gives the raw value received from the detector.

“DI=0xaa”; “aa” gives the digital inputs coded in hexadecimal, where
bit 0 = "urgent fault"
bit 1 = "any fault"
bit 2 = "all faults serviceable"
bit 3 = "filter fault"
bit 4 = "walk test"

Bits 5, 6 and 7 have no meaning.

“Normal” and “Normal” give the state of the first and second point respectively. Possible states are “Normal”, “PreAlarm” and “Alarm”.

Refer to the VLC800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.17 DDM800 Universal Fire and Gas Detector Module

```
T=16416; P=2.1;  DDM800 DI=224; AI0= 22; AI1= 22; AI2=251;
```

DDM800 DI=iii; AI0=xxx; AI1=yyy; AI2=zzz. “xxx” gives the raw value for the module input one, “yyy” gives the raw value for the module input two, and “zzz” gives that raw value from supply monitoring. “iii” is the value of the digital inputs – a change in this value can indicate a fault or be superfluous.

Refer to the DDM800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.18 DIM800 Detector Input Module

```
T=1334; P=1.125; DIM A= 26; B= 26; Supply=198;
```

DIM A=xxx; B=yyy; Supply=zzz. “xxx” gives the raw value for the module input A, “yyy” gives the raw value for the module input B, and “zzz” gives that raw value from supply monitoring.

Refer to the DIM800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.19 RIM800 Relay Interface Module

```
T=1334; P=1.24; RIM=224;
```

“RIM=xxx” gives the digital inputs to the module ASIC, converted to an integer. The only bit of use is the least significant bit - the number must be odd if the relay is activated, and must be even if it is not activated.

6.8.6.20 SNM800 Sounder Notification Module

```
T=1334; P=26; SNM=255, 3;
```

“SNM=xxx, yyy”; “xxx” gives the raw value for the EOL monitoring (when the relay is de-activated), and “yyy” gives the raw value for the power supply monitoring.

Refer to the SNM800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.21 LPS800 Loop Powered Sounder Driver

```
T=1334; P=1.27;  LPS=151, 78;
```

“LPS=xxx, yyy”; “xxx” relates to the voltage at the + terminal. “yyy” relates to the voltage at the – terminal.

Refer to the LPS800 profile in use for the point to determine analogue value ranges and their meanings.

6.8.6.22 QIO850 / QMO850 / QRM850 Quad Ancillary Modules

```
T=7138; P=1.41;  QRM850 RlyStuck1-4= OK, OK, OK, OK; Isol= OK; AuxSupply= OK;

T=7138; P=1.42;  QIO850 In1-4=153,153,153,153;
T=7138; P=1.42;  QIO850 RlyStuck1-4= OK, OK, OK, OK; Isol= OK; AuxSupply= OK;

T=7138; P=1.43;  QMO850 MonOut1-4=125,125,125,125;
T=7138; P=1.43;  QMO850 RlyStuck1-4= OK, OK, OK, OK; Isol= OK; AuxSupply= OK;
```

For the QIO850 “In1-4=xxx,xxx,xxx,xxx” is the raw values from the QIO850 inputs one through four respectively.

For the QMO850 “MonOut1-4=xxx,xxx,xxx,xxx” is the raw values from the QMO850 output monitoring for outputs one through four respectively.

For all the modules, “RlyStuck1-4=xxx,xxx,xxx,xxx” is the relay stuck monitoring status for output relays one through four. “Isol=xxx” is the status of the MX line isolator for the module. “AuxSupply=xxx” is the status of the module auxiliary supply monitoring. For all these common statuses, in place of “xxx”, “OK” signifies a normal status, whilst “Flt” indicates a fault status.

6.8.6.23 SIO800 Single Input/Output Module

```
T=4022; P=1.1;  SIO In=153; RlyStuck= OK
```

“In=xxx” is the raw value from the single SIO800 input.

“RlyStuck=xxx” is the relay stuck monitoring status for the output relay. In place of “xxx”, “OK” signifies a normal status, whilst “Flt” indicates a fault status.

6.8.6.24 P80SB, P80AVB, P81AVB, P80AVR, P80AVW VADs

```
T=4022; P=1.1;   VAD=XXX
```

“VAD=xxx” is the raw value from the device input.

6.8.7 *MX* Loop Card Diagnostics

6.8.7.1 TC Command (Total Counts)

This command gives the number of device failures and powerups of all addressable devices on a specific *MX* loop. See the EC command to get values broken down to individual devices.

For loop 1;

```
>>tc 1
Transmit echo reception fail count 0
Total reply fail count 191
Total rx noisy count 0
Total device powerups 18
```

"1" specifies the *MX* loop number.

"Transmit echo reception fail count 0" must always read zero on the *MX1* system.

"Total reply fail count" increments when a device does not reply to a poll, but has not already been deemed to have failed. When a device is removed this value increments by 12. This value is cleared when the *MX1* powers up and may also be cleared with the RS command.

If the reply fail count increments by more than a few counts in 24 hours, the reason must be investigated.

"Total Rx noisy count" reports noise that may interfere with *MX* loop communications. This value is simply for diagnostic use. This count is incremented whenever the reply-time for one or more devices exceeds a preset length.

If the line is noisy for too long and the *MX1* is unable to communicate with the loop at a sufficient rate, point 241.26.4 (or 245.x.4 for Loop x) goes into fault. The fault state is automatically cleared by the *MX1* 30 minutes after communications are restored.

"Total device powerups" increments when a device powers up. This must normally increment by one for each device when the loop first powers up, and by one each time a detector is plugged into a base with the loop powered up. If it increments at other times it is indicative of a problem which requires investigation. This value is set to zero when the *MX1* is reset or powers up.

6.8.7.2 EC Command (Error Counts)

Use this command to access statistics about the communications performance of each *MX* loop.

This command gives the total error counts for the specified loop as does the TC command, but it also gives the reply fail counts for individual devices, and an indication of whether each device is deemed to be in "scan fail". These individual counts are cleared when the *MX1* powers up, and may also be reset with the RS command.

This command is also useful to determine which points are configured and what their type is.

```
mxloop>>ec 1
       Transmit echo reception fail count 0
       Total reply fail count 4
       Total rx noisy count 9
       Total device powerups 0
```

```
Individual reply fail counts...
Point   1       MIM800,     0
Point  20       MIM800,     0
Point  32        814CH,     0
Point 101       MIM801,     2
Point 135        814PH,     0
```

"1" specifies the *MX* loop number (1-8). "Point xx" refers to the address of the device.

Note that "Total reply fail count" may increment in normal operation, and this does not necessarily indicate a fault.

6.8.7.3 RS Command (Reset)

This command resets (sets to zero) all the counters displayed by the TC and EC commands.

6.8.8 Logging Analogue Values to a File

If required, detector values may be logged to a file and imported to a spreadsheet program such as Excel. The procedure, when using SmartConfig, is as follows:

- Open Diagnostic Terminal and log in.
- Navigate to the *MX* Loop Diagnostics menu ("dg ->nx").
- Select the required points for logging. Detector data begins to scroll.
- Press the Capture button located near the centre of the Diagnostic Terminal toolbar. Save the file when prompted to do so.
- Allow the data to be displayed, then click the End Capture button on the SmartConfig toolbar.
- In Windows, navigate to the file, right-click on it and use the "Open As" option to open the file using the spreadsheet program. The file can then be formatted using the program's internal formatting facilities.

6.8.9 DP Command (Diagnostic Poll)

This command lists all the devices currently found on a specific *MX* loop (irrespective of the *MX1* programming) by issuing commands to each side of the *MX* loop (left and right) to request all devices identify themselves. Thus it can be used to find what devices are present on the *MX* loop and which devices are found from each end, if the loop is broken or short circuit isolators have opened. This can help identify which section of the loop cable is broken or shorted.

Do not use the DP command when the *MX* Devices Poll command is being used on the front keyboard.

It can also be used with SmartConfig to pre-configure all of the *MX* devices found on each *MX* loop into the SmartConfig configuration. Capture the DP command results to a file (or copy to the clipboard) and use the Import *MX* Points command to load the points into SmartConfig.

The command lists devices found at any address including illegal addresses 0 and above 250. If two or more devices are present with the same address they are usually detected, however their replies may collide, resulting in neither being detected. As a result, a second attempt is made on each line to maximise the chance of locating multiple devices with the same address. It is possible the device type reported for a duplicate device may be an older device type that a new device emulates.

The number following the DP command selects which *MX* loop to use.

The following is an example DP command with the loop open circuit, a foreign device at address 0, and the wrong device type at 250.

```
mxloop>>dp 1
Diagnostic Pollscan for loop #1 - will start in a few seconds

Scanning LEFT line...
Scanning RIGHT line...

Results:
Adr.  Dev. Type  Present On  Notes
  0:      814I   RIGHT  Unsupported Address (0 or >250)
  1:      814PH  LEFT
  2:      814PH  LEFT
  3:      814PH  LEFT
  4:      814PH  LEFT
  5:      814PH  LEFT
  6:      814PH  LEFT
  7:      814PH  LEFT
  8:      814PH  LEFT
  9:      814PH  LEFT
 10:      814PH  LEFT
 11:      814PH  LEFT
 12:      814PH  LEFT
 13:      814CH  LEFT
240:      814CH  LEFT
241:      814H   RIGHT
242:      814H   RIGHT
243:      814H   RIGHT
244:      814H   RIGHT
245:      814H   RIGHT
246:      814H   RIGHT
247:      814H   RIGHT
250:      814P   RIGHT  Type Mismatch

Diagnostic Pollscan for loop #1 ended
```

The DP command notes as foreign any devices which are found and are not configured in the active datafile. However, it does not display devices which are configured but not found. Other messages may be given, for example Duplicate Device, Unknown Type, Used as Heat only, Used as MIM, Type Mismatch.

6.8.10 CA Command (Change Address)

The change address command can be used to change the address of a single device, the second number, on an analogue loop to a new address, the third number. If devices are added one at a time, this command can be used to assign each address instead of using the *MX* 801AP or *MX* 850EMT service tools. New devices from the factory normally have an address of 255.

Both new and old addresses may be any number greater than 0 and up to 255. The old address can also be 0. In the following example, device 20 on loop 1 is readdressed to 100.

```
>>ca 1 20 100
Re-address device 20 to 100 ?y
Verify OK
```

The *MX1* configuration is not altered by this command.

If there is no device with the old address, or if there is already a device with the new address, an error message is displayed and the change is not made.

Normal polling resumes when the command is completed.

Note that where a new loop is being installed or a large number of new devices are being added to an existing installation, the *MX* 801AP or *MX* 850EMT service tools can be used instead of the CA command.

6.9 *MX* Loop Card Diagnostics

The documentation and use of the diagnostic commands on the *MX* Loop Card is beyond the scope of this manual. These commands must only be used under the guidance of Johnson Controls RandD staff.

6.10 Using Tandem Mode

PanelX provides an onscreen graphical representation which is an instance of the *MX1* Keyboard and LCD and operates independently of the physical keyboard and LCD. This can be used to remotely control the *MX1*.

MX1 Tandem mode requires PanelX V3.0 or later, configured with suitable connection parameters. Refer to the PanelX help file for settings and considerations. Also required is an *MX1* username and password combination for which Tandem mode access is enabled. See fig. 6-1.

Once successfully connected, a user can operate the *MX1* using the onscreen keyboard/ display.

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7 Hardware Replacement

7.1 In this Section

General – Fuses – PA1081 Controller – PA1057 LCD/keyboard – PA1020 Zone Display – *MX* Loop Card – LCD Module – Power Supply Module – Keypad Replacement – I-HUB Intelligent Hub – PIB Panel-Link IP Bridge – AS1668/DSS Control Board – Other Modules

7.2 General

The basic *MX1* cabinets contain several different PCBs and a power supply module. All of these contain many surface-mounted components, and in the case of damage, it is impossible to carry out any field repair work on these PCBs. Other than replacing blown fuses, a faulty board or module must be replaced with a known good unit.

This section of the manual details the replacement of fuses and the removal and replacement of the PCBs and power supply module.

None of the *MX1* modules may be disconnected or re-connected with power applied, therefore it is necessary to completely power the panel down when replacing any modules.

Some components on the *MX1* PCBs can be damaged by electrostatic discharge (ESD) during handling. Leave any replacement PCB in its ESD packaging until ready to fit into the *MX1* cabinet. Wear an ESD wrist-strap connected to the *MX1* cabinet earth point while handling the PCBs.

When replacing any modules of the *MX* before starting:

1. Ensure the system is isolated from the brigade and that the appropriate persons, such as brigade, key holders, and building management, are advised the system is out of service.
2. Once all the changes and tests have been completed re-enable the brigade connection and advise the appropriate persons that the system is back in service.

7.3 Fuses

There are five fuses on the *MX1* Controller. These protect the several 24 V supplies from the controller to ancillary devices such as tone generators, door holders and strobes.

All fuses fitted must be 3A slow-blow types. Do not fit 5 A or heavier fuses, since these do not reliably blow to protect the system from wiring faults.

All fuses are individually supervised and the *MX1* gives a fault indication if any fuse blows.

There are no user-replaceable fuses in the power supply module, LCD/keyboard and *MX* Loop Card.

7.4 PA1081 Controller

This is the PCB that is most directly connected to the outside world, and hence is the most likely to sustain damage from environmental effects such as lightning, wiring faults or AC power system faults.

Note the newer PA1081 controller may be used to replace an earlier PA1011 controller, but the PA1081 must use the A version if firmware V1.3X was installed in the PA1011. For example, V1.33A must be used in the PA1081 to replace a PA1011 controller with V1.33.

7.4.1 Parts, Equipment and Information Required

1. Replacement PA1081 PCB.

2. A copy of the *MX1* datafile for the site.

3. A PC or laptop with SmartConfig installed. SmartConfig is used to load the site-specific datafile into the controller through the serial DIAG/PROG port.

4. LM0076 or other null modem serial cable.

7.4.2 Preparation

Before going on-site, verify that the replacement PCB has been loaded with the correct version of *MX1* firmware for the site installation. The firmware version label fitted to the PCB may not be correct. In general, the latest version of firmware must be loaded.

It may be more convenient to verify and, if necessary, update the firmware and load the site datafile before going on-site. This can be done on the bench if a 24 V supply or battery is available:

1. Connect the PC COM port to the DIAG/PROG port on the controller using the null-modem cable. Run the terminal program on the PC and set the COM port settings to 19200 bps, 8 data bits, 1 stop bit. See section 6.4 for details of terminal software configuration.

2. Connect the 24 V supply or battery to the battery terminals of the controller.

3. The green BATT CONN and POWER indicators on the controller light, and the yellow LED C indicator flashes.

4. A message with the *MX1* firmware version number should appear on the PC terminal as the controller starts up. If this number is not the correct version, the *MX1* firmware must be changed to that required. See section 5 for details on downloading new firmware into the controller.

5. Once the firmware version is confirmed, the site-specific datafile can be loaded into the controller using SmartConfig. See section 4 and to the SmartConfig Manual for details of this procedure. For a new PCB, the default datafile username and password (of “FIRES” and “FIRES”) must be used (both uppercase).

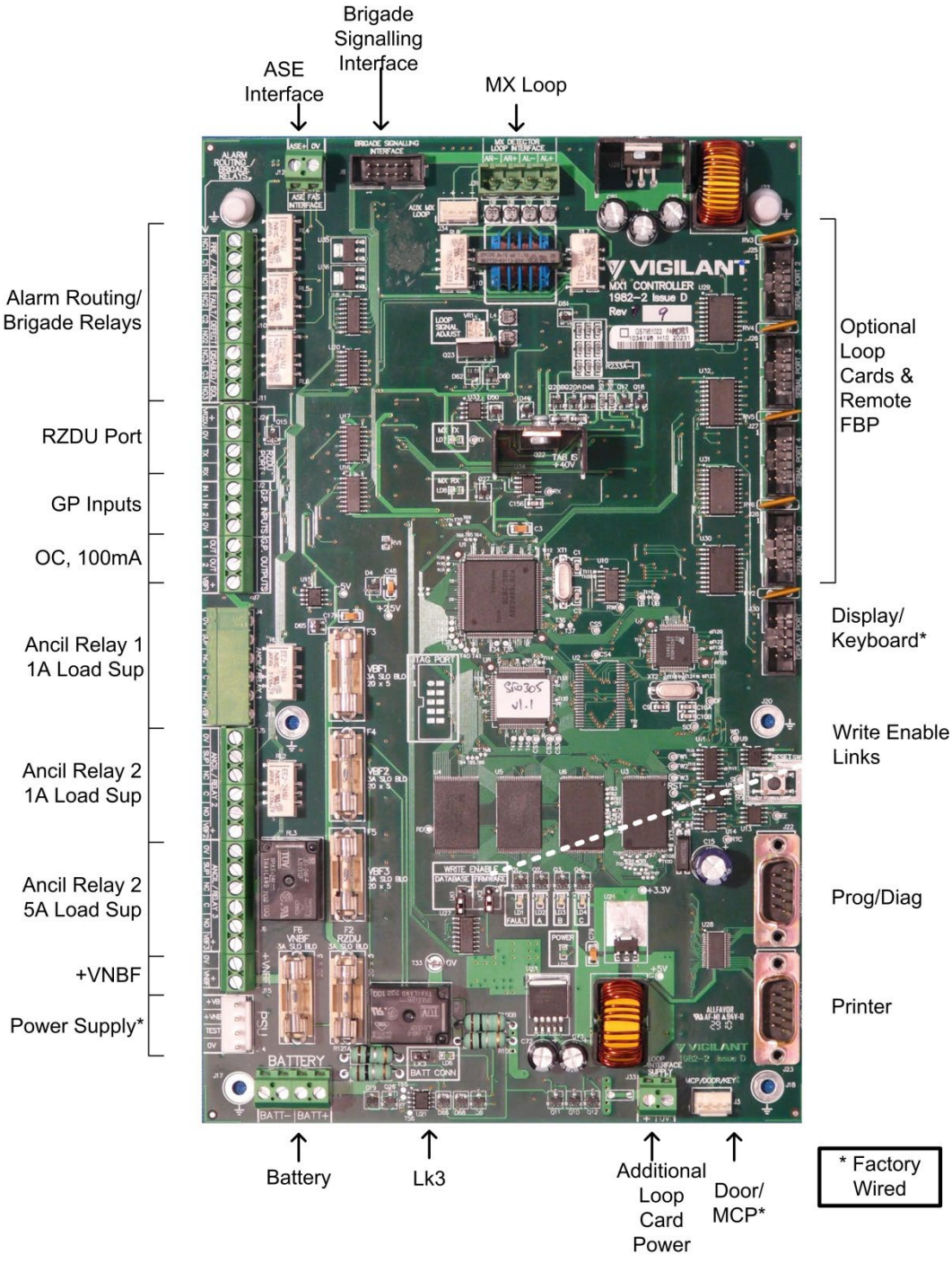


Figure 7-1 – PA1081 *MX1* Controller PCB

Note: The image of PA1081 with the issue and rev numbers is a representative of the MX1 Controller PCBA. The actual PA1081 in the MX1 panel may be a newer version.

The MX1 Controller Interfaces are unchanged.

7.4.3 Removal and Replacement

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other parts inside the cabinet while disconnected.

2. Power down the *MX1* using the switch for the power supply module and unplug the power supply loom from J14 on the controller.

3. Disconnect the field wiring from the screw terminals on the left and top edges of the controller. It may be helpful to label the field wiring with terminal numbers/names, or copy or print Figure 7-2 and record field wiring details on this copy, to assist in reconnecting the field wiring.

4. Unplug the Doorswitch/MCP loop from J3 and the LCD/Keyboard loom from J30. If there are looms plugged into other communication ports on the right edge of the controller, remove these also.

5. Undo the six M3 screws holding the controller PCB to the gearplate and lift it out. Place it in an ESD shielded bag for protection.

6. Remove the replacement controller from its ESD wrapping and fit it to the gearplate. Be particularly careful to avoid damage to components on the underside of the board while installing it. The mounting screws are an important part of the earthing and protection of the controller. Ensure that all six are refitted and tightened.

7. Re-connect the looms and field wiring to the correct connectors and terminals. **Do not re-connect the battery yet.** Powering the system up on the power supply module alone limits any fault currents from incorrect wiring to a safe level.

8. Switch on the power supply module and allow the *MX1* to start up. The front panel display shows the correct version of firmware.

9. If the site datafile was not already loaded into the replacement controller, there are probably many fault indications. Use a PC with SmartConfig to load the correct datafile and make this file active. See section 4 for details of doing this.

10. Carry out any necessary tests to ensure that the system is operating correctly. When these are complete, reconnect the battery, and check that the system is normal.

11. Advise the appropriate people that the system is back in service.

7.4.4 Link Settings

BATT CONN.	Forces the Battery Cutout to connect the battery to the charger. LD6 lights when the battery is connected. This link does not need to be connected for more than a few seconds, if at all, unless a very heavily discharged battery is connected, or no battery is connected.
WRITE ENABLE	
DATAFILE	Enables changes to the system configuration when fitted.
FIRMWARE	Enables updates to the system software (firmware) when fitted.

7.4.5 Internal Controls

SW1 – RESET - restarts the system immediately.

7.4.6 Internal Indicators

LD1 – FAULT	"On-steady" indicates fault.
LD2 – A	Not currently assigned.
LD3 – B	Flashes once for every complete cycle of logic equation processing. Slower flash indicates a more heavily loaded system.
LD4 – C	0.5Hz flash indicates normal processing. 1Hz flash indicates that no datafile is installed.
LD5 – POWER	"On" indicates controller has power applied.
LD6 – BATT CONN	On indicates the battery is connected to the PSU and panel.
LD7 – MX TX	Flashes green as data is transmitted to *MX* devices on the in-built *MX* loop.
LD8 – MX RX	Flashes green as data is received from *MX* devices on the in-built *MX* loop.

Note that the operation of LD2-3 can be controlled by logic equations. The actions listed here are the defaults.

7.4.7 Test Points and Voltages

Controller PCB test points and corresponding test voltages are indicated on the PCB overlay (refer Figure 7-2). Under normal conditions these voltages fall within the ranges listed in the following table. Readings outside this limit indicate a fault in the controller board. There is no adjustment or field repair possible, other than replacing the controller.

Supply	Supporting Condition	Range
+V	+VBF or Batt+ in range 19.2-28.8V	19.2 to 28.8V
+5V	+V supply in range	4.9 to 5.1V
+3.3V	5 V supply in nominal range	3.22 to 3.38V
+2.5V	5 V supply in nominal range	2.45 to 2.55V
+40V	+ V supply in range, 0 – 0.9A load on *MX* loop	39.0 to 41.0V
-5V	+ V supply in range	-4.8 to -5.2V

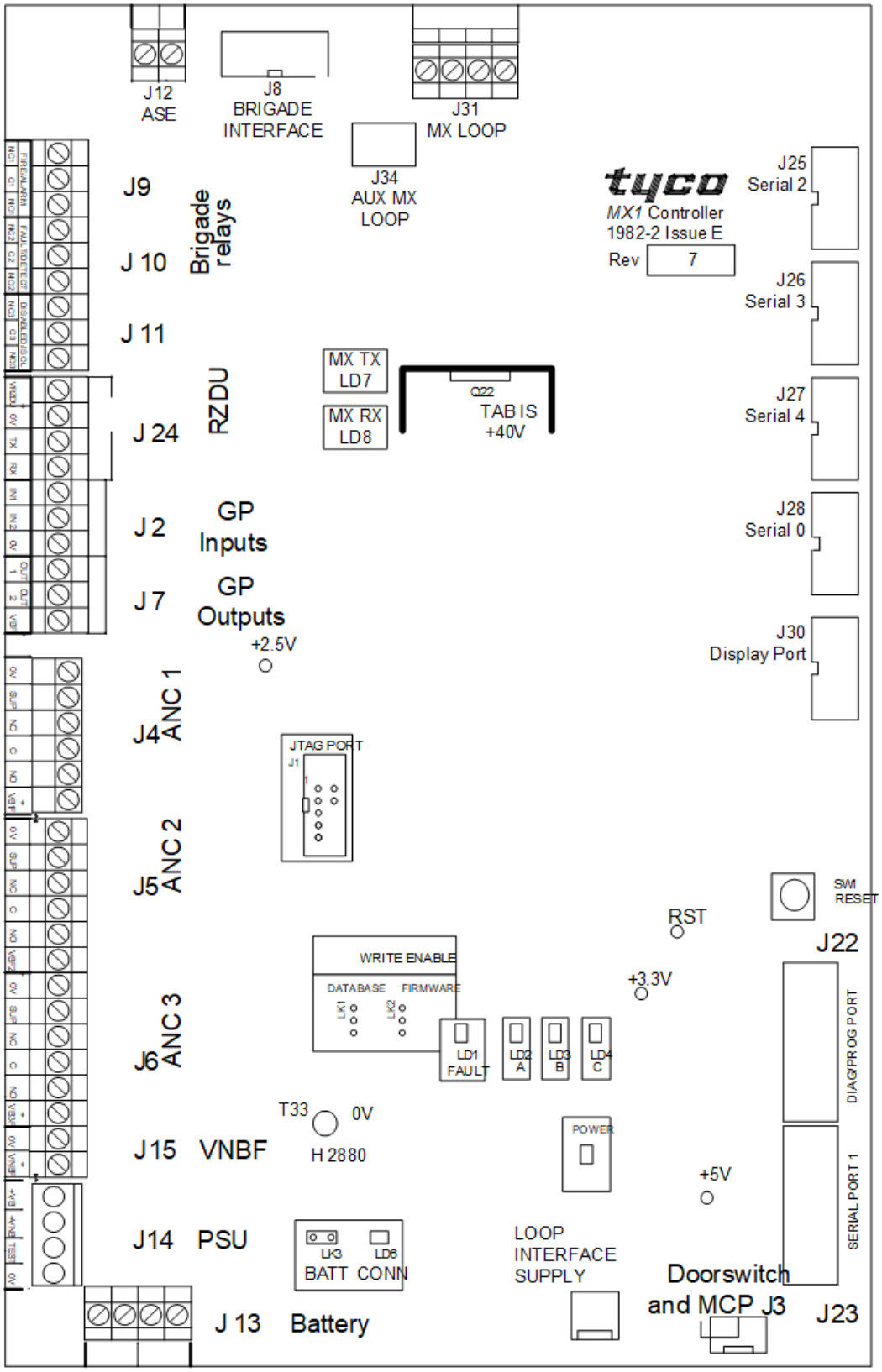


Figure 7-2 – Outline of PA1081 *MX1* Controller PCB

7.5 PA1057 LCD/Keyboard

7.5.1 Requirements

Replacement PCB, part number PA1057.

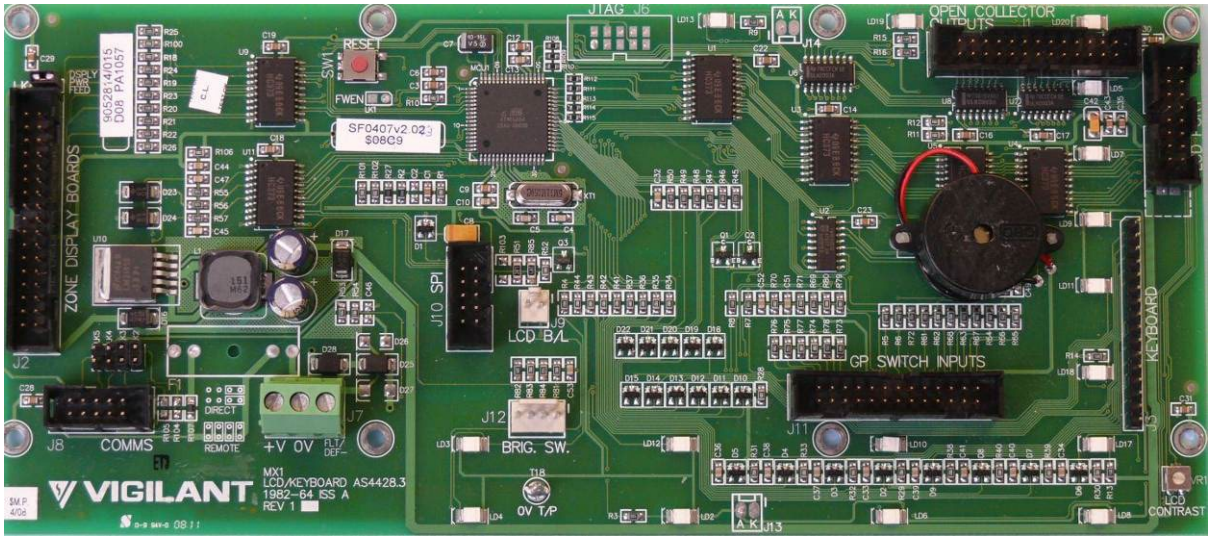


Figure 7-3 – PA1057 *MX1* Keyboard PCB

7.5.2 Preparation

Before replacing the PA1057, check that LK2, LK3 are in the correct position on the replacement (Section 7.5.4). It is worth checking the firmware version number on the replacement PCB against the latest version of LCD/Keyboard firmware. It is desirable but not essential that the LCD/Keyboard firmware is up to date.

If the version is not current, check Hardware and Software Releases, in Section 9.2 and 9.13 respectively, which list known incompatibilities with hardware variants. Section 5.4 describes how to upgrade the PA1057 firmware.

7.5.3 Removal and Replacement

See figure 7-4 for the location and function of the various connections.

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Power down the *MX1* using the switch for the power supply module.

3. Unplug the loom from connector J8 on the LCD/Keyboard.

4. Unplug the other looms connected to the LCD/Keyboard.

5. Undo the eight short M3 screws holding the PCB to the door, and lift it clear.

6. Fit the new PCB to the door and fasten it in place.

7. Replace all the looms to the corresponding connectors on the new PCB, not forgetting the LCD backlight and the keyboard tails.

8. Power up the *MX1* using the switch for the power supply module.

9. Check that the LCD/Keyboard starts correctly and that there are no unexpected fault indications. The LCD contrast control VR1 is factory set and must not be adjusted. Refer Section 7.5.5.

10. Reconnect the battery and check all faults are cleared.

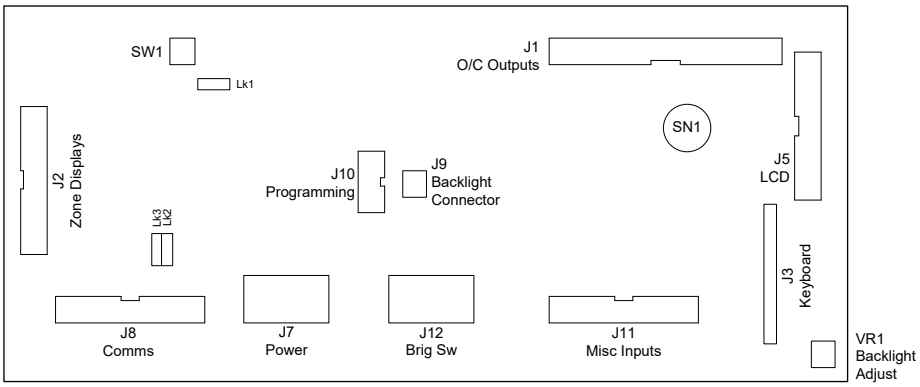


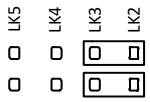
Figure 7- 4 – Outline of PA1057 *MX1* LCD/Keyboard PCB

7.5.4 Links

PA1057 has two field-configurable links.

Configuring for *MX1* Panel

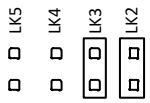
When the PA1057 is installed in the *MX1* panel LK2 and LK3 need to be fitted as DIRECT (horizontally).



DIRECT

Configuring for Remote FBP

When the PA1057 is installed in the Remote FBP LK2 and LK3 need to be fitted as REMOTE (vertically).



REMOTE

7.5.5 Internal Controls

VR1 controls the brightness/contrast of the LCD display. It has no other effect on the operation of the *MX1*.

VR1 is factory-set to have 0.9 V on its wiper. This provides a compromise setting which makes the LCD readable even at the extremes of the *MX1*'s temperature ratings. If necessary, this setting can be checked with a voltmeter by measuring the voltage between the 0V Test Point near the centre bottom edge of the board and the wiper joint on the upper side of VR1 on the bottom right corner of the board. Be careful not to short the wiper of VR1 to the nearby mounting screw. If necessary, adjust VR1 "LCD CONTRAST" on the LCD/Keyboard PCB as shown in figure 7-5 until the measured voltage is in the correct range.

Note if VR1 is adjusted to give good contrast at the normal operating temperature, this may not give good visibility at the extremes of temperature operation.

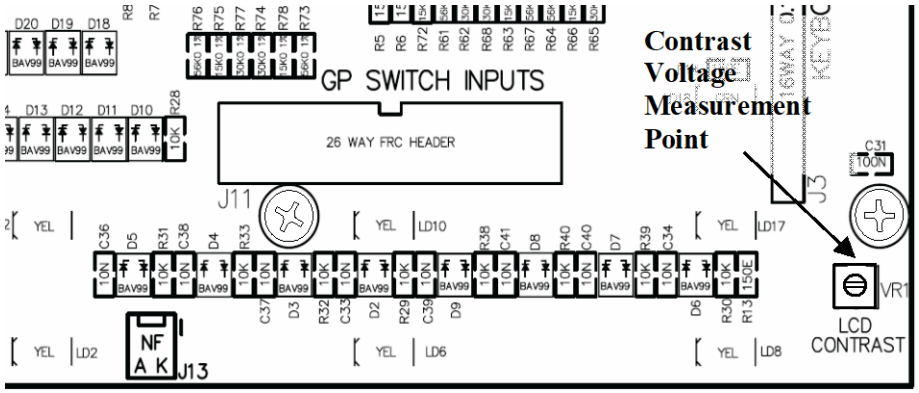


Figure 7-5 – Contrast Voltage Measurement Point

7.5.6 Internal Indicators

Piezo sounder SN1.

Refer to LT0439 *MX1*-Au Operator Manual for a list of buzzer cadences and their meanings.

7.6 PA1020 Zone Display

This is a simple PCB with no connections outside the cabinet. It is unlikely to develop a fault unless by direct mechanical damage, or by inadvertent connection/disconnection while powered up.

7.6.1 Requirements

The replacement PCB (PA1020) is obtained by ordering the 16 Zone Display Extender kit (part number FP1002). This is an extension kit that comes with an interconnecting 26-way FRC loom, which is not usually required for repair work.

7.6.2 Preparation

There is no preparation of the replacement PCB required.

7.6.3 Removal and Replacement

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Power down the *MX1* using the switch for the power supply module.

3. Replace the faulty Zone Display PCB if doing a repair, or add the new PCBs if doing an extension. Refit the 26-way FRC looms to the zone displays. Observe the “From Previous” “To Next” connection arrangement from the LCD/keyboard to the furthest Zone Display. The furthest zone display shows the zone 1 indication.

4. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.

5. Perform a Display Test (refer to LT0439 *MX1*-Au Operator Manual) from the front panel to verify that the new/replacement PCBs are working correctly.

7.7 *MX* Loop Card

7.7.1 Requirements

The replacement PCB (PA1052) is obtained by ordering the *MX* Loop Card Kit (FP0950). This is an extension kit that comes with interconnecting 10-way FRC looms, suitable mounting hardware, and power wiring, and which is not usually required for repair work.

It also includes detailed instructions, *LT0443, MX Loop Card Installation Guide*, for setting up and installing the loop card.

Figure 7-6 – *MX* Loop Card

7.7.2 Preparation

Note the settings of the dipswitches and links LK1 and LK2 on the existing card. Refer Figure 7-6. Replicate these settings on the replacement card.

Do not change the LOOP SIGNAL ADJUST setting.

7.7.3 Removal and Replacement

Note that the Loop Card connectors for J2 and J3 and for J1 and J6 are physically identical. Label the cables or plugs to ensure that they are returned to the correct sockets on the new card.

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Power down the *MX1* using the switch for the power supply module.

3. Disconnect all wiring from the old card.

4. Undo the M3 screws holding the *MX* Loop Card Bracket in place. Lift the bracket and PCB clear.

5. Install the new PCB and replace the screws.

6. Replace the wiring to the cards. Verify that the connectors have been fitted correctly before proceeding. Reconnect the power lead between J6 (loop card) and J33 (Controller).

7. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.

7.7.4 Setup and Testing

Check that the loop card is operating correctly (and all other Loop Cards).

- LD3 status LED is double-flashing
- The *MX1* does not show a scan fault for the card
- All the devices on the loop are communicating correctly, i.e., none are in Device Fail.

7.8 LCD Module

This is a simple PCB with no connections outside the cabinet. It is unlikely to develop a fault unless by direct mechanical damage.

7.8.1 Requirements

Replacement module kit, part number FP0913. This kit contains a replacement LCD module, 16-way FRC loom, LCD protector, and detailed installation instructions in LT0347, *MX1* LCD Module Install Instructions. Note, different versions of LCD module could be supplied, refer to the appropriate details on the *Installation Instructions (LT0347)*.

7.8.2 Preparation

No preparation of the replacement module is required.

7.8.3 Removal and Replacement

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Power down the *MX1* using the switch for the power supply module.

3. Unplug the 16-way FRC loom from J2 and the 2-way backlight loom from J9 of the LCD/keyboard PCB.

4. Undo the four-barrel nuts holding the LCD module in place and lift it clear.

5. If necessary, remove the clear LCD protector window and fit the replacement part.

6. Fit the replacement LCD module according to the supplied installation instructions. **Don't forget the nylon washers under the barrel nuts** - in some versions of the LCD module, the barrel nuts can contact PCB wiring if the washers are not fitted, leading to earth faults and other faulty operation.

7. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.

8. Check the LCD contrast. See section 7.5.5.

7.9 Power Supply Module

This section contains all the information needed to use the 5A PSE ME0448 with MX1 base panels

Refer the *LT0685 Manual Rev 1.20* for installation of a new 14A PSE in MX1 BTO panels.

7.9.1 Requirements

Replacement power supply module, part number ME0448.

MX1 panels have used two different arrangements of PSU – the first uses the complete ME0448 unit in its aluminium chassis, and the second uses just the PSU "brick" and circuit board contained within the aluminium chassis. The replacement procedure depends on which version is fitted in the *MX1* panel.

The small printed circuit board and the brick PSU mounted inside the ME0448 cover are not

separately replaceable.

7.9.2 Preparation

The *MX1* is fitted with an internal mains socket. No preparation is required.

The termination of the mains cable into the mains outlet inside the *MX1* and at the distribution board must be done by a suitably qualified electrician. If the mains cable is routed inside the cabinet, the outer sheath of the cable must be maintained unbroken until after the cable enters the mains outlet. The PSU module power lead plugs into the mains outlet.

After replacing the power supply module, use the operator menu to display the power supply voltage and current on the front panel (refer to the *MX1* Operator Manual LT0439 for this procedure). Section 3.4 of this manual describes adjusting the battery charger voltage.

7.9.3 Removal and Replacement

The *MX1* system must be powered down during replacement of the power supply module.

1. Disconnect the batteries from the controller board. Switch off the power supply module and unplug it from the mains.

2. Remove the DC wiring loom from J14 of the *MX1* Controller.

3. Refer to the Installation Instructions that come with the ME0448 PSU – LT0537 – to remove the existing PSU and prepare and fit the replacement.

4. Fit the new DC loom to J14 on the controller.

5. Plug the power supply module into the mains outlet and switch it on.

6. Check the green OPERATING/POWER LED on the front panel is on steady. Also check the power supply voltages and currents – See section 3.4.1.

7. Reconnect the batteries to the controller board.

7.10 Keypad Replacement

7.10.1 Requirements

The keypad on the 15U cabinet can be replaced by using:

ME0464 MECH ASSY MX1 4U DOOR C/W KEYPAD

Instructions for an *MX1* 4U door replacement are contained in LT0466.

7.10.2 Removal and Replacement

This involves removal of the old door, careful transfer of the LCD module, PA1057 LCD keyboard PCB, and any zone LED boards fitted, from the old door to the new door, and refitting the new door.

Refer to Sections 7.5, 7.6 and 7.8, and to the LT0466 instructions for detail.

Ensure any earth lead to the door is re-connected to the new door.

7.11 I-HUB Intelligent Hub

7.11.1 Requirements

The replacement I-HUB Module (PA0839) is obtained by ordering the I-HUB Upgrade kit (part number FP0771). This kit comes with interconnecting 10-way FRC loom and mounting plate, which is not usually required for repair work.

7.11.2 Preparation

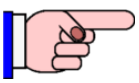
Note the settings of the links on the existing I-HUB. Replicate these settings on the replacement card.

If the existing I-HUB still responds to commands on its programming/diagnostic port (RS232 PORT B) download its configuration using the DISPLAY ALL command. You require LM0076 (RS232) and LM0065 (10W FRC to DB9) cables and a laptop PC with a serial port. Refer to the *I-HUB User Manual (LT0229)* for details.

7.11.3 Removal and Replacement

Note that the I-HUB connectors for J4, J5, J6 and J10 are physically identical. Label the cables or plugs to ensure that they are returned to the correct sockets on the new card.

1. If possible save the old I-HUB's configuration using the DISPLAY ALL command on the I-HUB's diagnostic/configuration port.
2. Disconnect the battery leads from the *MX1* Controller board and ensure that these do not short together or touch other cabinet parts while disconnected.
3. Power down the *MX1* using the switch for the power supply module.
4. Disconnect all wiring from the old I-HUB.
5. Undo the M3 screws holding the I-HUB in place. Lift the module clear.
6. Install the new I-HUB and replace the screws.
7. Replace the wiring to the I-HUB. Verify that the connectors have been fitted correctly before proceeding.
8. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.
9. Connect a laptop to the I-HUB's programming port and configure it with the settings saved in step 1, or from a copy. Note that the I-HUB comes pre-configured with default settings for the *MX1* so for the majority of installations no additional configuration is required.



It is highly recommended that you backup the I-HUB's configuration settings and store them offsite (with the *MX1* database) in case the I-HUB has to be replaced in the future.

7.11.4 Setup and Testing

If the I-HUB is part of a ring network with the default factory settings (MX1DEFAULTS) check the following (see Figure 7-7):

- RUN LED is on
- LD1 flashes
- LD2 turns on/off about once a second
- RXD A and RXD B LEDs are on (shimmering very fast)
- TXD A and TXD B LEDs are on (shimmering very fast)

- The *MX1* does not have any network faults
- You can access other devices on the same network.

For other configurations please refer to the I-HUB User Manual (LT0229).

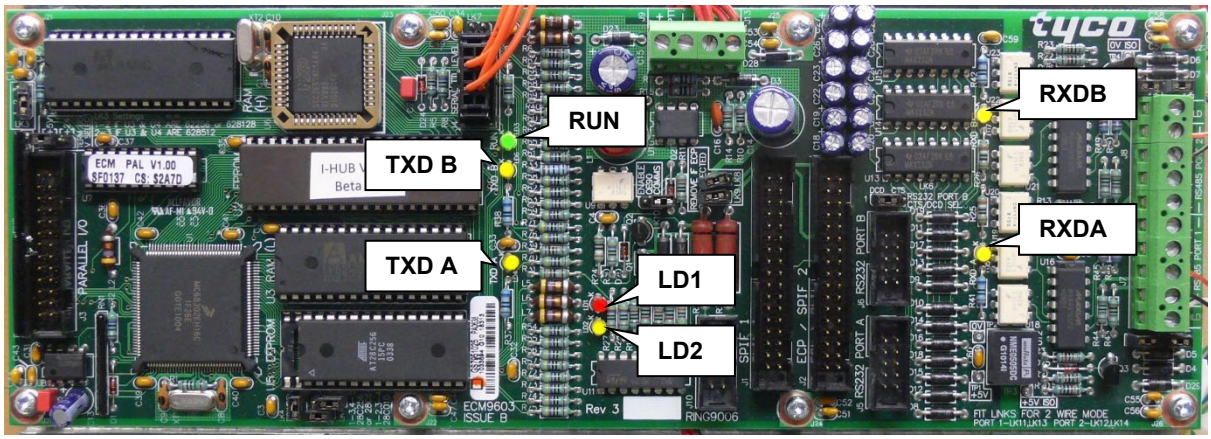


Figure 7-7 – I-HUB LED Positions

7.12 PIB Panel-Link IP Bridge

7.12.1 Requirements

The replacement PIB Module (PA1091) is obtained by ordering the PIB IP Networking kit (part number FP0986). This kit comes with PCB standoffs, FRC loom (PIB – *MX1*), 2m UTP patch lead, programming lead, and PIB User Manual.

There are two versions of the PIB. The latest (PA1091) PIB is shown in Figure 7-8. The older PA1031 PIB (now obsolete) is shown in Figure 7-9.

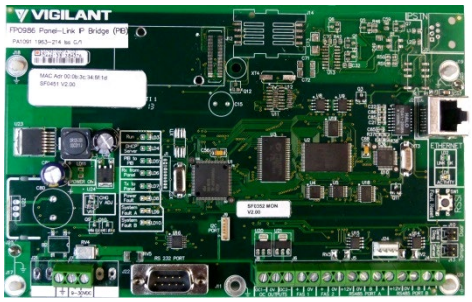


Figure 7-8 – PA1091 PIB

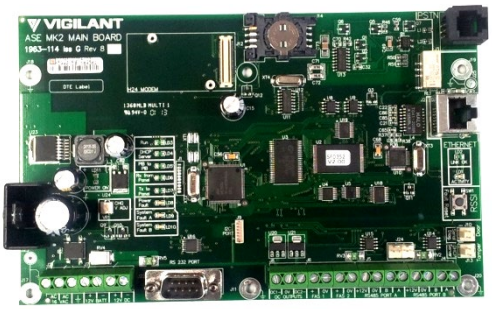
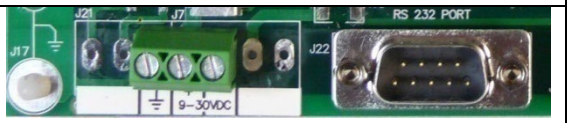


Figure 7-9 – PA1031 PIB

The configuration and wiring of the two boards is identical apart from the power supply wiring. The power supply wiring details are as follows:

PCB	Power Wiring	PCB Terminals
PA1091	Connect 9-30V DC to the 9-30V DC + and – terminals	 E + -
PA1031	+15-28 V DC to either of the 16 V AC terminals and the –ve wire to the -12 V DC terminal (0 V); or +10-14 V DC to the +12 V DC terminal and the –ve wire to the -12 V DC terminal.	 + E + - +15Vmin +14Vmax

7.12.2 Preparation

Note the settings of the two links on the existing PIB. Replicate these settings on the replacement board.

If the existing PIB's web page is still functioning on its Ethernet port, record or save the PIB's configuration settings. Refer to the PIB User Manual (LT0519) for details.

7.12.3 Removal and Replacement

Label the cables or plugs to ensure that they are returned to the correct sockets on the new card. Note that the power supply wiring may be different depending on the version of the PIB being replaced.

1. If possible save the old PIB's settings through the PIB's web page.
2. Disconnect the battery leads from the *MX1* Controller board and ensure that these do not short together or touch other cabinet parts while disconnected.
3. Power down the *MX1* using the switch for the power supply module.
4. Disconnect all wiring from the old PIB.
5. Undo any M3 screws holding the PIB in place. Lift the PIB clear.
6. Install the new PIB and replace any screws.
7. Replace the wiring to the PIB. Verify that the power supply wiring is correct before proceeding.
8. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.
9. Connect a laptop to the PIB's Ethernet port (or another port on the same network) and configure it with the settings saved in step 1, or from a backed up copy.

It is highly recommended that you backup the PIB's configuration settings and store them offsite (with the *MX1* database) in case the PIB has to be replaced in the future.

7.12.4 Setup and Testing

Power up the PIB and check the following:

- RUN LED flashes on and off about once a second
- Ethernet Link OK LED turns on steady
- Ethernet Activity LED flashes (when receiving/transmitting data on the Ethernet port)
- The *MX1* does not have any network faults
- You can access other devices on the same network.

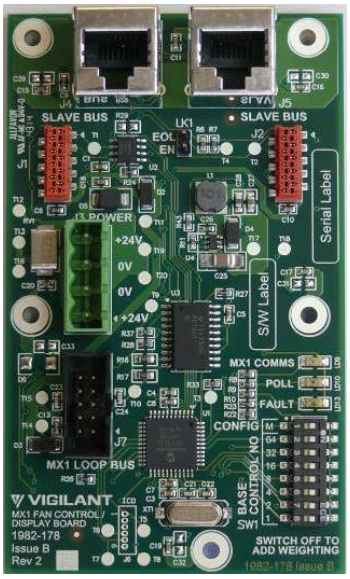
For other configurations please refer to the PIB User Manual (LT0519).

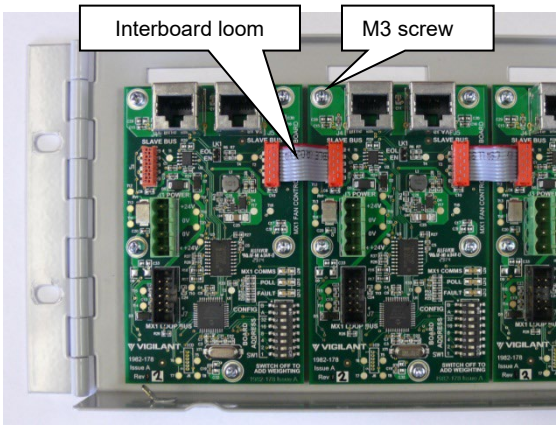
7.13 AS1668/DSS Control Board

7.13.1 Requirements

The AS1668 fan control modules can be obtained by ordering the AS1668 3U Door (FP1056) that comes with one AS1668 Fan Control PCB (two AS1668/DSS controls). Each 3U Door is able to accommodate a maximum of 12 AS1668/DSS controls (i.e. 6 x AS1668 Fan Control PCBs). Order additional or spare Fan Control Boards as FP1057.

See detailed instructions (LT0587, "*MX1* Fan Control Installation Guide") for setting up and installing the AS1668/DSS controls.





Mounting Adjacent Control Boards

Figure 7-13 – AS1668 Fan Control PCB

7.13.2 Preparation

Note the settings of the dipswitches on the existing fan control PCB to be replaced. Make the same settings on the replacement board.

7.13.3 Removal and Replacement

1. Disconnect the battery leads from the controller and ensure that these do not short together or touch other cabinet parts while disconnected.

2. Power down the *MX1* using the switch for the power supply module.

3. Disconnect all wiring from the old board.

4. Undo the M3 screws holding the board in place. Lift PCB clear.

5. Install the new PCB and replace the screws.

6. Replace the wiring to the new control boards. Verify that the connectors have been fitted correctly before proceeding.

7. Power up the *MX1* using the switch for the power supply module. Reconnect the battery leads.

7.13.4 Setup and Testing

Check that the new AS1668 fan control is operating correctly (as well as the other existing AS1668 control PCBs).

- POLL LED is flashing on all AS1668 control modules, MX1COMMS LED flashing on master AS1668 control
- The *MX1* does not show a Scan/CRC/Foreign fault for the fan controls
- No FAULT LEDs are lit on any control PCBs.

To perform a lamp test on the AS1668/DSS control units, see section 3.5.6 AS1668/DSS Lamp Test.

7.14 Other Modules

For information about replacement of other modules (such as T-Gen2, T-GEN 50 and Mini-Gen), refer to the installation documents for these devices.

Before removing the old device, note the configuration of links, switches, and wiring.

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8 Troubleshooting

8.1 In this Section

Troubleshooting Guide – Troubleshooting Table – Software Fault Codes – Default Procedure for Software Faults/Problems

8.2 Troubleshooting Guide

An installed *MX1* fire alarm system is in its quiescent (normal) condition when there are no alarms, faults, disables or other conditions that need attention.

If any of these conditions exist, the system can be considered to be in an off-normal condition.

In situations where a service person is attending to rectify off-normal conditions, the *MX1* fire alarm system provides several indications, status, recalls and other diagnostics features to assist in fault finding. Refer to the *MX1-Au Operator Manual (LT0439)* for details.

Using the Diagnostic Terminal the history of events can be:

- printed on the printer using the “P” command
- dumped to the Diagnostic Terminal using the “T” command.

This section of the manual provides a troubleshooting table to assist a service person in determining why indicators, and sounders are on, and the next steps to take to diagnose and correct the situation.

It also provides sections that describe how to find more information on how to acquire diagnostic and event information, plus other specialised diagnostic information.

8.3 Troubleshooting Table

Please check this table before contacting Johnson Controls Technical Support.

See also:
LT0439 *MX1*–Au Operators Manual, “Viewing the Event History Log” and “List of Possible LCD Messages”.

This table lists some possible issues, causes and appropriate responses. To use the table, look at the left-hand column and find an indication that matches your situation. Then view the meaning from the corresponding cell in the centre column, and suggested courses of action from the right-hand column.

Table 8.1 - Troubleshooting		
Indication	**Meaning/Cause**	**Suggested Action**
Alarm Routing Fault/Disabled LED is on steady.	Alarm Routing has been disabled.	Press Disables key to determine whether Alarm Routing has been disabled from the panel.
Alarm Routing Fault/Disabled LED is flashing (may be accompanied by fault message on LCD panel).	There is a fault in the Alarm Routing equipment.	Check Alarm Routing equipment and wiring for faults.
Alarm Devices Fault/Disabled LED is on steady.	Alarm devices have been disabled.	Press Disables key to determine whether Alarm Devices have been disabled from the panel.
Alarm Devices Fault/Disabled LED is flashing (may be accompanied by fault message on LCD panel).	There is a fault in the Alarm Devices wiring.	Check Alarm Devices equipment and wiring for faults. Do NOT disable the Alarm Devices to mask this fault as doing so also prevents any non-faulty outputs from operating. Instead, disable the specific points in fault.
Battery test cannot be started.	A battery test may already have been carried out recently. After a battery test is completed, a further test cannot be started for a time period equal to twice the length of the test already completed. This allows time to recharge the battery following the removal of the test load, and prevents inadvertent repeated battery tests from discharging the battery.	Do not initiate a battery test if a battery test has been performed recently. The time of the last test can be displayed on the LCD. See also LT0439 *MX1*–Au Operator Manual, Chapter 8 “Other Service Functions”, “Power Supply Status and Battery Testing”.
“DB1 CRC”, “DB2 CRC” are in fault.	Corrupted datafile/site-specific configuration.	Switch to backup datafile, if it is the same configuration. (SmartConfig or press RESET on the controller). Download new datafile (see Section 4).
Firmware CRC error.	Corrupted firmware.	Reload firmware. See section 5. Confirm that the WRITE ENABLE Firmware link is not fitted.
Controller board or keypad “RAM Test” points are in fault. Fault LED (Controller LD1) is on.	Faulty hardware.	Replace controller. If these measures fail or if the problem recurs, contact Technical Support.

Table 8.1 – Troubleshooting (Cont'd)		
Indication	**Meaning/Cause**	**Suggested Action**
Type mismatch.	Type of device on loop differs from *MX1* configuration settings and not a permitted substitute.	Use the Devices command in *MX* Loop Status screen on front panel to search for MISM devices. Check device address settings and programming. Check *MX* Loop Point settings in SmartConfig. Check that the device is installed on the correct loop. Use DP command in Diagnostic Terminal to identify the devices on the loop (refer Section 6.8.9). Check what devices are permitted as substitutes (refer Section 3.6)
Foreign device.	An unprogrammed device has been detected on the loop.	Use the Devices command in *MX* Loop Status screen on front panel to search for FRGN devices. Check device address settings and programming. Check *MX* Loop Point settings in SmartConfig. Check that the device is installed on the correct loop. Use DP command in Diagnostic Terminal to find extra/missing devices on loop (refer Section 6.8.9).
Internal sounder sounds continuously, no fault present.	Hardware fault.	Replace LCD/Keyboard.
Buzzer not functioning.	Buzzer has been muted or disabled.	Check if buzzer has been muted or disabled. Check configuration operates buzzer.
	Buzzer lead is disconnected.	Check and reconnect lead.
	Hardware fault.	Replace LCD/Keyboard.

Table 8.1 – Troubleshooting (Cont'd)		
Indication	**Meaning/Cause**	**Suggested Action**
LCD shows "ERROR: CANNOT COMMUNICATE WITH MAIN BOARD"	LCD/Keyboard cannot communicate with controller.	Check links on the LCD/ keyboard and the cabling.
		Controller firmware corrupt or is not operating. Check controller indicators.
	Controller is having its firmware programmed.	Press SILENCE and recheck when programming is completed.
		Replace or re-fit.
	Faulty loom between Controller and LCD/Keyboard, or loom not plugged in properly.	
	Controller faulty.	Replace.
LCD shows "No database present. Program *MX1* with a valid database", and the System Fault and Fault LEDs and the buzzer is on. The internal LEDs of the *MX1* show Fault, A and B on-steady, C flashes very slowly.	No valid datafile in panel, e.g., after updating controller firmware, and the new firmware does not support the old datafile.	Upgrade datafile if necessary and download it. See section 5.5.
	System restarted on "No Datafile".	Download the datafile. Refer Section 5.5.
Keyboard is not enabled when keylock is in KEYBOARD-ENABLE position (key inserted and turned 45º or more).	Fault in doorswitch, loom, connection or panel configuration.	Check that the doorswitch loom is correctly connected to J3 on controller board. Removing J3 is equivalent to the door being closed.
	Doorswitch fault	Replace doorswitch, retest.
	Loom fault.	Replace loom, retest.
	Configuration fault	Check panel configuration.
Login - can't log in.	Invalid User Code and/or PIN.	Check User Code and PIN.
PIN not valid.		Check doorswitch enabled.
No response from panel.		Check power is on.
		Check that the keyboard is plugged in.
"MX Loop left S/C" point is in fault.	Short-circuit on *MX* Loop wiring between the *MX1* and first isolator.	Locate and rectify short circuit.
AND/OR		Use the Devices command in the *MX* Loop Status screen on front panel to show which devices are present on left and right sides of the loop.
"MX Loop right S/C" point is in fault.		
OR		
"*MX* Loop O/C" is in fault.	Open circuit on loop or short circuit between isolator devices.	

Table 8.1 – Troubleshooting (Cont'd)		
Indication	**Meaning/Cause**	**Suggested Action**
"*MX* Loop overload" point is in fault.	*MX* Loop power feed is overloaded by an excessive current draw on the loop, especially during alarm conditions.	Use *MX* Loop Status Display to show the voltage and current being drawn by the loop. Check for additional loads arising from recent system changes (for example, additional devices or sounder bases). Re-validate loop design using MX1Cal.
"MX Loop open circuit" point is in fault.	Break in *MX* Loop wiring. Addressable devices may or may not be affected.	Use front panel *MX* Device command or Diagnostic Poll, in conjunction with the "as-installed" diagrams, to scan from each end of the loop. If there is a break, the Line 1 and Line 2 information assists in determining which two devices are on either side of the wiring break. Disconnect one side of the loop and use scan fail information to determine the break location.
	Short circuit on *MX* Loop between two isolators. Any addressable devices between these isolators are in device fail.	Use *MX* Points LCD command or refer to wiring diagram to identify and locate the devices in device fail, to localise the fault. Use *MX* Points LCD command or use Diagnostic Poll as above to confirm numbers and wiring segment of missing detectors.
No lights, LCD or other activity when panel's main power switch is turned on. ("Dead" unit) PSU power light is off.	No mains power reaching panel.	Check mains power at supply, mains connection to panel. Check that PSU plug is connected and power is switched on. Check battery and charge if necessary. Check mains supply fuses at switchboard and replace as necessary.
No lights, LCD or activity when panel's main power switch is turned on. PSU power light is on (if fitted).	Mains power is reaching panel's internal PSU but panel's other circuitry is not activated and battery is discharged or faulty.	Check that PSU wiring loom to main board is correctly connected and is undamaged.
POWER ON LED is flashing	Mains power is off or failed.	Check mains supply. If mains supply is present, check that the *MX1* PSU is functioning.

Table 8.1 – Troubleshooting (Cont'd)		
Indication	**Meaning/Cause**	**Suggested Action**
Printer does not respond.	Printer is off.	Check that the printer is connected to mains power and switched on.
	Printer is not receiving data.	Check that: - printer cable is correctly connected to printer and *MX1* - Xon/Xoff is selected and printer has sent Xoff - printer is online Refer to printer manufacturer's documentation.
	Printer is not correctly loaded with paper and toner.	Replenish paper and/or toner as required.
Zone LEDs are flashing	Yellow LED flashing = Fault in the corresponding zone.	Recall Faults list for further information.
"*MX* Loop Poll rate" point is in fault.	*MX1* is unable to poll the *MX* loop devices at the required rate to ensure correct operation of the detectors and modules.	Use the diagnostic terminal to review the "Total RX Noisy Count" in the *MX* Loop Common Error Count display over a period of 10 seconds - if the count is increasing at a rate approaching <total loop devices> every 5 seconds, then there may be significant electrical noise on the loop interfering with communication on the *MX* Loop. The noise source needs to be traced and removed. If the "Total RX Noisy Count" is not increasing, then the normal operation of the system may be triggering the fault, for example constant changes to analogue values or air handling systems continually changing module input states, in which case the fault detection parameters may need adjustment.
"245.248.x" points in fault	Point 245.248.0 fault is "Common Scan Fail" indicating one or more AS1668 control boards configured on the DSS are not communicating with the DSS master board.	Check the dip switch on the board to ensure a unique odd number is assigned/used and matches the SmartConfig configuration. For general COMM failures refer to 'AS1668 board fault LED flashing' below.
	Point 245.248.1 fault is "Foreign Control" indicating one or more AS1668 control boards are present but not programmed into the configuration.	Check the dip switch on the board to ensure a unique odd number is assigned/used and matches the SmartConfig configuration.

	Point 245.248.2 fault is “Common CRC Fault” indicating one or more AS1668 control boards configured on the DSS has a CRC failure.	Replace the faulty board.
AS1668 board fault LED flashing	Fail to communicate with the master control board.	Check cable connection and board address setting.
Buttons on AS1668 controls not working at all	AS1668 control board is not enabled or configured as part of the DSS.	Check the SmartConfig settings to ensure that each control is configured and buttons are enabled.
Button LED flashes but does not change state	Communication between the DSS master and the *MX1* main board or network communications with the remote DSS controls have failed.	Check the communication cable from the master control board to *MX1* main board. Check the network communications if the control is a ‘Duplicate’.

8.4 Software Fault Codes

Software Fault codes are generated by the *MX1* to indicate that an internal consistency check has failed or an error or system failure has occurred. Generally, a software fault code indicates a serious problem that is unlikely to be resolved by simply restarting the panel.

The codes are included here for completeness, but are intended for use by Technical Support staff. If these faults are encountered in the field, reload the *MX1* datafile and restart the panel. If the problem remains, follow the procedure in Section 8.5.

Note: If a fatal software fault occurs, the *MX1* logs its occurrence and then automatically restart itself.

Table 8-2 – Software Fault Codes

Fault number indicated	Fatal	Meaning
1		Out of range
2		Stream manager not implemented
3		Stream manager no semaphore
4		Stream manager semaphore exist, so discard
5		RZDU services LED range
6	yes	Memory pool exhausted
7	yes	Operator force restart
8	yes	Exit task reached
9	yes	Idle task missing
10	yes	Task pool too small
11	yes	Semaphore pool too small
12	yes	Switching during task switch disable
13	yes	Fault stack overflow
14	yes	Menu fault
15	yes	Unexpected fault
16	yes	Assertion fail
17	yes	Task not responding
18	yes	Task monitor not responding
19	yes	Timer data corrupted
20	yes	Timer setup corrupted
21	yes	Scheduler timer setup corrupted
22	yes	Datafile download timeout
23	yes	Semaphore not initialised

24		Output logic endianness incorrect
25		Keyboard RZDU buffer size
26		Keyboard RZDU buffer access
27		Large nested switch enable size
28		Output logic token error
29		Output logic range error
30		Output logic format unknown
31		Output logic alignment endianness error
32		Output logic stack overflow
33		Output logic stack underflow
34		Output logic stack error
35		Output logic invalid point
36		Logic invalid zone
37		Output logic zone command fail
38		Output logic point command fail
39		LED num range error
40		RZDU transmit buffer full
41		Point datafile error
42		Set point status bad point
43		Get point status bad point
44		Point command fail
45		Invalid zone number
46		Zone point command fail
47		Menuing fault
48		Alarm list discrepancy
49		Parallel flash error
50		Set point status invalid task
51		Fault invalid number of points
52		Zone input point lookup fail
53		Zone map zone command fail
54		Zone group command invalid
55		Zone datafile error
56		Get next point command invalid task
57		Startup point isolate switching enabled
58		Startup zone isolate switching enabled
59		Point datafile structure
60		Unsupported supervision
61		Queue Handler read handle overflow
62		Init comport fail
63		Persistent variable out of bounds
64		Non-fatal memory CRC faults
65		ADC Read error
66	Yes	Illegal cast
67		Buffer handler get record error
68		Event status tx cos queue
69		Scheduler not initialized
70		Plink debug message lost
71		Bad LCD cursor row
72		Bad LCD cursor column
73		Tandem LCD RX checksum mismatch
74		Persistent vars dataflash fail
75		Zone isolates dataflash fail
76		Point isolates dataflash fail
77		History dataflash fail
78		Real time clock chip update failed.

8.5 Default Procedure for Software Faults/Problems

1. *MX1* firmware has many internal checks that get reported as a "software fault" when a problem occurs. It is strongly recommended that all information relating to a software fault is sent to Johnson Controls Technical Support, including a copy of the history and the database. See section 6.6.4 for information on capturing the history data. At the very least, make a note of the information logged in the history relating to the fault and record any numerical values as carefully as possible.

2. Review the faults present on the system, i.e., by recalling the faults and reviewing the history. If the System Fault indicator is ON then first reset the Software Fault point P241.27.0 to try to clear the fault condition.

3. If the faults recall or history indicates corrupted databases or system firmware, or a Software Fault as described in Section 8.4, download the site-specific configuration to the panel again, or update the firmware as appropriate. Then repeat the situation where the problem arose to see if it is fixed.

4. Review Product Bulletins and software upgrade information at the Fireplace (refer Section 1.3).

5. If the issue remains unresolved, contact Johnson Controls Technical Support with relevant information including software version numbers, and a complete description of the situation.

Fatal Software Faults

Some software faults result in the firmware being re-booted automatically. If the panel restarts because of a software fault, some "reboot" events are logged in the history. For example -

```
21/07/17 23:34:51 Sys    2            Local MX1          Reboot 017 0038BD92
21/07/17 23:34:49 Sys    2            Local MX1          Reboot 017 12345678
```

If the System Fault indicator is on, then recall the history to see what events have occurred. If a reboot event is listed, then recall point 241.27.0 and write down the numbers that appear. The LCD shows something like the following:

P241.27.0 Status
Software Fault
Error number = nn, X = 12345678

The error number and X value must be reported to Johnson Controls Technical Support. Then reset the Software Fault point P241.27.0 to try to clear the System Fault condition.

MX1 firmware V1.70 and onwards has some diagnostic commands that can be used to output some snapshot data relating to the state of the system at the time the fatal software fault occurred. **It is requested/ recommended that the snapshot data be captured and sent to Johnson Controls Technical Support**. The procedure for doing this is as follows.

1. Connect a terminal emulator (e.g. WinComms) to the *MX1* diagnostic port – baud rate 19200. Enter the username and password to get into the diagnostics menu.
2. Type "DG" (without quotes) then <ENTER>. Then type "ME" <ENTER>.
3. Enable capturing of the data output e.g. in WinComms, select "capture to file" from the "Transfer" menu.
4. Type "DTCD" <ENTER> and wait until the output stops.

5. Type “DTSD” <ENTER> and wait until the output stops.
6. Type “DFRD” <ENTER> and wait until the output stops.
   The “DFRD” command takes approx. 20 minutes to complete.

Send the captured data to Johnson Controls Technical Support along with the panel history (event log), the database and the error numbers.

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9 System Specifications

9.1 In this Section

Environmental Operating Conditions – Cabinets – Electrical Supply – Inputs – Outputs – Communication Ports – Internal Controls and Indicators – External Controls – External Displays – Compatible *MX* Devices – Hardware Releases – Software Releases

9.2 Environmental Operating Conditions

Temperature	-5°C to 45°C ambient.
Humidity	Up to 95% relative humidity at 40°C (non-condensing).

9.3 Cabinets

8U Cabinet	
Finish	Powdercoat Dulux Titania Ripple 288 1235Z.
Dimensions	H440m W550mm D210mm.
Construction	1.2mm and 1.6mm welded steel.
Weight	17kg packaged 15kg unpackaged
Mounting Format	Suitable for surface or inset wall mounting. Includes outer door with clear acrylic window covering the keyboard and display.
Capacity	Up to 32 zone indicators. Up to 12 AS1668 Fan/DSS Controls.
	Internal space for a pair of 12 V batteries up to 17Ah.

15U Cabinet	
Finish	Powdercoat Dulux Titania Ripple 288 1235Z.
Dimensions	H750 mm W550 mm D210 mm.
Construction	1.2 mm and 1.6 mm welded steel.
Weight	24 kg packaged 20 kg unpackaged
Mounting Format	Suitable for surface or inset wall mounting. Includes outer door with clear acrylic window covering the keyboard and display.
Capacity	Up to 192 zone indicators. Up to 36 AS1668 Fan/DSS Controls (Additional cabinets required for the maximum of 126 controls).
	Internal space for a pair of 12 V batteries up to 40Ah.

9.4 Electrical Supply

Mains Supply Requirements	Voltage	Single phase, 230 V a.c. (192-253 V a.c.).
	Current	1.2 A rms maximum.
	Frequency	50-60 Hz
	Termination	Switched mains outlet block mounted in cabinet. PSU connects through standard 3-pin plug.
Battery Charger/ Power Supply	Charger Voltage	27.3 V d.c. (nominal at 20°C)
	Temperature Compensation	-31m V for each °C (nominal)
	Non-Battery-backed Output Voltage	27.3 V (nominal)
	Charger Voltage During Battery Test	21.5-22 V (nominal)
	MX1 Base Panels (5 A PSE)	**MX1 BTO Panels (14 A PSE)**
DC Operating Voltage	19.2-27.3 V	16.8 to 27.3 V
Input Voltage (min)	19.2 V	17 V
Output Voltage (min)	19 V	16.8 V
Pa_{max}	55.5 W	309.4 W
Pb_{max}	110 W	364 W
Pc_{max}	55.5 W	309.4 W
P_{min}	9.1 W	9.1 W

Note 1: Minimum supply voltage when the AC is off and the battery is discharging.
Note 2: Minimum battery voltage when the AC is off and the battery is discharging.

	Battery Specifications	Minimum: 2 x 12 V 17 Ah capacity Maximum: 2 x 12 V 40 Ah capacity. Rechargeable Valve Regulated Sealed Lead Acid Batteries Limited by in-line ATQ 20 A Blade Fuse on Battery Connecting Leads, supplied with the panel.
	Fused Outputs from the controller	Battery-backed, VBF1, VBF2, VBF3, VRZDU. Each fused at 3A, individually supervised. Non-battery-backed; VBNF, fused at 3A, supervised.

	Fuse Output from Power Distribution Board	4 fused outputs with 5 A each, only with MX1 BTOs.
	Fuse Types (Controller)	All 5 x 20 mm, glass cartridge type, 3 A slow blow.
Current Consumption	Controller	150 mA nominal at 24 V supply (system normal, LCD backlight off, no zone indicators lit) (excludes *MX* loop, *MX* Loop Card and other connected loads). Plus 60 mA for each Loop Card installed.
	Zone Indicator	5 mA nominal at 24 V for each active indicator.
	AS1668/DSS Control	8.5 mA average for each board (2 x Controls).

9.5 Inputs

Battery Input	**MX1 Base Panels (5A PSE)** Two pairs of (+) ve and (-)ve screw terminals with capacity for 4.0 mm^2 conductors. Battery cutout closes at no greater than 19.2 V and opens at no less than 15V. Contact rating is 5 A nominal. "Connected" status LED indicator. **MX1 BTO Panels (14A PSE)** One Pair of +ve and -ve flag posts with 1.5 m long cable and M5 Lug on Battery side
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 1.2 kΩ, pull-up to 5 V. These inputs share a common 0 V terminal. All terminals have a capacity for 2.5mm^2 conductors.
Door Switch and Integral MCP	These unprotected inputs are used to sense the state of the Cabinet door switch and MCP (if fitted). Input characteristic is 10 kΩ, pull-up to 3.3 V. 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 protected input for supervision. If not required for relay supervision, these can be used as supervised inputs for clean contacts. Each supervision terminal has a capacity for a 2.5mm^2 conductor. Operation set by configuration.

LCD/Keyboard Switch Inputs	The LCD/Keyboard has 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 AS 1668 5-way Fan Control Panel (PA0956).

9.6 Outputs

Ancillary Relays

ANC1, ANC2	Single pole, voltage-free changeover contacts. Rated at 30 V d.c. 1A inductive, 2A resistive. Screw terminal, 2.5mm^2 conductor capacity. ANC1 connector is demountable, and can be replaced with a pre-made loom for connection to a T-Gen2 or T-GEN 50. Supervision modes: load mode, door-holder mode, contact mode, or none, set by configuration. Operation mode: set by configuration.
ANC3	Single pole, voltage-free changeover contacts. Rated at 30 V d.c., 5A resistive, 3A inductive. Screw terminals, 2.5mm^2 conductor capacity. Supervision modes: ANC3 (negative bias, up to 3 branches, 9kΩ EOLR), contact mode, 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 500 mA from the 24 V supply, plus common +VBF supply terminal. Supervision modes: 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 30 V d.c., 1A inductive, 2A resistive. The Fault relay is normally energised. Screw terminals with 2.5mm^2 conductor capacity.
ASE Output	Isolated, protected output suitable for direct connection to an FAS input of a Centaur ASE. Signals Alarm, Fault, and Disable, Normally-Closed configuration. Screw terminals 4.00mm^2 conductor capacity.
SGD Interface	(New Zealand facility) 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. These are available on a 26-way header suitable for use with an unprotected termination board (PA0483) for internal connections only, relay board (PA0470) or AS 1668 5-way Control Panel (PA0956).

LCD/Keyboard Display Bus Output	Suitable for driving up to 12 zone LED display boards (either small format PA1020 or large format PA0454, or a mixture).

9.7 Communication Ports

_MX_ Loop

	MX1 can be operated only in Loop Mode. Protocol: *MX DIGITAL*. **Controller** Feed Voltage 37-40 V depending on load. Current capacity 1.0A continuous, overload trips at 1.1A typical. Four demountable screw terminals, AL+, AL-, AR+, AR- with 2.5mm^2 conductor capacity. Supports up to 250 *MX VIRTUAL* analogue addressable detectors or modules. Cable limit: 2,000m of typical TPS. AUX Connector: J34 **Loop Card** Feed Voltage 37-40 V depending on load. Current capacity 1.0A continuous, overload trips at 1.1A typical. Four demountable screw terminals, AL+, AL-, AR+, AR- with 2.5mm^2 conductor capacity. Supports up to 250 *MX* VIRTUAL analogue addressable detectors or modules. Cable limit: 2,000m of typical TPS.

Serial Communications

Diag/Prog Port	DB9 male connector configured as RS232 level DTE. Diag/Prog is used for loading configuration data and using Diagnostic functions. This can be connected to a modem for remote access to the *MX1*.
Serial Port 1	DB9 male connector configured as RS232 level DTE. 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, the *MX* Loop Cards, AS1668/DSS Control PCB, or network interface. Note, if Serial Port 0 is used the RZDU port is disabled.
RZDU Port	Four 2.5mm^2 terminals providing +VRZDU, TX, RX and 0 V signals to Remote Display Units (up to eight) or other RZDU compatible devices.
	Protocol: VIGILANT RZDU LCD Protocol 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.

9.8 Internal Controls and Indicators

Reset	"Reset" on controller restarts the system immediately. "Reset" on LCD/Keyboard restarts the LCD/Keyboard immediately.	
Write-enable Links (DATAFILE, FIRMWARE)	Enable changes to the system configuration (DATAFILE) or updates to the system software (firmware).	
Battery Connection Link (LK3)	Forces the Battery Cutout to connect the battery to the charger.	
Internal Indicators	LD1 – FAULT	"On-steady" indicates fault.
	LD2 – A	Not currently assigned.
	LD3 – B	Flashes once for every complete cycle of logic equation processing. Slower flash indicates a more heavily loaded system. (Default configuration).
	LD4 – C	0.5Hz flash indicates normal processing. 1Hz flash indicates that no datafile is installed.
	LD5 – POWER	"On" indicates controller is powered up.
	LD6 - BATT CONN	Lit green when battery is connected.
	LD7 – TX	Flashes green as data is transmitted to *MX* devices on in-built loop.
	LD8 – RX	Flashes green as data is received from *MX* devices on in-built loop.
	Internal Piezo Sounder	Gives short "beep" for a valid keypress of the Keyboard, a long beep for an invalid keypress, or no beep for an inactive key if part or all of the Keyboard is disabled. Refer to the LT0439 *MX1*-Au Operator Manual for Alarm and Fault cadences.

9.9 External Controls

External Keyboard	Polyester Keyboard type, 29 keys. Includes Fire Brigade Panel (see below) and the following keys: four softkeys beside alphanumeric display, 0-9 numeric keys, MENU, ZONE, OK, CANCEL.
Fire Brigade Panel	**NEXT**, **SILENCE BUZZER**, **SILENCE ALARM DEVICES**, **RESET**, **DISABLE** keys as in AS 4428.3.

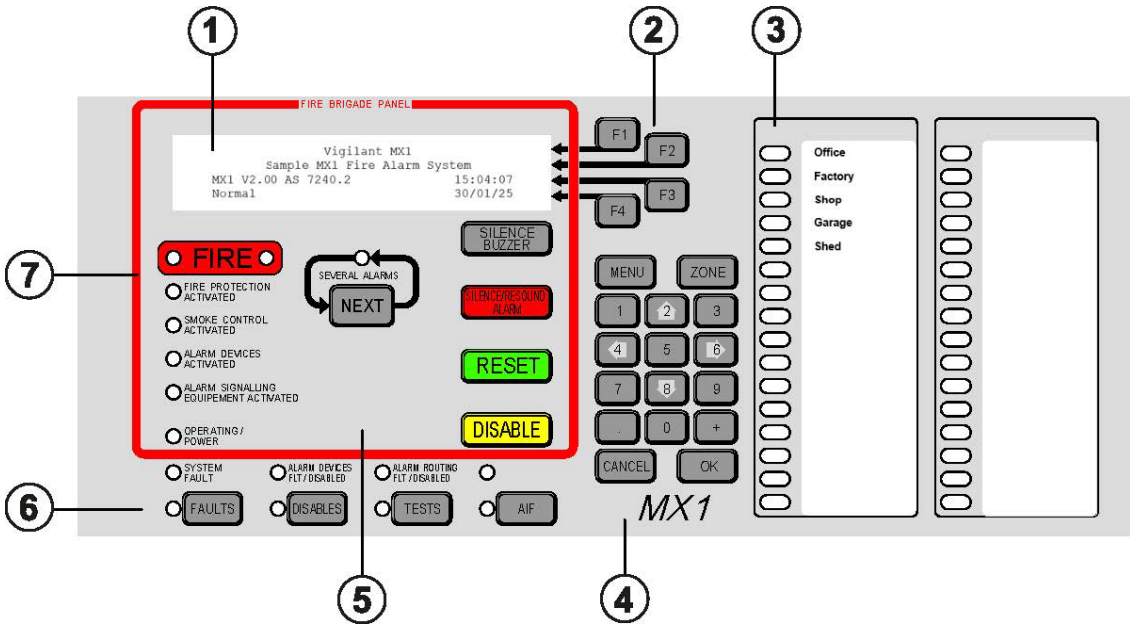


Figure 9-1 – *MX1* External Keyboard and Indicators

Callout	Description
1	Alphanumeric Liquid Crystal Display (LCD)
2	Soft keys
3	Zone LED indicators
4	Numeric keypad
5	Fire Brigade Panel (FBP)
6	Status indicators
7	Fire Brigade Panel indicators

Cabinet Lock	Keyed 003, to secure cabinet. Also operates internal switch to enable Keyboard functions.

9.10 External 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 keyboard is in use, or when an alarm occurs.
Status Indicators	For a description of these indicators refer to *MX1*-Au Operator Manual (LT0439), Section 1.
	FIRE LEDs
	SEVERAL ALARMS
	FIRE PROTECTION ACTIVATED
	SMOKE CONTROL ACTIVATED
	ALARM DEVICES ACTIVATED
	ALARM ROUTING ACTIVATED
	OPERATING/POWER
	SYSTEM FAULT
	ALARM DEVICES FLT/DISABLED
	ALARM ROUTING FLT/DISABLED
	FAULTS
	DISABLES
	TESTS
	AIF
Zone Indicators	Zone LED indicators can be added in groups of 16. For each zone, a red LED shows alarm status, and a yellow LED shows Fault (flashing) or Disable (steady) status.
AS1668 Fan/DSS Controls	Maximum of 126 AS1668 Fan/DSS controls can be configured. Each AS1668 Fan/DSS control has three buttons with LED indications and four LED indicators for output status.

9.11 Compatible *MX* Devices

Ordering Code	Device Type	Description	Max No. for each Loop
516.800.006	801F	Flame Detector	250
516.850.051.E	850PH	Photoelectric Smoke + Heat detector	250
516.850.053.E	850H	Heat detector	250
516.850.052.E	850P	Photoelectric Smoke Detector	250
516.850.054.E	850PC	Photoelectric Smoke + CO + Heat Detector	250
516.800.510	814PH	Photoelectric Smoke + Heat detector	250
516.800.513	814H	Heat detector	250
516.800.517	814P	Photoelectric Smoke Detector	250
516.800.511	814CH	CO + Heat multi-sensor detector	250
516.800.512	814I	Ionisation chamber detector	250

Refer 4B-I	814IB	Isolator Base (Obsolete)	128
814RB	814RB	Relay Base	250
576.080.001	80DSB	Detector Sounder Base (Low/Mid L/ Mid H/High volume)	250
576.080.002	P80SB	Addressable Sounder (AAD) Base	250*
576.080.006	P80AVB	Addressable Sounder (AAD) / Beacon (VAD) Base	250*
576.080.014	P81AVB	Addressable Sounder (AAD) / Beacon (VAD) Base – High Intensity	250*
576.080.008	P80AVR	Addressable Sounder (AAD) / Beacon (VAD) Wall Mount Red	250*
576.080.007	P80AVW	Addressable Sounder (AAD) / Beacon (VAD) Wall Mount White	250*
814SB	814SB	Sounder Base (Low/Med/High volume) (obsolete)	104/83/66
802SB	802SB	Sounder Base (loop powered) (Obsolete)	250
516.800.911	901SB	Sounder Base (external power) (Obsolete)	250
577.800.006	DDM800	Universal Fire and Gas Detector Module	15 (loop power) / 80 (external power)
DIM800	DIM800	Detector Input Module	250
MIM800	MIM800	Mini Input Module (Hard contact s/c alarm)	250
MIM801	MIM801	Mini Input Module (Hard contact o/c alarm)	250
CIM800	CIM800	Contact Input Module	250
555.800.071	QIO850	Quad Input / Output Module	107
555.800.070	QMO850	Quad Monitored Output Module	250
555.800.073	QRM850	Quad Relay Output Module	250
555.800.063	SIO800	Single Input/Output Module	250
555.800.065	MIO800	Multiple Input/Output Module	250
SNM800	SNM800	Sounder Notification Module	250
RIM800	RIM800	Relay Interface Module	250
577.800.011	LPS800	Loop-Powered Sounder Driver	166
VLC-800MX	VLC800MX	VESDA Laser Compact	125
516.018.014	Vi0800	VESDA Interface Module	250
514.800.611	MCP820	Indoor Manual Call Point with SCI	250
514.800.612	MCP830	Outdoor Manual Call Point with SCI	250
CP820	CP820	Indoor Manual Call Point	250
CP830	CP830	Outdoor Manual Call Point	250
516.800.530	801PHEx	Intrinsically Safe Photoelectric Smoke + Heat multi-sensor	250
516.800.531	801CHEx	Intrinsically Safe CO + Heat detector	250
516.800.532	801HEx	Intrinsically Safe Heat detector	250
516.800.066	801FEx	Intrinsically Safe Flame Detector	250
514.800.513	CP840Ex	Intrinsically Safe Manual Call Point	250
514.001.062	IF800Ex	Intrinsically Safe Contact Input Module	250
516.041.004	S271i+	Intrinsically Safe Infrared Flame Detector	125
516.041.003	S271f+	Flameproof Infrared Flame Detector	125
516.800.956	SAB801	Sounder Base Driver with LED Beacon	250
516.800.954	SAM800	Sounder Base Driver	250
545.800.004	LIM800	Short Circuit Loop Isolator Module	250
517.050.018	5BI	Short Circuit Isolator Base	250
517.050.041	4B	Detector Base	250

517.050.042	4B-C	Continuity Base for 850 detectors	250
517.050.043	4B-I	Short Circuit Isolator Base	250
516.300.411	FV411f	Flameproof Triple-Infrared Flame Detector	125
516.300.412	FV412f	Flameproof Triple-Infrared Flame Detector and PAL Camera	125
516.300.413	FV413f	Flameproof Triple-Infrared Flame Detector and NTSC Camera	125
516.300.421	FV421i	Intrinsically Safe Flame Detector	16

*The actual maximum number of devices for each loop depends on the mixture of types, how many are activated simultaneously, cable type and cable length.

9.12 Hardware Releases

Version	Drawing #	Comments
Controller		
PA1081 D/12	1982-2	Improved noise immunity.
PA1081 D/11	1982-2	Inductors changed to low profile.
PA1081 D/10	1982-2	Unused serial EEPROM chip removed.
PA1081 D/9	1982-2	Expanded RAM, different Flash Memory, for example. Must use V1.40 onwards or A versions of 1.0X, 1.2X, 1.3X firmware.
PA1011 B/6	1982-2	Replaced by PA1081.
LCD/Keyboard		
PA1057 C/2	1982-64	No change.
PA1057 B/2	1982-64	PCB updated to include rev 2 circuit changes.
PA1057 A/2	1982-64	Updated for Direct/Remote links and components needed for Remote FBP.
PA1057 A/1	1982-64	Original.
Zone Display		
PA1020 C/3	1982-3	First Australian release.

***MX* Loop Card**		
PA1052 C/5	1982-57	Improved noise immunity.
PA1052 C/4	1982-57	PCB updated to include rev 3 circuit changes.
PA1052 B/3	1982-57	Added components to do Loop Short Circuit detection. Avoids isolators at Loop Start/End.
PA1052 B/2	1982-57	Original.
PSU Module		
PA1050 A/1	1982-55	Original.

AS1668/DSS Control		
PA1102 B/2	1982-178	Original.

9.13 Software Releases

Version	Comments
Controller	
SF0412 V2.00	It includes support for latest updates in AS ISO 7240.2:2018; AS ISO 7240.4:2018 and AS 4428.3:2020; along with a support for 14 PSE.

SF0412 V1.80	Add support for the MX VADs – P80SB, P80AVB, P81AVB, P80AVR, and P80AVW. Requires SmartConfig V2.9.0 or later.
SF0412 V1.70	Add SIO800 input output module supports. Flame detector time-to-alarm improvements. Requires SmartConfig V2.6.0 or later.
SF0412 V1.62	Maintenance release to fix a problem with loop comms start-up issue.
SF0412 V1.61	Fix problem with 814P and 850P detectors - widen accepted range of EEPROM pedestal values for MX optical element. Support multiple alarms for each zone in the alarm list across the network.
SF0412 V1.60	Adds AS1668/DSS controls, AS4428.3-2010 Fire Brigade Panel, DDM800 and QIO/QMO/QRM modules. Requires SmartConfig V2.5.0 or later.
SF0412 V1.52	Fix problem with 814P and 850P detectors - widen accepted range of EEPROM pedestal values for MX optical element.
SF0412 V1.51	*MX* loop noise immunity improved. Printer can now be on Diag/Prog port. 850EMT operation improved. Network compatibility with XLG and NSA improved. AAF alarm LED now latches. SA Disable operation added (requires SmartConfig V2.4.2 or later). Tandem mode transmits less data.

SF0412 V1.50	Adds Panel-Link networking. Adds *MX* 850H, 850P, 850PC, and 850PH detector support with *MX* device substitution capability. Requires Smart Config V2.4.0 or later. Fix for *MX* device polling faults when operating on long steel wire armoured cable.
SF0412 V1.42	Fixes issue on startup; if the maximum zones configured is ≤100, the zones already disabled do not turn on their Zone Disable LED.
SF0412 V1.41	Fixes issue with fewer than 200 sub-points not activating the fault buzzer for “MCP Fault to Brigade” sub-points. Supports CP830 call point (programmed as CP820).
SF0412 V1.40	Multi-Loop operation, supports RFBP, new commands. Requires *MX* Loop Card V2.02 onwards. Runs in both PA1081 and PA1011. Requires Smart Config V2.3.0 or later.
SF0412 V1.33A	Version of V1.33 to be used in PA1081 controller.
SF0412 V1.33	Daily testing of 814CH fixed along with polling rate fault incorrectly annunciated, alarm screen fixes and entry of invalid date now rejected. Refer PBK0004.
SF0412 V1.31	Fixed GP Out and Anc Out operation with no supervision
SF0412 V1.30	First Australian release.
LCD/Keyboard	
SF0407 V2.03	First Australian release.
PLD software	
SF0305 V1.2	PA1081 version. Supports larger memory on PA1081.
SF0305 V1.0	Original, used on PA1011.
***MX* Loop Card**	
SF0392 V2.07	Improves open circuit detection for NZS 4512.
SF0392 V2.06	Work with Agilent 34401A DVM. Test 13 supply current improvement.
SF0392 V2.05	Fix for spurious *MX* loop open circuit seen on *MX1* cold start.
SF0392 V2.04	Improve noise immunity – particularly to 100 V speaker wiring.
SF0392 V2.03	Fix for ringing on long steel-wire-armoured cable causing *MX* device comms fails.
SF0392 V2.02	Fixes short circuit relay chatter. Must be used with controller V1.40 onwards.
SF0392 V2.01	Fixes message truncation issues (upgrade to latest).
SF0392 V2.00	Original Multi-Loop version (upgrade to latest).

	Suitable for controller V1.3X.
SF0392 V1.06	Fixes handling of interrupt messages from *MX* devices. Refer PBK0005.
SF0392 V1.04	Original. Can use with controller V1.3X.
Fan Control Module	
SF0501 V2.0	Original production release.

Refer to the Fireplace (refer Section 1.3), for more recent versions of *MX1* firmware.

10 Ordering Codes

10.1 In this Section

Ordering Codes – New Installations – Spare Parts – Literature Items – Software Items – sales Presentations and other Drawings.

10.2 Ordering Codes

These ordering codes are correct at the time of publication, but are subject to change without notice.

MX detector and module part numbers are listed in Section 9.11.

Copies of software, firmware, labels, literature items and presentation drawings, and updates to these, are available from the **Fireplace** (refer Section 1.3).

Figure 10-1 shows a block diagram of the modules and interconnecting cables in the *MX1* panel. It also shows the part numbers the spare parts can be ordered as.

Figures 10-2 and 10-3 show the same modules in the *MX1* pictorially, to aid identification.

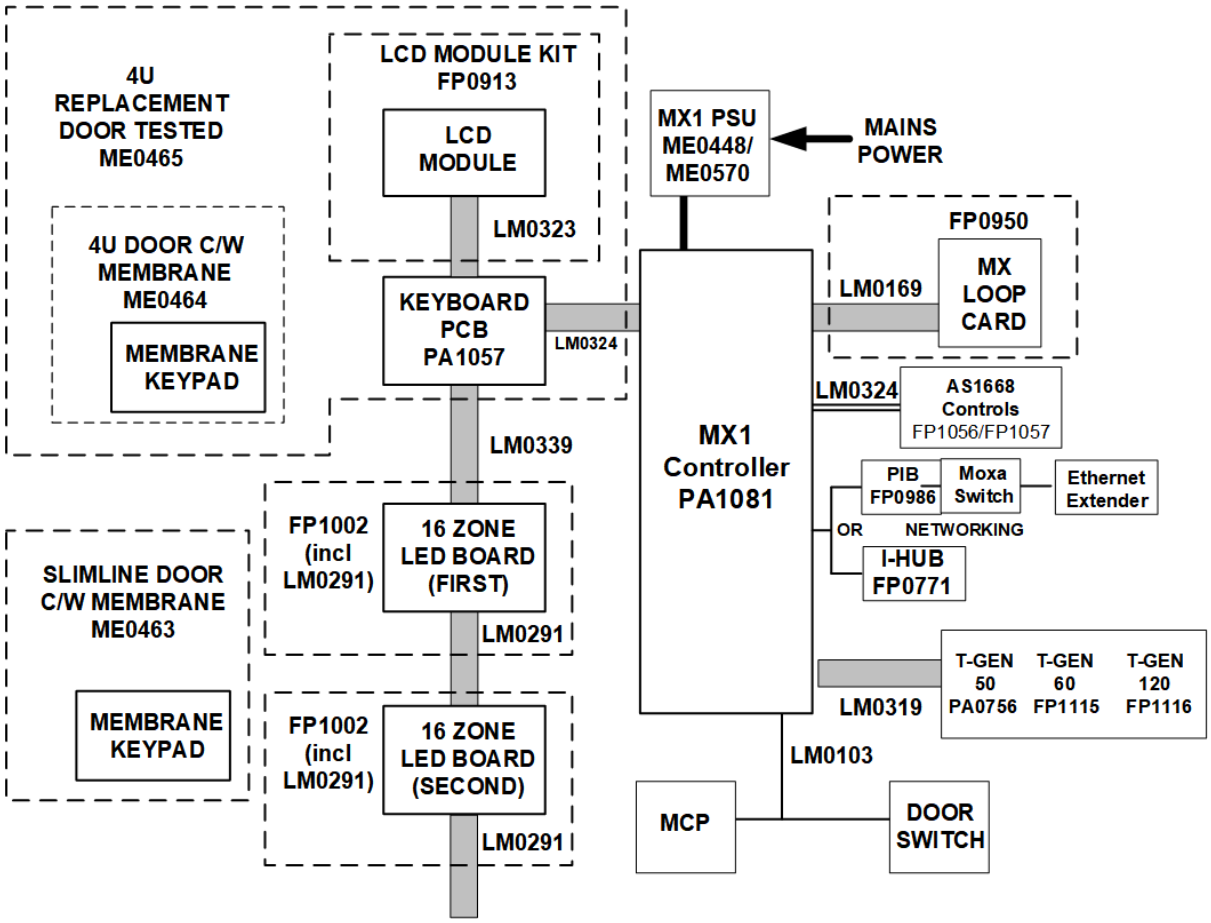


Figure 10-1 – *MX1* Panel Block Diagram

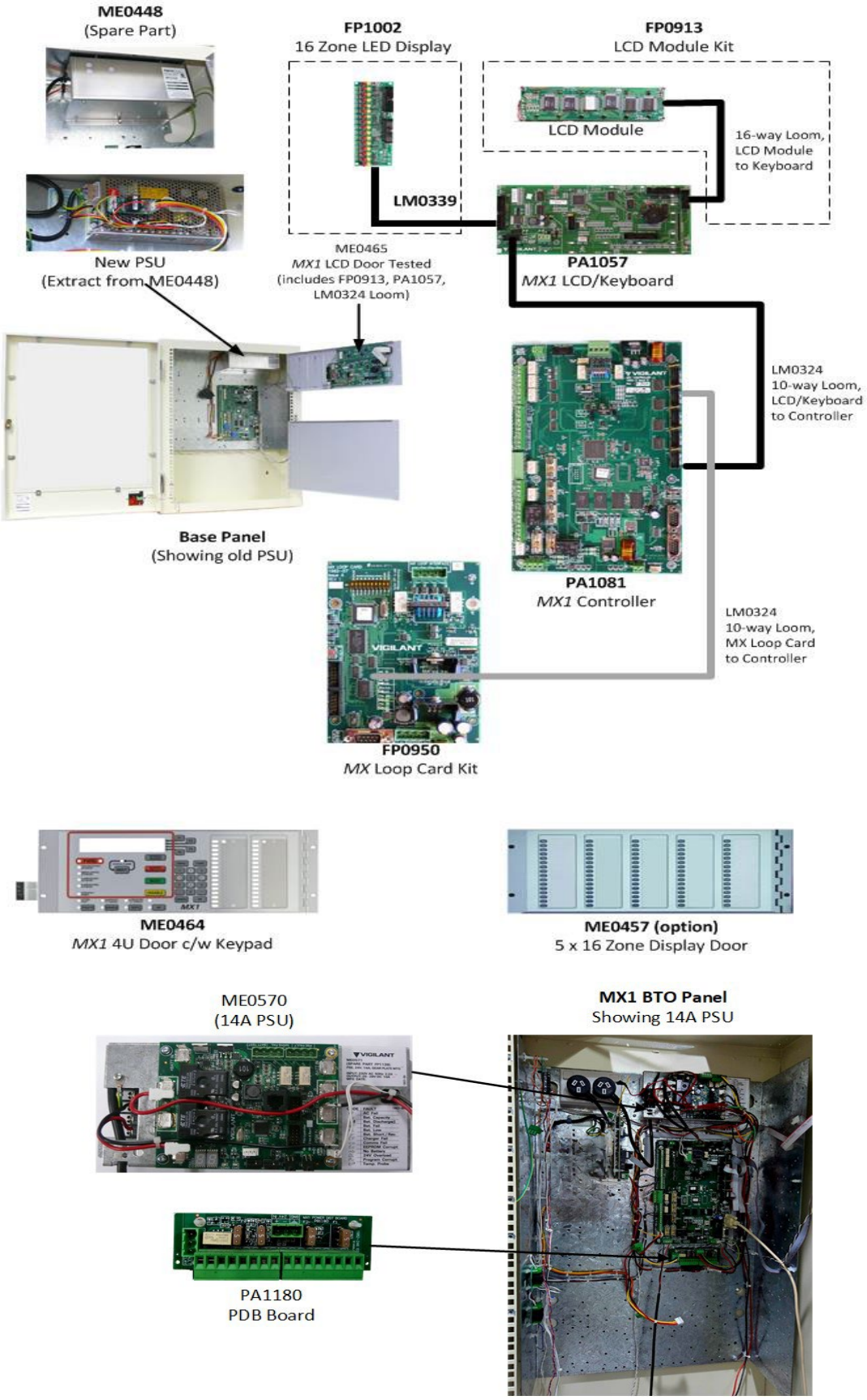
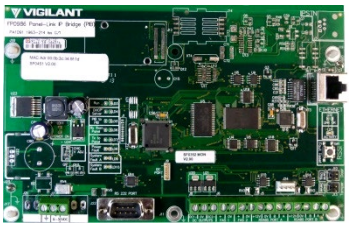
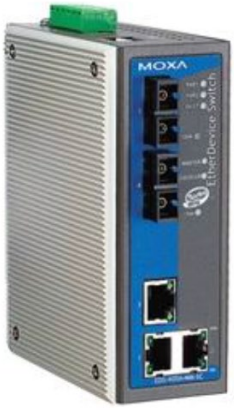


Figure 10-2 – *MX1* Spare Parts Identification



FP0986
PIB Panel-Link IP Bridge

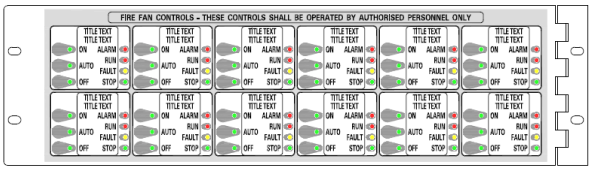
FP0771
I-HUB Intelligent Hub



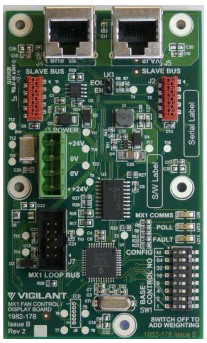
SU0319/SU0320
5 Port MOXA Switch

SU0328
DDW-120 Ethernet Extender

Figure 10-3 – *MX1* Spare Parts Identification – Networking Items



FP1056
3U 12 X AS1668 Door with 1st BRD



FP1057
2 X AS1668 Control BRD

Figure 10-4 – *MX1* Spare Parts Identification – AS1668 Fan/DSS Controls

10.3 New Installations

10.3.1 Panels

FP0927	FP MX1 AUST 15U PANEL 3U CENTAUR ASE BRACKET
FP0928	FP MX1 AUST 15U PANEL 3U CUBE/WA ASE BRACKET
FP0948	FP MX1 AUST 15U PANEL 3U BLANK
FP1040	FP MX1 AUST 8U PANEL 3U BLANK

10.3.2 Networking

FP0771	I-HUB UPGRADE KIT
FP0986	PIB PANEL-LINK IP BRIDGE
FP1044	IP NETWORK STP CABLE TERMINATION 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 ETHERNET EXTENDER DDW-120
OSD139AF	FIBRE OPTIC MODEM, MULTI-MODE, OSD139AF
OSD139AFL	FIBRE OPTIC MODEM, SINGLE-MODE, OSD139AFL

10.3.3 Other

FP0950	MX1 LOOP CARD KIT
FP0991	MX1 REMOTE FBP
FP1002	MX1, 16 ZONE LED DISPLAY EXTENDER
FP1012	MX1 DIN MODULE MOUNTING BRACKET
FP1013	IP NETWORKING BRACKET
FP1027	FP, MX1 LOOP CARD/MX MODULE MOUNTING BRACKET
FP1032	FP, OSD139 FIBRE OPTIC MODEM X 2 MOUNTING KIT
FP1056	FP, MX1 3U 12 X AS1668 DOOR, C/W 1st BD, LMs, LT and MTG
FP1057	FP, MX1 2 X AS1668 CNTRL BRD, C/W LOOM, LIT and MTG
FP1062	FP 1982-197, MX1 4xDDM800 MTG BRKT
FP1063	FP 1982-197, MX1 4xDDM800 MTG BRKT C/W DDMS
FP1092	6U NTFAST BRIGADE I/F DOOR
FP1115	FP,T-GEN 60,24V,C/W INSTALL LIT and MTG
FP1116	FP,T-GEN 120,24V,C/W INSTALL LIT and MTG
FP1117	FP,100 V SWITCHING MODULE,C/W LIT,LOOMS and MTG BRK
FP1118	FP,100 V SPLITTER MODULE,C/W LIT,LOOMS and MTG BRKT
FP1121	FP,GRADE 3 EWS UI 3U DOOR,C/W T-GEN 60 and MIC,GREY
FP1122	FP,GRADE 3 EWS UI 3U DOOR,C/W LOOM and MIC,GREY
FP1124	FP,GRADE 2 EWS UI 3U DOOR,C/W LOOM and MIC,GREY
FP1126	FP,GRADE 2 16Z EWS EXTENDER,3U 19" DOOR,GREY
FP1128	FP,GRADE 2 8Z EXPANSION BRD,C/W LOOM and MTG
FP1196	FP, MX1 POWER DISTRIBUTION BOARD SPARE
LM0076	LOOM 1922-25 ECM PROG DB9 (FEM)-DB9 (FEM) NULL MODEM
ME0457	4U 80 ZONE LED DISPLAY DOOR
ME0472	2U 4 X AS1668 CONTROLS AND COMMONS DOOR

10.4 Spare Parts

FP0913	FP, MX1, REPLACEMENT LCD MODULE KIT
FP0698	3U T-GEN 50 BRACKET C/W MICROPHONE
LB0600	LABEL, MX1, BLANK ZONE LABEL, GREY (two supplied with panel)
LM0076	LOOM 1922-25 ECM PROG DB9 (FEM)-DB9 (FEM) NULL MODEM
LM0103	LOOM,1931-97,F3200 MCP and MICRO SWT LOOM
LM0169	LOOM FRC 10W STYLE C 400MM

LM0291	LOOM, FRC, 26W, STYLE B, 270mm (between LED zone displays)
LM0319	LOOM, MX1, MAIN BRD TO T-GEN 50 (one supplied with panel)
LM0324	LOOM, FRC, 10W, STYLE B, 900mm (LCD/Keyboard to controller)
LM0685	LOOM,1982-247,MX1 MAIN BRD TO 14A PSU
LM0339	LOOM 1982-28 MX1 LCD/KEYBD TO 1ST ZONE DISPLAY
ME0448	MECH ASSY, 1982-26,MX1, PSU ASSY
ME0457	MECH ASSY 1982-40 MX1 4U 5 X 16 ZONE DISPLAY DOOR
ME0570	PSE ASSY, 24V,14A,GEAR PLATE MTG,MEANWELL
ME0464	MECH ASSY MX1 4U DOOR C/W KEYPAD ONLY
ME0465	MECH ASSY MX1 4U LCD DOOR TESTED
PA0773	PCB ASSY 1901-139-3 RS485 COMMS BD CMOS FRC ONLY
PA1081	PCB ASSY, 1982-2, MX1 CONTROLLER
PA1057	PCB ASSY, 1982-64, MX1 LCD/KEYBOARD, AS4428.3
PA1180	PCBA PA1180, PCB ASSY,1982-246,MX1
SW0030	F3200 DOOR SWITCH ASSEMBLY

10.5 Literature Items

LT0229	LIT I-HUB USER MANUAL
LT0332	LIT SMARTCONFIG PLUS USER MANUAL
LT0369	LIT MX1 ZONE DISPLAY LABELLING TEMPLATE (MS Word document)
LT0439	LIT MX1-Au OPERATOR MANUAL A5 (supplied with panel)
LT0440	LIT MX1-Au, SERVICE MANUAL A4
LT0441	LIT MX1-Au SYSTEM DESIGN MANUAL A4
LT0442	LIT MX1-Au FIELD WIRING INSTRUCTIONS
LT0443	LIT MX1 LOOP CARD INSTALLATION GUIDE
LT0466	LIT MX1 REPLACING 4U KEYBOARD/DISPLAY DOOR
LT0468	LIT SMARTCONFIG USER MANUAL
LT0519	LIT PIB USER MANUAL
LT0532	LIT MX1 REMOTE FBP INSTALLATION INSTRUCTIONS
LT0534	LIT MX1 PA1057 LCD/KEYBOARD INSTALL INSTRUCTIONS
LT0537	LIT MX1 PSU C/W COVER INSTALLATION INSTRUCTIONS
LT0540	LIT MX1 CONTROLLER SPARE INSTALLATION INSTRUCTIONS
LT0547	LIT FP1012 INSTALLATION INSTRUCTIONS
LT0557	LIT MX LOOP CARD/MX MODULE MOUNTING BRACKET INSTALLATION INSTRUCTIONS
LT0563	LIT FP1032 OSD FIBRE-OPTIC MODEM INSTALLATION INSTRUCTIONS
LT0571	LIT FP1044 IP NETWORK STP CABLE INSTALLATION
LT0587	LIT FP1056/57 MX1 FAN CONTROL INSTALLATION INST
LT0623	LIT 6U NTFAST BRIGADE I/F DOOR INSTALLATION INSTRUCTIONS
LT0685	LIT PSE 14A, GEAR PLATE MTD, INSTALLATION GUIDE

In addition, the third-party networking products such as the Moxa switch, DDW-120 Ethernet Extender, and OSD fibre modems have manuals from the respective manufacturer.

10.6 Software Items

SF0202	SOFTWARE, PANEL-LINK I-HUB EPROM
SF0278	SOFTWARE, SMARTCONFIG PLUS, INSTALL CD
SF0281	SOFTWARE, PANELX REMOTE OPERATION, INSTALL
SF0305	SOFTWARE, MX1 CPLD V1.00 FLASH
SF0332	SOFTWARE, MX1CAL, INSTALL
SF0392	SOFTWARE, MX1 LOOP CARD, FLASH
SF0407	SOFTWARE, MX1 FPB KEYBOARD, AS 4428.3, FLASH
SF0412	SOFTWARE, MX1, MAIN BOARD, FLASH
SF0432	SOFTWARE, SMARTCONFIG, INSTALL CD

SF0451	SOFTWARE, PIB FLASH
SF0465	SOFTWARE, PIB-FINDER (PC APPLICATION)
SF0501	SOFTWARE, MX1 AS1668 FAN CONTROL/DISPLAY BD
SF0280	SOFTWARE SMARTCONFIG PLUS INSTALL AUST

10.7 Sales Presentations and other Drawings

1982-42	Presentation Drawing for *MX1*-Au 15U
1982-66	Presentation Drawing for *MX1*-Au 15U - Examples
1982-142	Presentation Drawing for *MX1*-Au 8U
1982-185	Presentation Drawing for *MX1* 3U 12 x AS1668 Fan Controls Door

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