VIGILANT

PANEL-LINK IP BRIDGE (PIB) USER MANUAL

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The Panel-Link IP Bridge is a product of

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END USER LIABILITY DISCLAIMER

Some of the operation of the PIB as described in this manual is dependent on site-specific configuration performed by the field engineer. If the configuration is not well-designed, then operation may differ from this manual and compliance to local installation standards may be invalidated.

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AMENDMENT LOG

Date	Issue	Details
20/4/2010	1.00	First Release
27/7/2010	1.02	Updated for Firmware V1.02. New configuration items “Disable PIB Identification Broadcast” and “Prevent PIB from acting as DHCP server”. Initial configuration can be done using the serial port. Multiple (random) IP addresses can be inserted on each row of the Remote PIBs table. New serial commands “stat” and “config”. Serial help describes links, switches, jumpers and LEDs
22/03/2013	1.03	Corrects UTP definition. Updated for PIB firmware V1.03 - Includes an alternate method of saving / restoring configurations. Status page displays faults at remote PIBs. External fault contact input. Description of fault messaging over Panel-Link. Includes details of Ethernet switches and Ethernet extenders. Includes details of suitable mounting plates. Changed wiring, and LED, link and switch labelling for Issue G Rev 8 PCBs.
24/10/13	2.00	Updated for new PIB PA1091. Updated for PIB software V2.03. Add power supply fault level. FAS2 as power fault input. Power Fault LED. Add *MX1* networking details.
09/02/15	2.10	Updated for F3200 and MX4428 IP Networking approved to AS 4428.1.
07/07/17	3.00	Re-branded manual to Johnson Controls. Added documentation for VoIP proxy functionality. Added further documentation on fault monitoring.
15/5/23	4.0	Added QE20 details

- W A R N I N G -

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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1. Overview

1.1 Introduction and Scope

This manual describes the applications, installation, wiring, programming, commissioning and maintenance of the VIGILANT Panel-Link IP Bridge (PIB), which is an interface or gateway between VIGILANT Panel-Link products and an IP Network. It also has the capability to act as a VoIP proxy where it makes a VoIP call to a single audio source and distributes the received audio to many VoIP callers.

ATTENTION

This equipment contains
STATIC SENSITIVE DEVICES

Use Antistatic Procedures
when handling

1.1.1 PIB Hardware Versions

The PIB was originally supplied as a fully-populated circuit board – PA1031. In August 2013 a new version was created that uses the same bare Printed Circuit Board, but has only those components necessary for PIB operation fitted. This is PA1091. The two versions are functionally equivalent – except for the power supply wiring (see section 4.8).

1.2 Terminology Used In This Manual

1.2.1 VIGILANT

PIB	Panel-Link IP Bridge.	The product this manual refers to.
I-HUB	Intelligent Hub	An intelligent “hub” (actually a switch) for Panel-Link that can route and filter messages, and offers ring networking.
Panel-Link or Plink	VIGILANT protocol for networking fire alarm panels and other products.	A Plink message contains the panel information sent on a Panel-Link network.

SID	System Identifier	An address in the range 1 – 254, used to identify devices on a Panel-Link network.
VIF	VoIP Interface	A VIGILANT module that uses analog telephone connections to interface with ATAs to support VoIP.
VoIP Proxy		A function of the PIB that transmits (streams) audio to many VoIP callers.

1.2.2 IP Related

ARP	Address Resolution Protocol	A protocol to find the physical address (e.g. Ethernet MAC address) of a device on a local area network that has a specific IP address.
ATA	Analog Telephone Adapter	An adapter designed to connect an analogue telephone device (e.g. VIF) to the internet.
DHCP	Dynamic Host Control Protocol	A protocol for an IP connectable device to obtain its IP address automatically from a DHCP Server.
DSL	Digital Subscriber Line	Used for high speed (100 kbit per sec to 10Mbit per sec) communications over a phone line. There are various flavours: ADSL, ADSL2+, etc.
HTTP	Hyper Text Transfer Protocol	The protocol used for fetching and delivering “web pages”.
ICMP	Internet Control Message Protocol	A protocol for checking connectivity and reporting errors on a network.
IP	Internet Protocol	A protocol suite used to provide communication **within** and **between** local area networks. IP runs on many types of media (Twisted pair, optional fibre, WiFi, etc). An IP address that is unique in the world (or at least unique in a customer’s wide area network) is used to identify devices. The IP address is different to the LAN address, which need not be unique across a WAN (although it is in the case of an Ethernet MAC address).

LAN	Local Area Network	A network covering a small physical area.
MAC Address	Media Access Control Address	A 6-byte unique number assigned to each product by the manufacturer – used to identify the unit on Ethernet cabling.
10Base-T 100Base-T	Twisted Pair Ethernet	Twisted pair (4 pairs) Ethernet cable with RJ45 connectors operating at 10Mbit/s or 100Mbit/s. Limited to cable distance of 100m.
100BaseFx	Fast Ethernet Over Optical Fibre	100Mbit/s Ethernet operating over two optical fibre cables – one transmit, one receive.
MDI MDI-X Auto-MDIX	Medium Dependent Interface (-X = Crossover)	Defines the pinout used for the UTP RJ45 connection. Usually devices are MDI and hubs/switches are MDI-X. MDI and MDIX devices can be connected using straight through UTP cables, whereas two MDI (or two MDIX) devices will require a cross-over cable. Auto-MDIX products can automatically determine and configure their UTP port to suit the cable and type of product used at the other end.
RTP	Real-time Transport Protocol	A standardised packet format for delivering audio and video over the Internet.
SAS	Streaming Audio Server	A “server” that transmits (one-way) digital audio to multiple clients that is present in an ATA. Whilst functionally similar, the number of callers supported is limited compared to the VoIP proxy of the PIB.
SIP	Session Initiation Protocol	A protocol used to set up and take down phone calls across IP.
STP	Shielded Twisted Pair	Shielded cable with 4 pairs, used for 10Mbit, 100Mbit and 1Gbit Ethernet connections.
Telnet		A protocol for connecting an ASCII terminal to a host across a network.

TCP	Transmission Control Protocol	A protocol used for reliable transmission of a stream of bytes between two end-points, used for HTTP and Telnet for example.
UDP	Universal Datagram Protocol	A protocol for transmission of a packet of data from any point to any other point of a network. Delivery is on a best-effort basis, i.e., is not guaranteed.
UTP	Unshielded Twisted Pair	Wire cable with 4 pairs, used for 10 Mbit, 100Mbit, and 1Gbit Ethernet connections.
V-Lan	Virtual Lan	The programming of switches and routers so that the connected devices appear to be on a self-contained independent network, whereas they are actually on a very large network.
VoIP	Voice over IP	The use of IP to transport voice.
WAN	Wide Area Network	A network encompassing a large physical area that joins multiple LANs together.

1.2.3 General

Broadcast	A message that is addressed to **multiple** recipients.
Hub	A device that provides a centre point for a “Star” network connection. All data received on each port is transmitted on **every other port**.
Multidrop	A network segment with potentially more than two devices. Data messages need to be addressed, and there needs to be a means to ensure that only one device transmits at a time.
Point to Point	A network segment with only two devices – one at each end. Data messages do not need to be addressed to reach their immediate destination. With a “full duplex” connection both devices can transmit at the same time, while with a “half duplex” connection only one device can transmit at a time.
Router	The same as a hub, but data is transmitted on only the **required** other ports (based on IP address). Routers typically are capable of working out the best (fastest) route to a final destination if there are several routes, and working out alternative routes if the usual route is “down”.
Switch	The same as a hub, but data is transmitted on only the **required** other ports (based on LAN address, e.g., Ethernet MAC address).

1.3 Brief Description of PIB Uses

The PIB can be used to interconnect a number of Panel-Link panels and devices over an IP network, or to extend a Panel-Link network over long distances or between locations where it is not convenient or economic to install the cable normally used for Panel-Link, but where an IP network is available.

It also has the capability to act as a VoIP proxy where it can stream (replicate) up to 4 channels of VoIP audio to up to 31 remote nodes. For example, it could stream a PA announcement from one ATA to up to 31 other ATAs (that will call into the PIB to hear the announcement). Or it could stream each of PA, WIP All-Call, PABX and Background music to 8 other nodes. Up to four audio sources (each with a separate dial-in number) and 31 callers (shared across all active audio sources) are supported. This reduces the number of ATA and VIF modules required to support a given number of QE20/QE90 panels. For a full description of the VoIP proxy refer to the QE90 IP Networking Design Guide (LT0535) and the QE20 Design Manual (LT0726).

PIBs at different physical locations can be inter-connected using either the customer’s existing network, or media installed specifically for the purpose. In very simple terms, the PIBs act as a “piece of wire” between these locations. Each PIB transmits the messages it receives from the connected Panel-Link device via the network IP to all the other PIBs it knows about. Each receiving PIB sends an acknowledge message back to the sending PIB and also transmits the Panel-Link message out on its Panel-Link port.

The PIB cannot be used to extend the existing limits of a Panel-Link network regarding the maximum number of nodes and so on. It merely provides a convenient way of interconnecting Panel-Link nodes using IP networking.

The PIB can also provide remote access to the diagnostic port of certain VIGILANT panels, or other products with a serial connection. This allows a user with a PC running terminal emulation software to obtain access to the serial port of these devices from anywhere on the network.

For the Ethernet/IP network, many media types are available (from other suppliers).

For example:

- Unshielded Twisted Pair (UTP) or Shielded Twisted Pair (STP). Note – limited to 100m. Fire rated cable is available but it may be difficult to terminate.
- Fibre. Note – “Fire rated” fibre is available but although this rating applies to overseas standards it may not comply with current Australian standards.
- Wireless (WiFi, WiMax, Microwave, Bluetooth, etc).
- DSL (DSL, ADSL, ADSL2, ADSL2+, etc).
- Ethernet extender.

Note that many of these media types are not suitable for fire alarm/evacuation systems requiring compliance with appropriate installation standards (see section 2.8).

Figure 1-1 shows a diagram of a fully redundant ring network. Each circle is a PIB + third party Ethernet Switch (with 2 Fibre ports if applicable). If any one of the segments is broken, the switches will re-direct data as required so that communication will continue unimpeded. Furthermore, each of the switches can be configured to output a fault signal when this happens so that the fault can be identified, located and repaired.

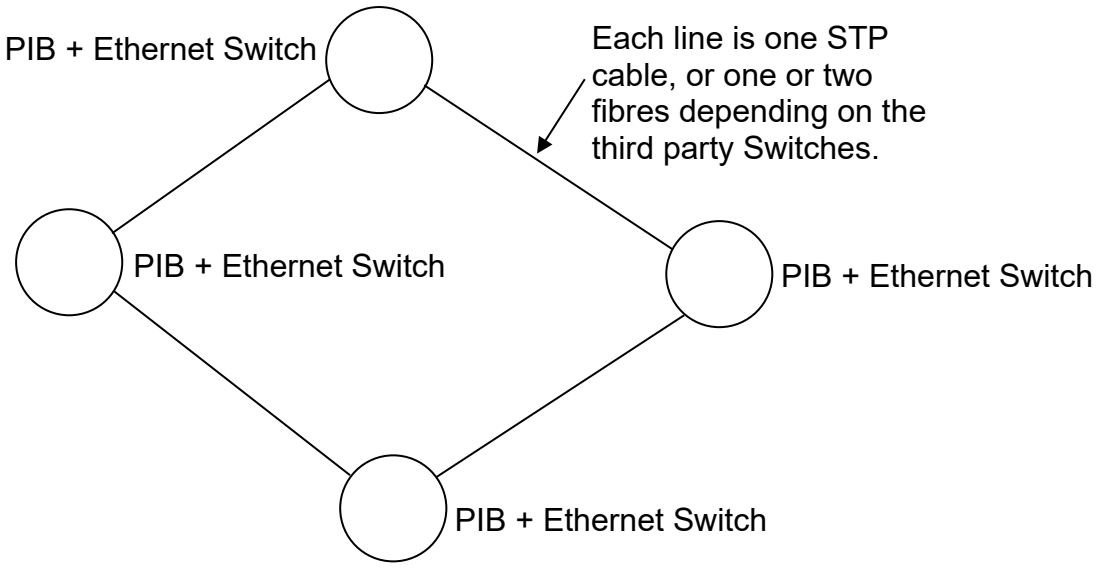


Figure 1-1 – Fully redundant ring topology

Figure 1-2 shows two fully redundant rings, interconnected using dual paths. Each circle is a PIB + third party Ethernet Switch (with 2 Fibre ports if applicable). If any one of the segments is broken, the switches will re-direct data as required so that communication will continue unimpeded. Furthermore, the switches can be configured to output a fault signal when this happens so that the fault can be identified, located and repaired.

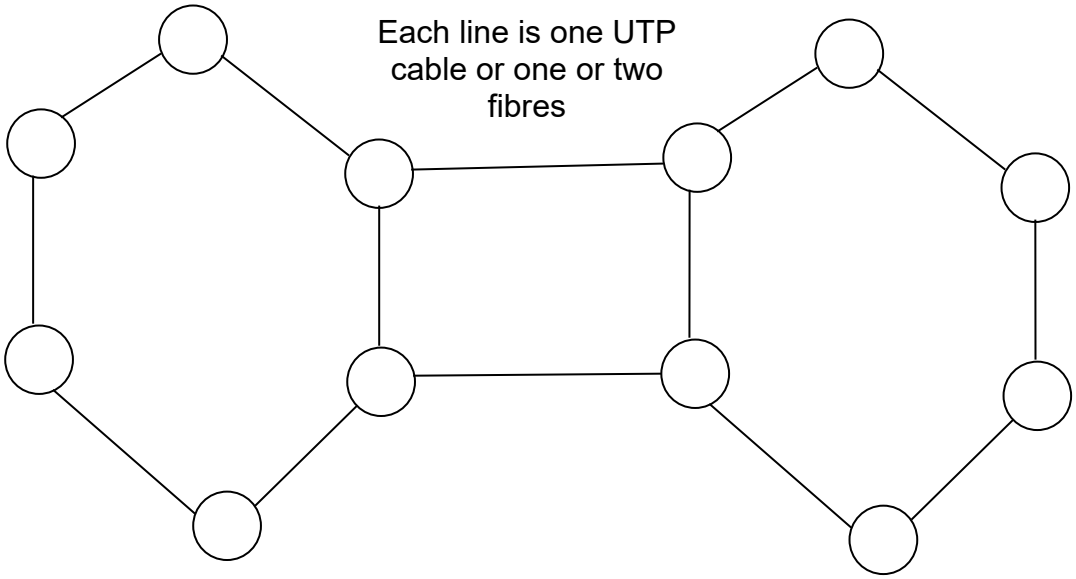


Figure 1-2 – Fully Redundant - two rings, interconnected at two points

Each PIB can connect directly to one Panel-Link device that supports point-to-point mode (i.e., *MX1*, MX4428, F3200, I-HUB, PTM, PMB, NDU, NLDU, Compact FF/NSA, QE20/QE90, XLG-C/S colour graphics system, or even another PIB). To connect a PIB to more than one Panel-Link device, an I-HUB (or PTM) is required as the PIB does not directly support multi-drop Panel-Link.

1.4 Applications

1.4.1 Example : Standards-Compliant Solution

Currently, IP Networking is ActivFire listed for

MX1 panels using the:

- The PIB
- Moxa 5-Port Ethernet fibre switches using any combination of shielded twisted pair (STP) cable, multi-mode or single-mode optical fibre cable, or Westermo Ethernet Extenders using a copper pair cable.
- Arranged in a ring to provide continued operation with one cable fault.

F3200 and MX4428 panels, NDUs, Nurse Station or Compact FF Annunciator, and I-HUBs using the:

- The PIB
- Moxa 5 Port Ethernet fibre switches using multi-mode or single-mode optical fibre cable or Westermo Ethernet Extenders using copper pair cable.
- Arranged in a ring to provide continued operation with one cable fault.

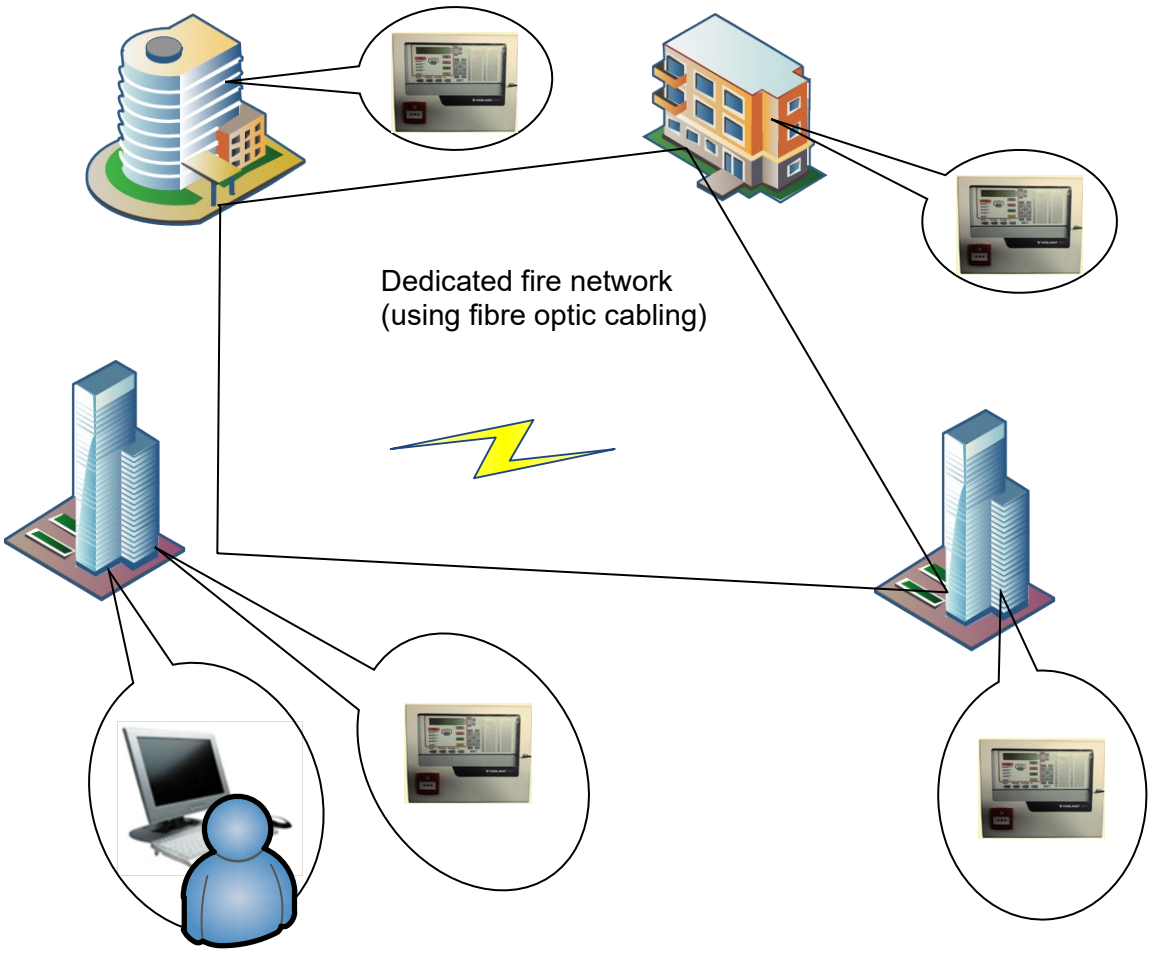


Figure 1-3 – Standards-Compliant MX1 IP Network

The PIB with fibre optic networking is listed to AS 4428.16 as part of the QE20 approval.

For most Standards-compliant installations the cables will need to be fire rated.

Fire rated optical fibre that complies with Australian fire rating standards should meet IEC 60331-25 with a minimum of 120 minute flame application time. In addition, an AS 3013 WS5X compliant support system should be used. Undergrounded cabling need not be fire rated. Refer to the appropriate installation standard (AS 1670.1, AS 1670.4, NZS 4512) for details.

Australian Standards fire-rated shielded CAT3 (Ethernet) cable is available. Ordinary fire-rated cable pairs can be used with the Ethernet Extenders.

1.4.2 Example 1 : Fully Redundant Network with F3200/MX4428

Figure 1-4 shows various F3200 and MX4428 panels connected by IP networking, arranged such that if there is a fault in any one of the extended Ethernet or fibre links, the system will continue to work unimpaired. Furthermore, the fault relay of the switches should be wired to the PIB (or panel) so that the segment with a fault can be identified.

The various locations have the following equipment connected:

1. XLG-C/S colour graphics server PC.
2. F3200 panel.
3. XLG-C/S colour graphics client PC + MX4428 panel (at the same location).
4. I-HUB that connects to a possibly remote F3200 panel and MX4428 panel.

Note that F3200 and MX4428 are ActivFire listed with IP networking approved, but using only fibre and Ethernet Extender – UTP and STP connections are not approved.

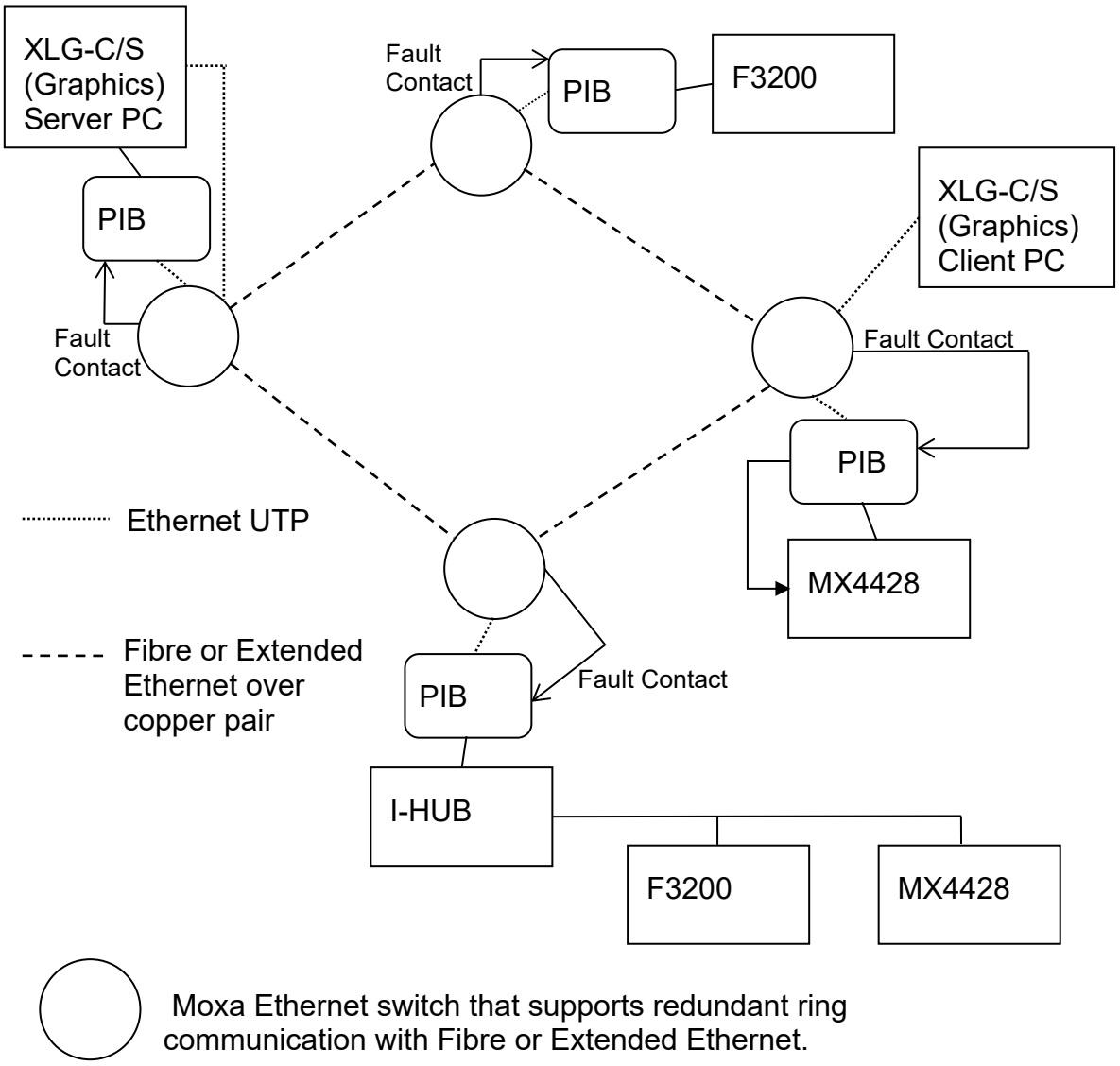


Figure 1-4 – Example Network with redundant paths

1.4.3 Example 2 : Network Without Redundancy

Figure 1-5 shows various locations connected by IP networking without redundancy. If there is a fault in the link between Switch 1 and Switch 2, the XLG-C/S colour graphics will lose connectivity with the disconnected devices. If there is a fault in any of the cabling between Switch 2 and PIBs 2, 3, or 4, then there will be loss of networking functionality (in both cases, a fault will be generated in the MX4428 / F3200 panels and at the XLG-C/S colour graphics).

The various locations have the following equipment connected:

1. XLG-C/S colour graphics.
2. F3200 Panel.
3. MX4428 Panel.
4. I-HUB that connects to (up to 1000m away) F3200 panel and MX4428 panel.

If Switch 2 is located remotely from all of PIBs 2, 3, and 4, then separate arrangements will need to be made to power it.

Generally this non-redundant configuration will not comply with fire alarm installation standards.

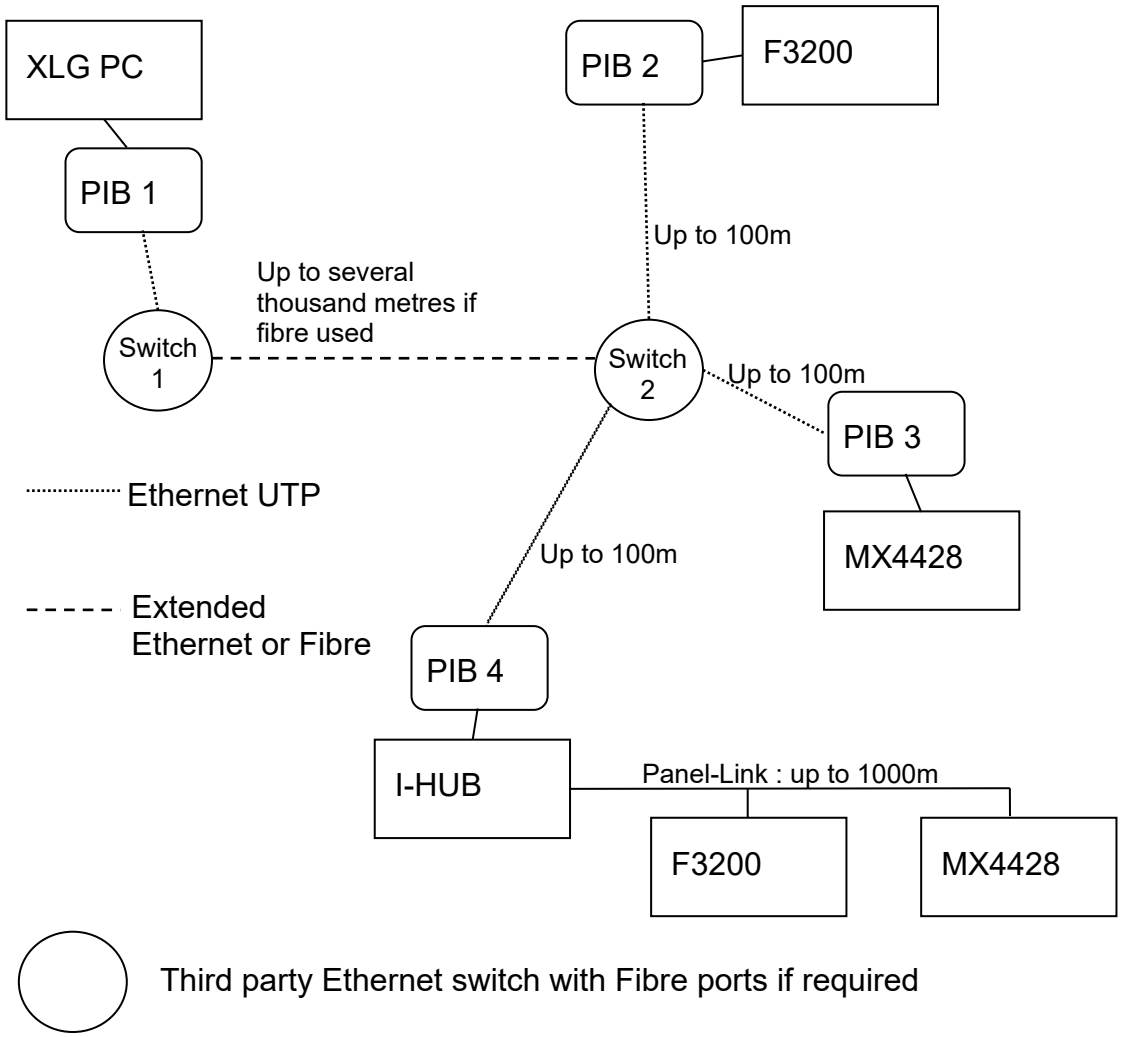


Figure 1-5 – Example Network without Redundant Paths

1.4.4 Combining Large *MX1* Networks

The *MX1* fire panel can support up to 250 other *MX1* panels in its network. However, the PIB is limited to just 64 PIBs in its network.

To achieve a full network of 250 *MX1* panels it is necessary to divide the network up into 4 (or more) sub-networks of up to 64 PIBs or I-HUBs each, with one PIB or I-HUB on each network connected back-to-back using the Panel-Link port with a PIB on a separate head-end network that merges the sub-networks together.

The Main *MX1* and other head-end equipment (PMB, XLG-C/S Colour Graphics) can be on this head-end network.

Figure 1-6 shows this arrangement.

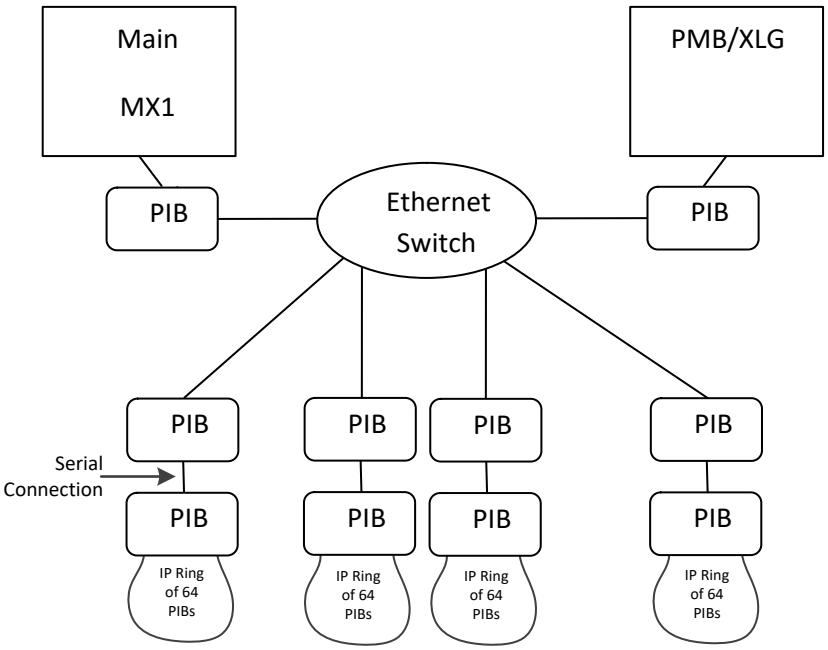


Figure 1-6 – Combining Multiple Sub-Networks using PIBs

1.4.5 Not Supported : Part of I-HUB Ring over IP

The example shown in Figure 1-7 (transporting part of an I-HUB ring network over IP) is **not** supported by the PIB.

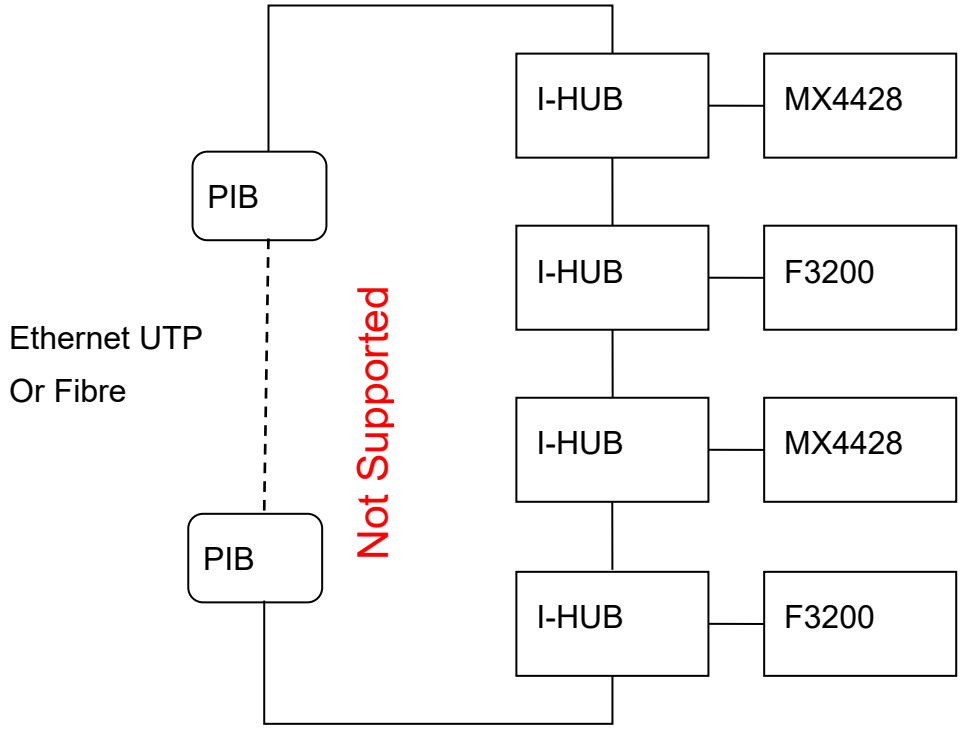


Figure 1-7 – Not supported – PIB in the ring of an I-HUB network.

A third party “Serial Device Server” product could possibly be used to achieve the arrangement shown in Figure 1-7.

1.4.6 Multiple Panel-Link Networks over one IP Network

The PIBs can be configured so that there are several independent Panel-Link networks running over the same Ethernet / IP network. This may be useful (for example) when one XLG-C/S system connects to several networks, and/or to several independent panels that have networking enabled only for the purpose of communicating with XLG-C/S.

XLG-C/S will currently need one PIB for each Panel-Link network and an RS232 connection to each PIB.

Alternatively, if all the panels can be given different SIDs, they can all be part of the same Panel-Link network, and un-wanted interactions between panels avoided by suitable configuration of the PIBs and panels (e.g., by excluding the un-related panels from each panel's SID list).

1.4.7 Network Independence

The operation of the PIB and Panel-Link network is independent of the IP topology. The PIB(s) and Panel-Link devices do not need to be configured for, or be aware of, any redundancy in the IP network (apart from being configured to accept a fault signal from a switch when applicable).

1.5 PIB Operation

1.5.1 Routing

The primary function of the PIB is to pass the Panel-Link messages it receives on its Panel-Link port on to the other PIBs it knows about so they can send the messages on to their Panel-Link port (and thus to their connected devices).

Panel-Link messages are addressed in two ways:

- Broadcast – sent to all other devices by using a special destination address (0).
- Directed (non-broadcast) – sent to a specific device (SID) by the destination SID being 1-255.

On receiving a non-broadcast message on its Panel-Link port the PIB will send the message on to the specific PIB that has the destination SID attached. If the PIB does not know where the addressed SID is then the message is silently discarded. Messages to SID 255 are processed locally by the PIB and are not on-sent.

Each received broadcast message is sent on to all the other known PIBs, unless the programmed routing rules say that a particular type of message is not to be sent to a specific panel (SID). Thus broadcast messages can be filtered if they do not need to be sent to specific destinations – e.g., to reduce the loading on the network or other receiving panels.

1.5.2 Message Load

The PIB has an internal 30,000 byte queue to buffer the incoming Panel-Link messages. This can hold up to 30 seconds of continuous data from the 9600 baud Panel-Link port, or a few minutes for occasionally transmitted Panel-Link messages. The oldest message will be deleted when the queue is full.
The PIB will broadcast its own PIB SID list message to the network. This allows the PIBs in the network to discover each other and their connected panels (SIDs).

The PIB can communicate with up to 63 other PIBs. If these are all present, and the transmitted data is not filtered in any way, each received broadcast message will be transmitted to 63 other PIBs. The PIB has a maximum transmit rate of about 300 PIB messages per second. With 63 other PIBs in the network, a PIB is capable of sending 4.7 messages per second (300 messages per second / 63 PIBs) to each PIB. But as each PIB may receive messages from the other 63 PIBs and pass them on to its Panel-Link port, so the number of PIBs that can be configured in a network is limited by the message burden on the Panel-Link port receive side (and thus the panel(s)).

Additionally, the time that it takes each message to be sent to another PIB and be acknowledged sets the maximum message throughput to that PIB. For example, if it takes 100 ms for a message to be acknowledged by the receiving PIB then at most 10 messages per second can be sent to that PIB.

As a guide, F3200 and MX4428 FIPs (when lightly loaded with local detectors and output logic) can handle a sustained incoming message rate of 15 messages per second at 9600 baud (and higher peak loads under alarm conditions). The default network message transmit settings for the F3200 and MX4428 FIPs are:

Message Type	**TX Rate**
Link Integrity TX	2 messages every 5 seconds
MAF Status	2 messages every 20 seconds
NETVAR TX	1 message every 20 seconds
Status Refresh	1 message every 10 (MX4428) / 23 (F3200) seconds

For this example assume worst case and accept that all of the message types are enabled for transmission by each FIP in the network (Status Refresh is required by only certain products). The default settings indicate that every 20 seconds each FIP will transmit 13 messages (2 x 4 = 8 Link Integrity, 2 MAF Status, 1 Netvar, 2 Status Refresh), that is 0.65 messages per second. In this case, the maximum number of FIP/PIBs that can be in the network is 23 (0.65 messages per second X 23 PIBs = 15 messages per second for each PIB).

Reducing the message transmit rate will allow more FIP/PIBs to be connected to the network:

	Maximum FIPs/PIBs
Default Setting (TX Link Integrity TX rate is 5 seconds)	23
Change Link Integrity TX rate to 10 seconds	33
Change Link Integrity TX rate to 20 seconds	43

To allow 64 F3200/MX4428 panels to be on the network, all 4 message type transmit periods need to be increased to 25 seconds (a permissible setting), or filtering needs to be employed in the PIBs.

In most networks it is highly unlikely that all messages sent by each panel will need to be sent to all the other panels on the network. Therefore filtering can be (and should be) programmed into the PIB (see section 5.5.3) to filter the outgoing messages to only those panels that need to receive them.

At its default baud rate (38400 bps) an *MX1* panel can support at least 40 incoming messages/second. The default message transmit rates for an *MX1* panel are:

Message Type	**TX Rate**
Link Integrity TX	2 messages every 15 seconds
MAF Status	2 messages every 60 seconds
NETVAR TX	2 messages every 120 seconds
Status Refresh	2 messages every 120 seconds

With 63 other *MX1* panels sending at this rate the total incoming message rate is 12.6 messages/second, well below the maximum supported.

As long as only *MX1* panels are present on the network, this level of messaging would be acceptable without filtering in the PIBs.

If other Panel-Link devices are included, and they support a lower maximum message rate, then filtering will be required to reduce the incoming message rate at those devices.

When the PIB VoIP proxy is active the Panel-Link message throughput should be de-rated to approximately 90% of nominal for 31 callers across 4 channels using the G.729 codec (the default). For the G.711 codec this derating should be 70% of nominal.

1.6 Configuration of Panel-Link Devices

A network of correctly configured PIBs broadly emulates “a piece of wire”, with each panel connected to it in “Point to Point” mode in contrast to the older multidrop mode. All Panel-Link data messages and Link Integrity messages are passed through (subject to the filtering described in the configuration section). However Panel-Link Acknowledgments are never passed across the IP network, but are generated locally by each PIB.

The PIB uses Panel-Link’s “Point to Point” mode on its Panel-Link port. The Panel-Link device connected to the PIB must be programmed for “Point to Point” mode, to expect acknowledgements to broadcasts (“NIC” in MX4428 terminology), and to acknowledge any broadcasts it receives.

The specific programming for the various panels that can be connected is:

MX1
On the Hardware table of SmartConfig select PIB in the Function cell for Equipment 247 Network. If the profile needs to be different to standard (e.g., a non-standard baud rate is being used) copy an existing profile to a suitably named new one, change as required, then select this profile. Then select the serial port to connect to the PIB.

On the System page enter the SID and Local Network Profile for this panel. On the SID Points page enter the other SIDs that the *MX1* needs to communicate with.

F3200
On NetPg0 enable networking.
On NetPg1 assign the unique SID, set the mode to **Pnt to Pnt**, set NIC to **Yes**.
On NetPg3 set link Tx to **Yes** if the panel is to send link integrity (usual), and Link Tx time to **20** seconds (see section 1.5.2).
On NetPg4 set Ack Broadcasts to **Yes**.

MX4428
In SmartConfig on the Network Page enable networking, assign the unique SID, set the topology to **Point to Point**, increase the LinkI Tx period to **20** seconds (see section 1.5.2 if Tx LinkI is enabled), and tick both **Expect Ack to Broadcasts (NIC)** and **Ack Broadcasts**.

I-HUB
The I-HUB is used to connect multiple panels on to the PIB network. Assuming the *MX1*Defaults option has been used: for the port connected to the PIB, enable the port, select Point to Point mode and the appropriate baud rate. Mapping of message types from and to the port will also be required.

QE90
As well as being set to “Point to Point” mode, a QE90 or I2000 device must be set to “Transmit all link integrity on channel A” and to “Disable Cyclic Addressing”.

QE20
The QE20 needs to be set to “Fibre” networking to enable point-to-point networking between the QE20 RS485 Network Module and the PIB on the Fibre Network Module.

2. PIB Specifications

2.1 Physical

Size	Circuit Board: 192 x 120 x 30mm.
Mounting	6 holes 3.0mm diameter, earthing required.

2.2 Environmental

Operating Temperature	-5 to +45°C
Humidity	Up to 95% non-condensing

2.3 Power Requirements

Voltage Range	PA1091:	9–28V DC (connected to “DC In” terminals).
	PA1031:	15–28V DC (connected between one of the 16VAC terminals and the 12V DC – terminal). **or** 10–14V DC (connected between the Batt + and – terminals).
Current Consumption	PA1091:	Typically 35mA @ 24V DC
	PA1031:	Typically 60mA @ 24V DC
	Note that current increases with decrease in voltage.	

2.4 Electrical Inputs / Outputs

Power	Screw Terminals (2.5mm^2 wire capacity)
Ethernet	RJ45 10Base-T Half/Full Duplex IPV4 Addressing. Supports DHCP or pre-programmed IP address.
Panel-Link	Screw Terminals (2 wires TX, 2 wires RX, can be wired as RS422, RS232, or TTL). Point-to-Point mode.
RS232	DB9 Plug, DTE pinout.
Outputs	OC1– Open collector output, switching to 0V
	OC2 – Open collector output, switching off when a fault is detected (or when the PIB is powered down).
	PSTN – not used.
Inputs	FAS1 – can be programmed for connection to a (voltage free) relay output of other equipment, e.g., a Moxa switch. When so configured, it will generate a fault in the PIB when the terminals are open circuit.
	FAS2 – can be programmed as a PSU Fault Input. Shorting the input to 0V will cause a Power Supply fault. Wire to open collector PSU FLT- or similar.

J13 DHCP SERVER [TAMPER][*1] – a mini-jumper can be fitted to enable a DHCP server.

J10 SERIAL DIAG [DOOR] [*1] – a mini-jumper can be fitted to enable the PIB serial port for PIB diagnostics (rather than for connection to the diagnostic port of the connected panel to provide remote access to the panel). After changing the link the PIB must be powered off and on before the new mode takes effect.

2.5 Controls

Fault Reset SW1 [RSSI] button [*1]	Resets a latched fault condition. If held pressed during power up, resets the configuration to the factory default. (Note on PA1031 versions of the PIB this button cannot function if there is a mini-jumper fitted to the Serial Diag J10 [Door] connector. Temporarily remove the mini-jumper from J10 connector if required.)

2.6 LEDs

Ethernet Activity (LD1)	Yellow	Flashes indicating Ethernet communications.
Ethernet Link OK (LD2)	Green	Steady on indicates that an Ethernet connection has been established (generally to a hub or switch).
Run (LD3) [Radio Link (LD3)] [*1]	Green	Flashes on / off approximately every second indicating that the software is running.
DHCP Server (LD4) [PSTN Link (LD4)] [*1]	Green	Steady on indicates that this PIB is acting as a DHCP server, i.e. a link is installed in the J13 DHCP Server [TAMPER] connector and the DHCP server has not been disabled in the configuration.
PIB to PIB (LD5) [Ethernet (LD5)] [*1]	Green	Flashes when data is received on Ethernet from another PIB.
RX from Panel (LD6) [RS485 link A (LD6)] [*1]	Green	Flashes when data is received from the Panel-Link device.
TX to Panel (LD7) [RS485 link B (LD7)] [*1]	Green	Flashes when data is transmitted to the Panel-Link device.
Power Fault (LD8)	Yellow	Steady on indicates that the PIB's supply voltage is low or the power fault input (FAS2) is active – see 2.7.

System Fault A (LD9)	Yellow	Steady on indicates that a fault has been detected.
System Fault B (LD10)	Yellow	Steady on indicates that the PIB is trying to re-negotiate a connection to the hub or switch it is connected to, or obtain an IP address from the DHCP server if the PIB is configured to use DHCP.
Power On (LD11)	Green	Steady on when power is applied to the PIB.

*1 The text labelling of some of the links and LEDs depends on the version of the PIB circuit board. Labelling for Issue G Rev 8 boards onwards is shown first, with the text for previous issue boards in square brackets [ ]. The numbering of the LEDs is unchanged (LD1-LD10) between versions.

2.7 Fault Conditions

The following conditions generate a fault condition :

Condition	How Reset
The inability to transmit data successfully on Panel-Link (after multiple attempts). Usually caused by the "connected" panel being disconnected, turned off, or programmed for the wrong serial port or baud rate, or does not have broadcast acknowledgements enabled.	Cleared automatically when the PIB receives an acknowledgement or restart message from the panel.
Messages discarded due to queues being full (usually resulting from the inability to transmit successfully).	Reset fault(s) clicked on the status page, or the Fault Reset SW1 [RSSI] button is pressed, or 3 minutes after the last fault.
Ethernet failure (i.e., not connected to a hub or switch, or cannot establish Ethernet settings with the hub or switch).	Clears automatically when this fault is fixed.
Unable to get an IP address via DHCP (when so configured).	Clears automatically when this fault is fixed.
Flash Program CRC (checksum) failure.	Cannot be reset without re-starting the PIB.
Flash Data Base CRC (checksum) failure.	Reset by submitting new configuration or load the default configuration.
A change in the automatically detected network configuration (e.g., an automatically detected remote node being switched off).	Resets after 3 minutes
Incorrectly structured messages received.	Resets 3 minutes after the last fault
FAS1 terminals are open circuit when “FAS1 is fault contact input” is selected in PIB configuration page.	Terminals are shorted.
Power supply failure (e.g. the PSU voltage is dropped below 11.5V (configurable) for 30 seconds), or FAS2 terminals are short circuit when “FAS2 is power supply fault contact input” is selected.	Clears after the PSU voltage returns to normal for 30 seconds. Terminals are opened.

For those conditions that latch for 3 minutes after the last occurrence, the fault can be reset immediately by (a) Pressing the Fault Reset SW1 [RSSI] pushbutton on the PIB, or (b) Clicking the reset faults link on the status web page.

Note 1: For the PA1031 version of the PIB the Fault Reset switch SW1 is not recognised if a link is fitted to the Serial Diag [Door] link J10. Temporarily remove the link to operate SW1.

2.8 ActivFire/FPANZ Listing

2.8.1 EMC Radiation

The PIB is certified as compliant with AS/NZS CISPR22 (Class A).

2.8.2 AS 4428.1

The PIB is ActivFire listed to AS 4428.1 for F3200 (afp789) and MX4428 (afp1446) when used with the Moxa 5 port fibre switch (SU0319 or SU0320) to provide a redundant cable path. The approved media types for the ring cables are:

- Fibre on ports 4 or 5,
- Extended Ethernet using the Westermo DDW-120 (SU0328) on ports 1, 2 or 3.

This allows a ring to be achieved using a mixture of fibre and twisted pair cables.

Note that 8 port switches, or a UTP or STP path between nodes are not ActivFire listed.

2.8.3 AS 7240.2

The PIB is ActivFire listed to AS 7240.2 (afp2320) when used in an *MX1* panel along with the Moxa 5 port fibre switch (SU0319 or SU0320) to provide a redundant cable path. The approved media types for the ring networks are:

- Fibre on ports 4 or 5,
- Shielded Twisted Pair (STP) on ports 1, 2 or 3
- Extended Ethernet using the Westermo DDW-120 (SU0328) on ports 1, 2 or 3.

This allows a ring to be achieved using a mixture of fibre, STP and twisted pair cables.

Note that 8 port switches, or a single UTP or STP path direct from the PIB itself are not ActivFire listed.

2.8.4 AS 4428.16

The PIB is approved to AS 4428.16:2018 as part of the Fibre Network Module used in the QE20 EWS. The approved media types are single and multi-mode fibre using the appropriate Moxa fibre switch.

2.8.5 NZS 4512

The PIB is FPANZ listed to NZS 4512 as part of the MX1 and MX4428 panels. The approved media types for the ring networks are:

- Single mode and multi-mode fibre on ports 4 or 5,
- Extended Ethernet using the Westermo DDW-120 (SU0328) on ports 1, 2 or 3.

This allows a ring to be achieved using a mixture of fibre and twisted pair cables.

2.8.6 AS 2220.1

The PIB and IP networking are not listed to AS 2220.1 for use with the QE90.

2.9 Orderable Part Numbers

2.9.1 PIB and Hardware Parts

FP0986 PIB PANEL-LINK IP BRIDGE
This includes the PIB board and standoffs for mounting the PIB on a gear-plate, plus the following items.

The following items are included in FP0986:

LM0041 LOOM 1888-58 FP4000 PROG PORT TO DB9 SERIAL
This loom is for connecting the diagnostic port of an MX4428 or F3200 panel to the PIB, allowing remote access.

LM0076 LOOM 1922-25 ECM PROG DB9(FEM)-DB9(FEM) NULL MODEM
Loom for connecting the diagnostics port of the PIB to a PC for programming or diagnostics or to an MX1 for remote access, or for data transfer to an XLG Server PC with “Swap Serial Ports” configured.

LM0081 LOOM 0.75APP G/Y 200MM M4 LUG:2.3QC
Earth lead for Moxa switch.

LM0086 LOOM 0.75APP G/Y 100MM M4 LUG:2.3QC
Earth leads suitable for connecting J23 and J25 to earth points on a gearplate when the PIB is mounted on plastic standoffs.

LM0392 LOOM ETHERNET RJ45 UTP PATCH LEAD 2.1M
Ethernet cable for connecting PIB to Ethernet switch (or wall socket etc).

LM0576 LOOM 1982-153 MX1 TTL-PIB CONNECTION
4-Way cable to connect the TTL port of an F3200, MX4428, MX1, I-HUB, NDU, PTM, NSA or Compact FF to the Panel-Link connector J24 on an Issue G or higher PIB.

LT0519 LITERATURE PIB USER MANUAL
This manual.

The following items may be useful for mounting or wiring the PIB or other IP networking parts in cabinets. These are NOT included in FP0986:

FP1011 DIN RAIL MTG PLATE MULTI PURPOSE C/W MTG
Mounting plate and associated parts for mounting a PIB on a G-section DIN rail – useful for mounting the PIB in a QE90 or other cabinet using DIN rails.

FP1012 MX1 15U CAB IP NETWORKING BRACKET C/W MT SCREWS
A bracket and mounting kit that allows a Moxa switch (SU0319, 320, 325 or SU0326) and 1 Ethernet Extender (SU0328) to be mounted on the MX1 gearplates (8U or 15U) in place of three MX Loop Cards.

FP1013 IP NETWORK MOUNTING BRACKET C/W MTG HARDWARE
A bracket and mounting kit that allows the PIB, 1 x Moxa switch (SU0319,

SU0320, SU0325 or SU0326), and 1 x Ethernet Extender (SU0328) to be mounted on the right hand wall of the 15U F3200 or MX4428 cabinets. It can also fit in an 8U MX1 cabinet, but only the PIB and 1 x Moxa switch can be mounted on it. It fits on the existing RS485 mounting studs and extends down into the battery space. In the 15U F3200 cabinet it clears the 6A heatsink. If a second Ethernet Extender is needed it will need to be mounted on DIN rail elsewhere – on the gearplate perhaps.

LM0065 LOOM 1901-174 RS485 COMMS BD 10W FRC TO DB9 CABLE
Loom for use (in conjunction with LM0460) in connecting to an I-HUB RS232 port.

LM0460 LOOM 1922-106 PIB RS485 PORT TO DB9
Loom for:
(a) Connecting the RS485 port of a PIB to an RS232 port of an I-HUB (in conjunction with an LM0065), or
(b) Connecting to the RS232 port of a PC, for example, for use with XLG-C/S (with “Swap Serial Ports” not ticked), or to access the PIB’s diagnostics from the PC (with “Swap Serial ports” ticked).

35mm Top-Hat DIN rail may be useful for mounting the Ethernet switches or Ethernet extenders. This can be readily obtained from various electrical suppliers.

2.9.2 Ethernet Switches

The Ethernet switches listed below provide:

- 24V DC operation
- the ability to be connected in a redundant ring using fibre or Ethernet
- a relay contact output that opens when power is removed, or when the ring is broken.

See section 2.8 for listing information.

Part Code and Description	Power Requirement
SU0319 MOXA 5 PORT E/NET SW (2 MULTI MODE FIBRE) MOXA EDS-405A-MM-SC	0.32A @ 24V
SU0320 MOXA 5 PORT E/NET SW (2 SINGLE MODE FIBRE) MOXA EDS-405A-SS-SC	0.32A @ 24V
SU0325 MOXA 5 PORT E/NET SWITCH EDS-405A	0.24A @ 24V
SU0326 MOXA 8 PORT E/NET SWITCH EDS-408A	0.26A @ 24V

2.9.3 Ethernet Extenders

The following module provides a bidirectional extension of Ethernet signals over a single cable pair of up to 5-8km depending on cable size and type. It is designed for telephone cable, but will generally work over other cables, albeit over a shorter distance for the same connection speed.

See section 2.8 for listing information.

Part Code and Description	Power Requirement
SU0328 SUNDRY,WESTERMO SHDSL ETHERNET EXTENDER DDW-120	0.11A @ 24V

The quoted performance is 9 Mbps over 2000m or 3 Mbps over 5000m. However the speed achieved will vary depending on the cable. If you propose to use an Ethernet extender over existing cabling that is not telephone cable, it would be prudent to do some tests before assuming that the existing cable will be satisfactory.

Note: 3 Mbps would be adequate for a small to medium EWIS network or most Fire networks. For a large EWIS network, please refer to the IP Network Requirements chapter in LT0528.

2.10 PIB NETWORKING

Number of PIBs in Network	Up to 64.
Message Format	UDP transmission to each programmed or discovered PIB, which then replies to acknowledge receipt.
Throughput	At least 300 messages per second.
Panel-Link Port	Point-to-Point Panel-Link. Baud rate up to 115Kbs RS232/RS422/TTL

2.11 VOIP PROXY

Audio Channels	4
Maximum Callers	31 (shared across all channels)
Protocols	SIP, RTP
Supported Codecs	G.711 μ-Law, G.711 A-Law, G.726 32 kbit/s, G.729

3. IP Network Requirements

3.1 Overview

This chapter is intended to be discussed with the network provider, e.g., the customer when the customer is providing the IP network. For the customer's information the purpose of the PIB is repeated here.

The PIB is used to extend a Panel-Link network (i.e., the Fire / Evacuation System network) over long distances or between locations where it is not convenient or economic to install the cable normally used for Panel-Link, but where an IP network is available. It can additionally (or alternatively) provide remote access to the diagnostic port of certain panels.

Multiple PIBs at different physical locations can be connected to an IP network (either the customer's existing network, or a network installed specifically for the purpose). In very simple terms, the PIBs act as a "piece of wire" between these locations.

3.2 General

The PIB's Ethernet port is 10Base-T. It supports full duplex and half duplex and will auto negotiate this. It does not provide Auto MDI / MDI-X. It will connect to a hub or switch with a straight through Ethernet cable. Direct connection to a PC (for example for initial configuration) will require a cross-over cable if the PC does not provide Auto MDI / MDI-X.

The Ethernet port is configured with a MAC address in the factory. This address is printed on a label on the PIB.

The PIB requires a single IP V4 address that can be obtained by DHCP, or it can be set to a static address. A fixed IP address is required when VoIP proxy functionality is used, as the VoIP ATAs dial by IP address. The address must also be fixed in some other network setups where the PIBs can't discover each other. In this situation each PIB must have fixed IP addresses of all the other PIBs entered into its configuration.

A fixed IP address for a PIB can be provided by assigning a static address within the PIB, or programming the DHCP server to allocate a fixed address for the PIB's MAC address.

An on-board DHCP server can be enabled by shorting the DHCP Server J13 [TAMPER] input with a mini-jumper. This will enable both the PIB itself and any connected PC (or other PIBs) to obtain IP addresses and thus for communications to be established. The PIB will allocate pseudo-"random" addresses in the range 10.0.0.0 to 10.255.255.254. The address range cannot be programmed. This on board DHCP server is intended for use only with a standalone network, or for access to a single PIB (from a Laptop) for configuration. It is not intended to be used with a customer's network, or to provide access to any other network or to the Internet. This DHCP server can be disabled via configuration so that it will not operate regardless of the position of the jumper.

The PIBs, Moxa switches, and ATAs should be assigned high-strength passwords to provide a degree of security against unauthorised users.

3.3 Ethernet Switches

To comply with fire standards that require a dual path between devices on the fire network, Ethernet switches that support dual / multiple paths must be used. For example, the Moxa EDS 405A / 408A series is available with a selectable number of Ethernet ports and up to 2 fibre ports.

This series supports 100M Fibre Ethernet (100BaseFX), which requires two fibres between switches. Models are available for single-mode and multi-mode fibre.

The following items which have been listed for use with the PIB in an F3200, MX4428 or *MX1* panel. Refer to Section 2.8.

Part Number	Moxa Model	Features
SU0319	EDS-405A-MM-SC	Entry-level managed Ethernet switch with 3 10/100BaseT(X) ports, and 2 100BaseFX multi-mode fibre ports with SC connectors, 0 to 60°C operating temperature.
SU0320	EDS-405A-SS-SC	Entry-level managed Ethernet switch with 3 10/100BaseT(X) ports, and 2 100BaseFX single-mode fibre ports with SC connectors, 0 to 60°C operating temperature.

Further information is available at http://www.moxa.com/product/EDS-408405A.htm

This series supports several topologies with redundant paths, and can provide a hard-contact fault output when one of the redundant paths fails.

It also provides a basic DHCP server where it assigns a configurable IP address based on the port the requesting device is connected to.

Also, the Moxa EDS-510A series supports Gigabit Ethernet with plug in fibre modules. Some of these modules require only a single fibre between switches.

3.4 IP Ports / Protocols Used By PIB

3.4.1 ARP

ARP is supported as required to map IP addresses to MAC addresses.

3.4.2 ICMP

ICMP is supported to the extent that replies are sent to PING requests. The PIB does not support reception of ICMP redirect messages and it assumes that the Default Gateway is the only required gateway.

3.4.3 UDP

UDP is used for data transmission of the Panel-Link data and broadcast of auto configuration information. Port 2220 is used by default, but this may be changed by configuration. When multiple Panel-Link networks use the same IP network, different ports may be used to separate the networks. Note that the Panel-Link data is always individually addressed to every configured and every automatically detected remote PIB (and will be acknowledged by each receiving PIB individually). However the auto-configuration discovery information (which allows PIBs to automatically find each other and determine the location of each Panel-Link SID) is broadcast (unless disabled by ticking “Disable PIB Identification Broadcast”). If there are remote PIBs that broadcasts cannot reach, then their IP addresses must be specifically programmed so messages can be directed to them. (For a pair of PIBs on different broadcast domains to communicate, at least one of them must be programmed with the IP address of the other.)

The UDP broadcasts of auto-configuration information can be disabled if it is required to minimise broadcasts on the network. All UDP transmissions will then be addressed rather than broadcast. The consequence of this is that PIBs will not find each other and explicit programming of the PIBs will be required.

For the VoIP proxy, configurable port numbers are used for the SIP protocol which operates over UDP. The port number for each of the four channels is independently configurable. RTP ports for audio reception and transmission are dynamically allocated in the range 16000 to 19998 inclusive.

3.4.4 TCP

TCP Port 80 provides a web server that is used for configuration and diagnostic monitoring of the PIB. **Access to this web server must be provided to service personnel as required (if necessary using a customer’s PC).**

TCP Port 23 provides a (TCP/Telnet) connection to the PIB’s RS232 port (which is generally connected to the fire panel’s diagnostic port), thus allowing remote panel diagnostics and configuration over the IP network.

TCP Port 1023 provides a (TCP/Telnet) connection to the PIB internal diagnostics.

The web server can provide most[1] of the diagnostic information available from the Telnet connection to the PIB internal diagnostics or the connected panel. This may be useful if Telnet traffic cannot be routed through firewalls, and /or the customer’s policy will not allow Telnet connections on their network.

3.4.5 VoIP

When the VoIP proxy function is configured the PIB uses SIP on the enabled channels at the UDP ports configured in the PIB, plus SIP for the UDP ports of the source devices, and RTP on ports negotiated with the source ATA devices.

[1] The web representation of the internal or panel diagnostics is not useful when it is required to capture a large amount of data.

3.5 Data Throughput / Latency / Reliability

This information is provided to enable the **order of magnitude** of data throughput required on the Ethernet network. For more precise information, please consult Johnson Controls Technical Support.

Each PIB will **broadcast** a short UDP packet every 10 seconds. Each Panel-Link packet received on the Panel-Link port will be sent **individually** to every other (discovered or configured) PIB on the network, unless filtering is programmed into the PIB. Every receiving remote PIB will acknowledge receipt of the message. At the *MX1* maximum transmit rate of 10 message/s, with the maximum of 63 other PIBs, and the transmitted data not filtered in any way, the total data transmitted is approximately 8.3% of the capacity of 10Mbit Ethernet and 0.83% of the capacity of 100 Mbit Ethernet, for each such PIB. At the normal message rates (≈ 1 message/5s), the usage is about 0.27% of 10Mbit and 0.027% of 100Mbit Ethernet.

The network must allow for this level of throughput, and for a return trip latency of less than 0.2 seconds, regardless of other network traffic. Unsolicited broadcast packets sent to the PIB must be limited to fewer than 50 packets per second. The network must provide less than 0.1% packet loss.

For the VoIP proxy, approximately 80 kbps of traffic per caller will be transmitted in a single direction (to the caller) when a call is active.

3.6 Router / Firewall / VLAN Configuration

It is generally necessary to provide the PIB IP network with a VLAN on the customer's network. This provides a degree of security and isolation between the PIB network and the other users on the network. See section 3.7.

Routers/Firewalls within the IP network must be configured to let addressed (i.e. non-broadcast) UDP messages from / to port 2220 through between PIBs. (Note – other port numbers will need to be configured if there are multiple Panel-Link networks on the same IP network. These should be similarly treated.)

If the PIBs are not on the same IP subnet, then possibly a VLAN could be set up by the IP network provider for the PIBs so that they all appear to each other to be on the same subnet. This could reduce the amount of specific configuration of the PIBs that is required, and in the event of one failing and needing replacement, could make the replacement easier so that generally an "out of the box" replacement would work without any specific configuration. The VLAN will also logically separate the fire network from other IP applications, and could be used to increase the priority of the fire network.

Otherwise, the PIBs can be set up with IP addresses that are not on the same subnet. PIBs that need to communicate with each other across different subnets require the IP addresses of the remote PIBs to be programmed (programming at one end only is sufficient as the receiving end will reply automatically).

Routers / Firewalls that are located between the PIB network and any location where it may be desired to monitor and /or configure the PIBs must be set up to let HTTP traffic to port 80 through, and ideally allow Telnet connections to ports 23 and 1023 for remote access to the panel's diagnostic port, and the PIB internal diagnostics.

For the VoIP proxy, the SIP UDP traffic must be allowed through at the configured SIP ports for each channel. In addition, RTP UDP traffic with ports in the range 16000 to 19998 inclusive must also be allowed through.

Further information on configuration of the PIB is given in section 5.

3.7 Security Requirements

For dedicated networks used exclusively for fire and/or evacuation networking that use only Johnson Controls supplied and configured equipment there are no specific security requirements. Although it is recommended that PIBs, Moxa switches, and ATAs be configured with strong passwords.

Additional security measures are required for non-dedicated networks or customer supplied networks. These networks are defined as those that use any non-Johnson Controls supplied and configured equipment, and/or where the fire and/or evacuation networking traffic is shared with other building systems or general Information Technology (IT) equipment.

These measures include:

- All fire and/or evacuation traffic must be isolated from other traffic – generally this will require the use of a separate VLAN for the fire and/or evacuation network.
- Ensure network availability, security and throughput is acceptable.
- Use non-Johnson Controls networking and security experts to determine the security requirements, prepare the network design, and configure and maintain the customer networking equipment.
- Any external access to the Johnson Controls equipment requires:
    - End point to end point security (e.g., encrypted tunnel between user and the Johnson Controls equipment).
    - Authentication of the user making the access.
    - Use of non- Johnson Controls networking and security experts to design the network and configure and maintain the customer equipment.

Using a non-dedicated or customer-supplied network means the installation will not comply with fire/evacuation design/installation standards (e.g., AS 1670.1, AS 1670.4, NZS 4512).

The next page is to be filled out by the customer and the page sent to Johnson Controls Fire Protection Products (Christchurch) to acknowledge the customer’s agreement to these requirements and provide a liability exclusion to Johnson Controls for the network security.

USE OF CUSTOMER NETWORK FOR JOHNSON CONTROLS IP NETWORKING

Customer organisation name:

Site name:

Installation organisation name:

Overview of fire & evacuation system on-site:

Reason(s) using non-dedicated network:

Brief overview of customer's networking equipment:

Customer representative to complete and provide to Johnson Controls (Christchurch):

I acknowledge having read Section 3.7 of the Johnson Controls PIB User Manual (LT0519) and will undertake the network design and security arrangements as stated. I hereby exclude Johnson Controls from any liability with respect to the security of the fire and/or evacuation network operating on the customer network as detailed above.

Name: Role in Organisation:

Signature: Date:

4. Installation & Wiring

4.1 Mounting Options

The PIB has a mounting footprint that matches the MX4428 responders, F3200 8 Zone / 8 Relay modules, and T-GEN 50, so it can generally be mounted on gearplates, cabinets, etc., where those products can be mounted. It is higher than some modules and has an Ethernet cable that extends above the PIB.

Care must be taken in selecting the mounting position, so that the necessary cabling can be run and suitable earthing applied. This is especially important when fibre optic cable is used, as it does not support significant bending and the connectors can be fragile.

4.1.1 PIB Mounting

To provide sufficient EMI protection the PIB must be earthed to the gearplate/cabinet it is mounted on/in. J17 and J19 provide this connection if the PIB is mounted on metal standoffs, using metal screws, at these two points. (The other mounting points may be plastic standoffs). If J17 and J19 are not earthed, then earth leads (included with the PIB) must be fitted to the adjacent earth tabs J23 and J25, with the leads electrically connected to the gearplate/cabinet earth.

The PIB kit of parts includes these mounting parts, plus 6 x PBR-06 (HW0209) standoffs for old gearplates, and cable ties and holders for restraining the cabling.

In an *MX1* 15U cabinet, the recommended mounting positions for the PIB are:

- Firstly, on the bottom of the right hand flange of the gearplate, as this provides both earthing points.
- Secondly, in place of the T-GEN 50 on the bottom left hand gearplate position, as this provides one earthing point.
- Thirdly, in the top left position of the gearplate. This will require two earth wires to be fitted.

The Moxa switch and, if required, one Ethernet Extender, are mounted on an FP1012 bracket on the left hand side of the gearplate. Note it is possible to mount both the PIB and the FP1012 in the bottom left gearplate position.

In an 8U *MX1* the FP1013 bracket should be mounted on the right hand inside of the cabinet, with the PIB and Moxa switch mounted on the bracket. Ethernet Extenders, if required, will need to be mounted elsewhere.

Alternatively, the PIB can be fitted instead of the T-GEN 50 on the bottom left of the gearplate (requires one earth lead at the top), but this means the FP1012 bracket cannot be fitted for a Moxa switch or Ethernet Extender. Generally a second cabinet (e.g., battery box) will be needed for the batteries.

In an F3200 or MX4428 panel, the PIB is typically mounted on an FP1013 bracket that is mounted on the Right Hand Side of the cabinet as per the FP1013 section following.

4.1.2 Other Mounting Kits

Other brackets or special mounting facilities for the PIB and ancillary equipment include the following:

FP1011 DIN RAIL MTG PLATE MULTI PURPOSE C/W MTG

This bracket provides mounting for just the PIB (nothing else) and allows it to be mounted on the G-section DIN rails used in QE90 cabinets, or on small sections of DIN rail pop-riveted onto gearplates, cabinets, etc. See Figure 4-1.

It includes the plastic feet to mount on the DIN rail.

The Moxa switches and Ethernet Extenders that are quite often used with the PIB on an IP networking system are DIN rail mounting (top-hat DIN rail, not the G-section used in QE90). These modules are usually mounted on lengths of such DIN rail, pop-riveted to gearplates, cabinets or mounting brackets.

Figure 4-1 – FP1011 Bracket Holding PIB in QE90

FP1012 MX1 15U CAB IP NETWORKING BRACKET C/W MT SCREWS

This bracket mounts on the *MX1* gearplate occupying three horizontally adjacent *MX* Loop Card positions. It allows the Moxa switch and one Westermo Ethernet Extender to be mounted on the piece of DIN rail included on the bracket. See Figure 4-2.

The Moxa switch and Ethernet Extender simply click onto the DIN rail. The Moxa switch must be earthed – see section 4.7.5.

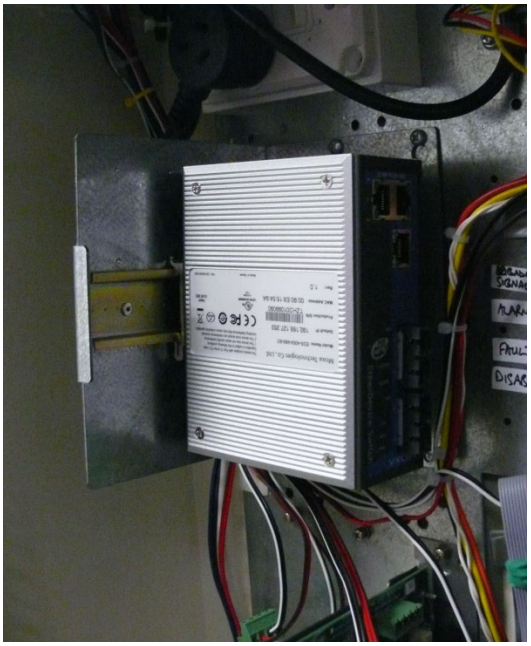


Figure 4-2 – FP1012 Bracket Holding a Moxa Switch

In a 15U *MX1* this bracket can be combined with the PIB in a compromise arrangement, by mounting the bracket in the two left hand *MX* Loop Card positions and mounting the PIB in the corresponding "responder" footprint position (see Figure 4-3). In this arrangement, the Moxa switch and one Ethernet Extender can be fitted to the FP1012 bracket, but they will cover the LED indications of the PIB. Access to the key PIB links, screw terminals and connectors is possible, but a little tight.

Also, placing the FP1012 bracket in the top position on the 8U or 15U gearplates will cover the cabinet mounting bolt, so the PIB and bracket must be removed from the gearplate when mounting or removing the cabinet from the wall.

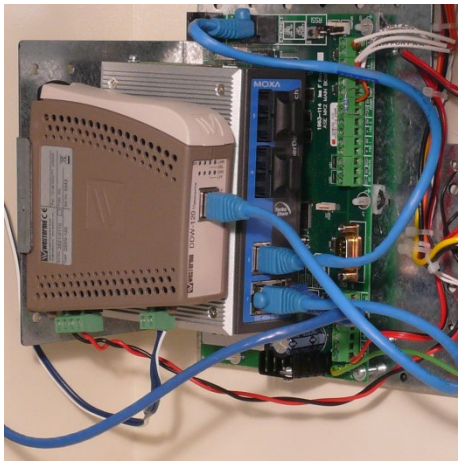


Figure 4-3 – FP1012 Bracket & PIB in Combined Arrangement

FP1013 IP NETWORK MOUNTING BRACKET C/W MTG HARDWARE

This bracket mounts on the RS485 board mounting position on the right hand side wall of 15U F3200/MX4428 cabinets. It can hold the Moxa switch, 1 Ethernet Extender and a PIB (see Figure 4-4). The Moxa switch and Ethernet Extender simply click on the DIN rail. Metal mounting standoffs and screws are included for the PIB.

The bracket can also be mounted on the right hand inside wall of the 8U *MX1*, but only the PIB and Moxa switch can be fitted. Any Ethernet Extenders will need to be mounted elsewhere.

The FRC from the *MX1* Controller to the LCD/keyboard will need to be moved out of the way while the bracket is being installed, then repositioned to clear the modules on the bracket.

Figure 4-4 – FP1013 Bracket in 15U Cabinet Mounting PIB, Switch, Ethernet Extender

Figure 4-5 shows a PA1091 Issue G PIB and its connectors.

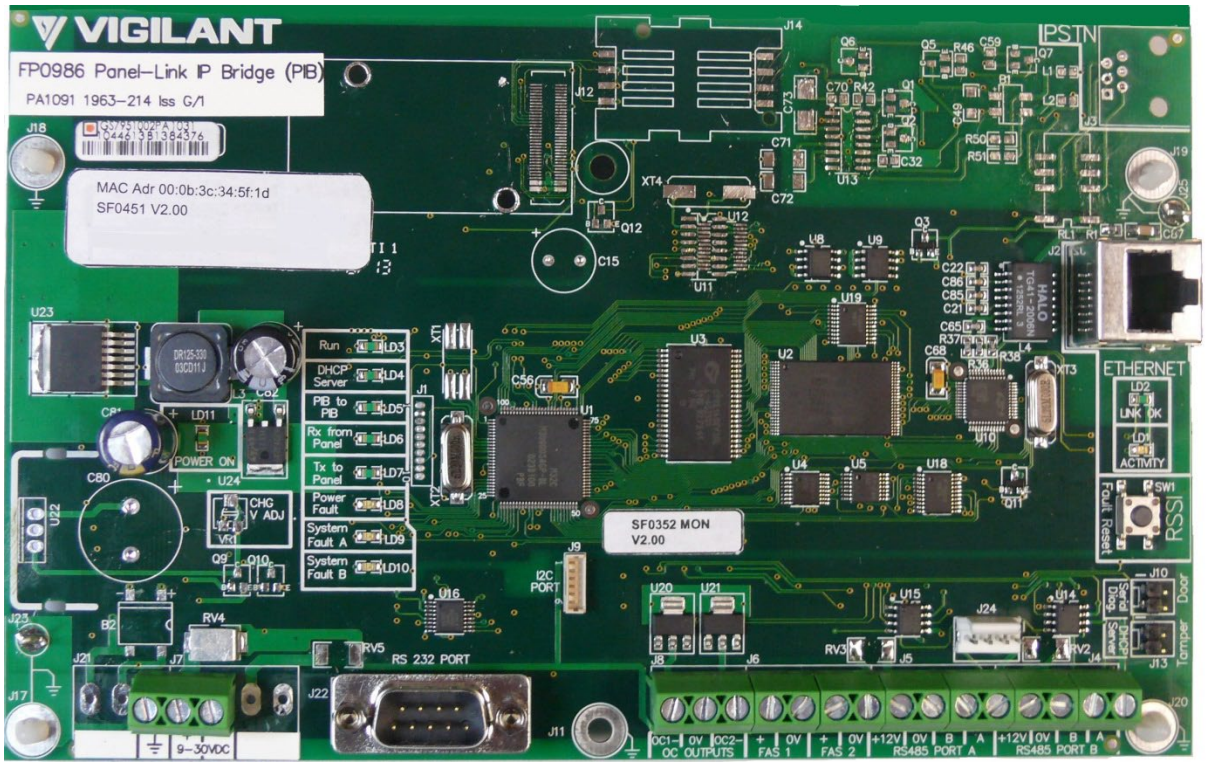


Figure 4-5 – PIB and Connectors (PA1091 Version)

4.2 Power Supply Wiring

In the fire panel obtain 24V from a suitable (fused) output. Generally, only the PIB and other networking equipment should be powered from the output – so that a fault in other (field) wiring does not blow the fuse and cut power to the network equipment.

If the PIB is being powered by a stand-alone PSU with a Fault output that needs to be monitored, connect the PSU FLT- signal to FAS2 (see section 4.6).

PA1091 Power Connection

Connect 9-30V DC to the 9-30V DC + and – terminals on the PIB.

PA1031 Power Connection

Connect either:

1. +15-28V DC to either of the 16V AC terminals and the –ve wire to the -12V DC terminal (0V); or
2. +10-14V DC to the +12V DC terminal and the –ve wire to the -12V DC terminal.

4.3 Ethernet Wiring

Figure 4-6 shows the general wiring of the PIB, Moxa switch, Ethernet Extenders and Panel.

Connect a standard Ethernet cable to the Ethernet port (J2) of the PIB.

In the event that you need to connect the PIB directly to the Ethernet port of a PC, and the PC does not support auto MDI / MDI-X, use a crossover Ethernet cable.

4.4 Panel-Link Wiring

4.4.1 Connecting PIB to TTL Port of MX4428, F3200, *MX1*, or ECM

With PIB Issue G and onwards the TTL Network port of compatible products (F3200/NDU/PTM, MX4428, *MX1*, I-HUB, NSA or Compact FF) can be connected directly to the PIB Panel-Link port, J24, using LM0576.

For earlier versions of PIB (without the J24 connector), or if a LM0576 is not available, plug the connector end of an LM0434 into the Network port of the MX4428, F3200/NDU/PTM, *MX1*, NSA, Compact FF or the TTL port of the I-HUB.

Connect the 4 wires at the other end to the RS485 terminals of the PIB. Each wire is labelled with the terminal it connects to.

The LM0576/LM0434 loom plugs into the network port of the panel as follows:
MX1 – Serial Port 4 or other as programmed in SmartConfig; MX4428 into the Modem Header J2A, F3200/NDU/PTM into the Network 1 Port J7, Compact FF and NSA into Serial Port 0 J2, and for an I-HUB into TTL Serial Port (Port 5) J4.

For early MX4428 mainboards and F3200 controllers (with only the Vicnet 12 way network connector) a LM0151 cable can be used. Cut off the 10 way FRC connector and wire the 3 wires to the PIB screw terminals as per the table below.

For PA1031 up to Issue F, connect an 18k resistor from +12V to RS485 Port A terminal B. (For Issue G and later of PA1031, and for PA1091 this is not required and should not be fitted). The following table shows this wiring.

PIB	***MX1*, F3200, MX4428, I-HUB, NSA, etc.**		***Old MX4428 Vicnet Connector Using LM0151***
RS485 Port B Terminal A	Pin 3	RXD at Panel	Pin 7
RS485 Port B Terminal B	-	-	-
RS485 Port B 0V	Pin 7	0V	Pin 12
RS485 Port A Terminal A	Pin 4	TXD from Panel	Pin 8
RS485 Port A Terminal B	(18k to +12V) *	-	(18k to +12V) *
RS485 Port A 0V	Pin 8	0V	-

* Connect resistor on PA1031 up to and including Issue F PIBs.

4.4.2 Connecting PIB to RS485/RS422 Port of ECM, I-HUB, PMB

Remove the resistor (if any) connected to RS485 Port A terminal B.

Connect 4 wires from the PIB to the I-HUB, QE90 ECM or PMB as follows.

PIB	I-HUB, QE90 ECM or PMB
RS485 Port B Terminal A	RXA+
RS485 Port B Terminal B	RXA-
RS485 Port A Terminal A	TXA+
RS485 Port A Terminal B	TXA-

4.4.3 Connecting PIB to RS485 Port of PA0773 RS485 board

Remove the resistor (if any) connected to RS485 Port A terminal B.

Connect 4 wires from the PIB to the RS485 Board as follows.

PIB	RS485 Board
RS485 Port B Terminal A	A+
RS485 Port B Terminal B	A-
RS485 Port A Terminal A	B+
RS485 Port A Terminal B	B-

Set the DIP switches on the PA0773 RS485 Board to 4 wire point to point mode.

1 : ON 2 : ON 3 : OFF 4 : OFF.

4.4.4 Connecting PIB to RS232 Port of ECM/I-HUB or XLG-C/S PC

Remove the resistor (if any) connected to RS485 Port A terminal B.

For an Issue G or onwards PIB fit a 1k5 resistor (supplied with the PIB) between Port A-A and 0V.

To connect the PIB RS485 port to the RS232 port of an ECM/I-HUB, obtain an LM0559. Connect the 3 free wires at one end of it to the RS485 terminals of the PIB as per the labelling on the loom, and plug the FRC connector into the required RS232 Port of the ECM (I-HUB).

For connecting to a PC, obtain an LM0460. Connect the 3 free wires at one end of it to the RS485 terminals of the PIB. Each wire is labelled with the terminal it connects to. Plug the DB9 connector into the PC serial port.

Note – to connect to an XLG Server comms port, instead of obtaining this cable, it may be easier to select "swap serial ports" in the PIB's configuration, so that the PIB's RS232 port can be used for Panel-Link. Then connect the PIB RS232 port to the PC comms port with a null modem cable such as LM0076.

Note – Take care when selecting the PIB's RS232 port for Panel-Link, as this is used at startup for diagnostics access. If characters are received more often than every 5s the PIB will stay in a password entry mode and not run. To ensure reliable startup the other device must not send data at less than 5s intervals.

4.4.5 Diagnostic Port Wiring

To connect the PIB's RS232 port to the diagnostic port of a panel for remote access use:

- The LM0041 supplied for MX4428 or F3200,
- A LM0076 for F3200, QE90, *MX1*,
- A suitable cable for other products.

To connect the PIB's RS232 port to the diagnostic port of an I-HUB (for remote access to the I-HUB's diagnostics) use a LM0065 + a LM0076. These are the same looms as used to connect the I-HUB's diagnostic port to a PC. These looms are not supplied with the PIB.

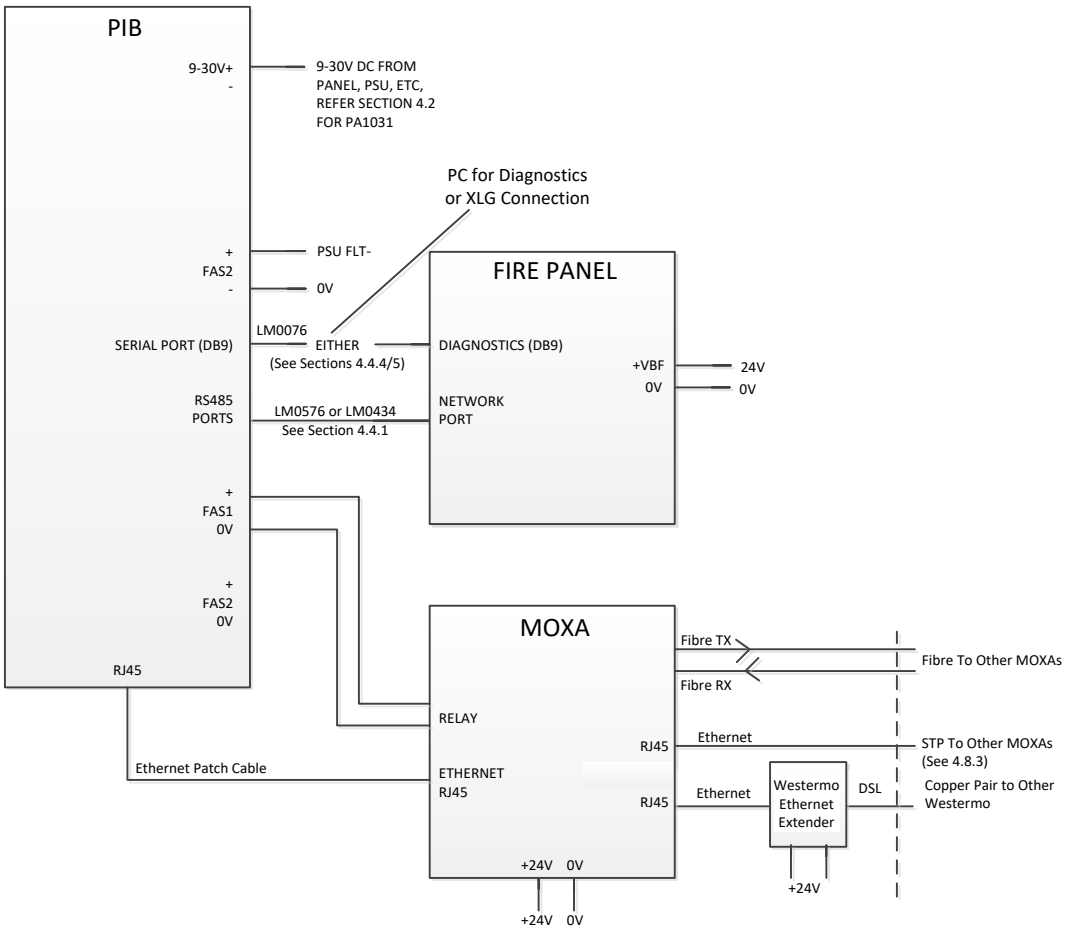


Figure 4-6 – Example Wiring of a PA1091 PIB, Moxa Switch, Ethernet and a Fire Panel

4.4.6 QE20

The PIB is fitted into the QE20 as part of the Fibre Network kit. Refer to the FP2024/2025 Kit Installation Instructions (LT0714) for installation and wiring details and LT0726 for QE20 network design information.

4.5 PIB Fault Output Wiring

If the PIB's status is not directly monitored by the connected Panel-Link device (e.g., with F3200/NDU/PTM/NSA or Compact FF/MX4428/QE90 and some I-HUBs) then it may be necessary to wire the PIB OC2 output to the device to indicate faults. If Panel-Link is not utilised at all (the PIB is performing VoIP proxy functions only) then it **will** be necessary to wire the fault output to the device for monitoring. This output is normally energised (i.e. closed to 0V) and so can normalise an end-of-line device (e.g., resistor) on an input circuit. When the PIB is not working correctly, or the Moxa switch has a break on the IP ring, OC2 opens so that a fault is generated. Wire to a suitable input on these devices to create the fault condition. For MX4428 there is no suitable spare input on the Main Board. Because the PIB OC2 output is switched to the panel 0V, it is recommended to have that drive a PA0730 General Purpose Relay Board to give a voltage-free contact to switch an input on an ADR, IOR, or *MX* module, e.g., MIM800.

With the PA0730 LK1 fitted, connect the + terminal to +VBF, and the – terminal to OC2-, so that the relay is normally energised. Use the C, NC terminals (that will be open for normal, closed for fault) to switch across (shunt) the device EOLR with short circuit programmed as fault, else use the C, NO terminals in series with the EOL with open circuit programmed as fault.

The PIB OC2 fault output can be monitored by the FAS1 fault input of another PIB, thus allowing PIB fault outputs to be chained together. This allows monitoring of a large number of PIBs, and even a Moxa switch at the end of the chain, with only one device input. This could be utilised with the QE20/QE90 and many PIBs performing VoIP proxy functions. The configuration item "FAS1 is fault contact input (NC)" must be enabled.

4.6 PSU FLT Input

If the PIB is powered by a stand-alone PSU/battery (e.g. the VIGILANT 1948 PSU, PSU24XX PSU) that has a fault output, then the PIB (with V2.00 onwards firmware) can be used to signal the PSU fault condition.

Connect the PSU FLT- output to the PIB's FAS2 input.

In the PIB's configuration tick the FAS2 is power supply fault input (NO) setting.

The PIB will generate a PSU Fault when the PSU activates its PSU FLT- output or the supply voltage to the PIB drops below the Power Supply Fault Level programmed into its configuration (see section 5.5.4). This will be signalled to other PIBs and reported as a Remote PIB Flt.

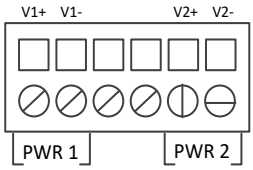
4.7 Moxa Switch Wiring

Configuration of the Moxa switch is detailed in section 5.6.

4.7.1 Power Supply Wiring

The Moxa switch can be wired with two +24V DC power sources V1 or V2. If one power source fails, the other source acts as a backup and automatically supplies the

EDS-405A/408A with power. This is generally not necessary when using the Moxa switch in a panel with battery backup. Connect the 24V supply to V1+ and V1- to match the recommended configuration.

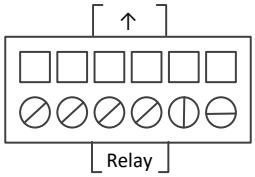


4.7.2 Wiring the Relay Contact

The Moxa switch can provide a relay output that is normally closed and opens when:

1. A relay warning event is triggered, or
2. The ring is broken either side of the Moxa, or
3. Power or start-up failure.

The middle two terminals of the 6-way terminal block provide the relay output, which should be wired between FAS 1 and 0V on the PIB.



Note, the PIB needs to be configured to enable the FAS input for fault monitoring.

4.7.3 Connecting to the Ethernet Port Terminals

The Moxa switch provides the Auto MDI/MDI-X function which allows connecting to any kind of Ethernet device without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use straight-through cable or cross-over cable to connect the other devices (e.g., PIB or PC).

See section 4.8 for further detail on field connections.

4.7.4 Fibre Connection

The EDS-405A/408A's fibre ports operate in full duplex mode at a fixed 100Mbps. The fibre ports are either multi-mode (-MM) or single-mode (-SS) with either SC or ST connectors. Therefore you should use the appropriate type of fibre cable that has the correct connectors at both ends. When plugging the connector into the port, remove the protective caps and make sure the slider guide is positioned correctly such that it fits snugly into the port.

The EDS-405A/408A supports up to 5km of multi-mode fibre or 40km of single-mode fibre, depending on the grade of fibre used, and the number and quality of interconnections.

Optical loss budget calculations must be carried out to ensure satisfactory operation. Of particular note, the single-mode transmitter can over-drive the receiver if very short fibres are used. In this case it may be necessary to insert a 3dB optical attenuator to reduce the signal level.

For the optical fibre specifications, please refer to the Moxa EDS-405A/408A Ethernet Switch User Manual.

See section 4.8 for further detail on field wiring.

4.7.5 Earthing the Moxa

The EDS-405A/408A must be earthed to help limit the effects of noise due to electromagnetic interference (EMI).

Run the ground connection from the earth screw on the top panel of the EDS-405A/408A to an earthed surface such as the mounting bracket or gearplate, using a short length of wire.

4.8 Field Wiring of IP Network

4.8.1 General

The recommended arrangement for a dedicated IP network is a ring using Moxa switches and fibre-optic cable, as fibre supports much greater cable distances than Ethernet cable and avoids problems caused by electrical noise and earth faults.

This is particularly relevant to large sites or those that have heavy electrical machinery, radio transmitters, or other sources of electrical noise.

Section 1.3 shows examples of ring networks that achieve the required path redundancy.

The Moxa EDS-405A-MM or –SS has two fibre ports (ports 4 and 5) and three Ethernet (RJ45) ports (ports 1-3). Any two of these ports can be configured as the two links in a ring, and the other ports used for local connections.

The PIB and a laptop may be plugged into these ports.

Figure 4.7 shows interconnection of a typical ring, with the fibre ports 4 and 5 as the “ring links”.

Figure 4.8 shows a ring with mixed Ethernet cable and fibre links. An Ethernet extender may be inserted in the Ethernet cable links (see section 4.9).

Note that for standards-compliant installations, the Ethernet to Ethernet connections require STP Ethernet cable or Ethernet Extenders (copper pair) on *MX1,* and Ethernet Extenders (copper pair) on F3200/MX4428.

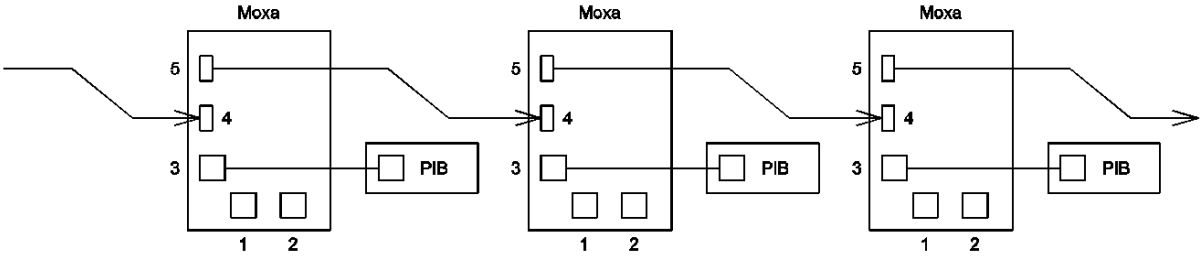


Figure 4-7 – Example Connection of Moxa Fibre Ports in Ring Network

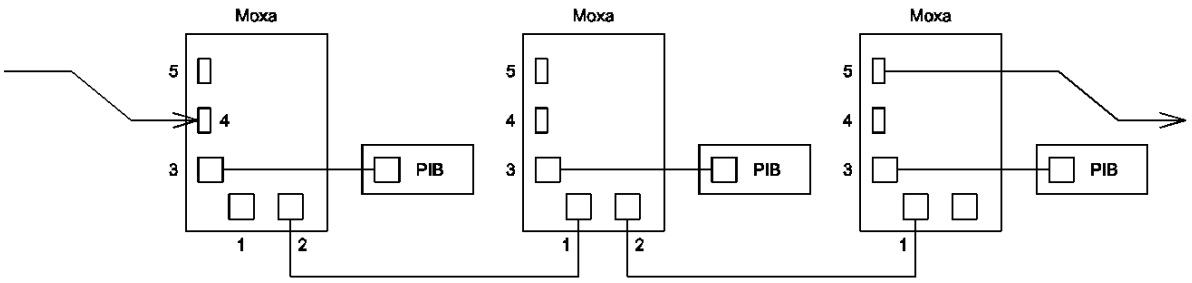


Figure 4-8 – Example of Mixed Fibre & Copper Ethernet Ring (MX1 only)

4.8.2 Fibre Cable

(See section 4.7.4 about optical loss calculations and connector type).

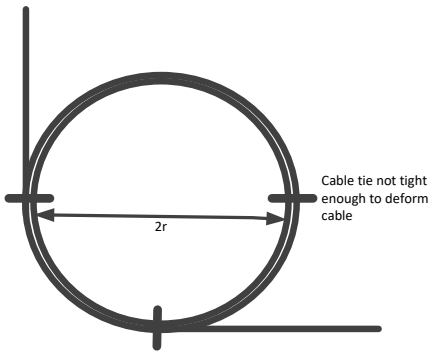
Installation of the fibre cable should be carried out by personnel competent in fibre-optic cabling as there are special rules regarding cable types, bend radius, terminations, etc.

The fibre cable may be terminated directly into the Moxa, but more commonly the field fibre will be terminated elsewhere and will connect to the Moxa via a suitable patch cable.

Such interconnections must be made within a securely closed termination box, or within the (locked) panel, to prevent them being unplugged by unauthorised personnel.

Field cabling must be fixed and protected so that it cannot be flexed, squashed or pinched. The correct minimum bend radius for the cable type must be observed (commonly 60-90mm for field cables).

Fibre patch cables should not be pinched or frequently flexed (e.g., by door closure) and also have a minimum bend radius (for all cables this is typically 10 to 15 times the insulation thickness, e.g., 40mm for a 3mm diameter patch cable). See Figure 4.9.



Bend radius must be greater than minimum bending radius
(e.g., 40mm for a 3mm patch cable)

Figure 4-9 – Example of Spare Cable with Bend of Radius r

4.8.3 Cat 5/6 Cabling & Earthing

Many buildings have Ethernet cable installed, and this is typically Cat 5e or Cat 6 UTP (unshielded twisted pair) with RJ45 wall sockets.

This can be used in limited situations for “non-approved” systems where the customer has been advised of and agrees to the security and reliability requirements of using the building infrastructure.

Shielded twisted pair (STP) must be used for external Ethernet cable in any *MX1* standards-compliant installations. Copper Ethernet (UTP or STP) cannot be used for external cabling on F3200 and MX4428 standards-compliant installations. Fibre or copper pair with the listed Ethernet Extenders are the only approved options.

Note the distance limit for STP of 100m.

There are contradictory requirements for earthing shielded cable:

- For better noise protection it is desirable to earth the shield at both ends of the STP.
- However to prevent mains earth fault current from flowing through the cable shield, it is desirable to have the shield earthed at only one end.

Therefore, where panels are relatively close together in the same building and use the same building earth grid, earth the shield at both ends.

Where panels are in separate buildings or there is a possibility of earth potential differences, it is recommended that fibre or Extended Ethernet be used instead. If STP must be used, ensure it is earthed at only one end, and that there are no earth fault paths.

Earth Connection

STP cables may be purchased pre-made with RJ45 plugs and the cable shield connected to the metal on the side of the plug.

The RJ45 sockets on the Moxa have metal contacts that connect the plug shield to the body of the Moxa, that must then be earthed – see section 4.7.5.

However, the recommended way of earthing STP is via a separate termination connector and brackets.

Recommended Inter-Panel STP Connection

A kit is available from Johnson Controls:

FP1044 IP Network STP Cable Termination Bracket

This includes two AMP-TWIST-6S SL connectors and a mounting bracket that should be installed as follows:

1. Use Cat 6 for field wiring – typically solid core, of gauge 24AWG (0.50mΦ) to 22AWG (0.65mΦ). As with fibre, maintain a minimum bend radius of 40mm, and secure the cable.

2. Terminate the cable in the AMP-TWIST-6S SL side exit connector. See below.

3. Mount the mounting bracket supplied in the FP1044 kit to an appropriate place on the gearplate or cabinet wall. It can be mounted where an *MX* Loop Card bracket can be mounted. Other positions may require mounting holes to be drilled. Ensure that it is earthed (attach with screws, nuts and star washers, or use an earth wire and stud). See Figure 4.10 for an example of the FP1044 installed on

an *MX1* 15U gearplate.

4. Clip the connectors into the mounting bracket.

5. Fix the cable near the bracket so that cable strain is not transferred to the connector.

6. Use standard UTP patch cables to connect the RJ45 sockets on the bracket to the appropriate ports on the Moxa.

AMP-TWIST-6S SL Termination

The AMP-Twist connector comes with a pamphlet that describes the termination process. A copy designated 411-93014 is available on the TE Connectivity web site: www.te.com (search on 411-93014 and when nothing is found click on “Search for a document with Document ID 411-93014”). The connector uses insulation displacement with positions to lay the wires, and has the wire-press and guillotine built in.

The recommended tool is effectively a clamp that squeezes both halves together, pushing the wires into place, causing them to be mated, and the wire tails cut off. If using a different tool, e.g., a small hand vice, ensure that both halves are pressed fully home, but not forced beyond that.

Notes:

1. The particular connection format, T568A or T568B, should be chosen to correspond to what is used in the particular building/area.
   The positioning of wires by colour is shown on the side of the connector for each format, with the particular colour, e.g. blue, shown as a solid colour in the rectangle below the wire exit point, and the corresponding white (or striped white), shown in the adjacent rectangle as half colour, half white.

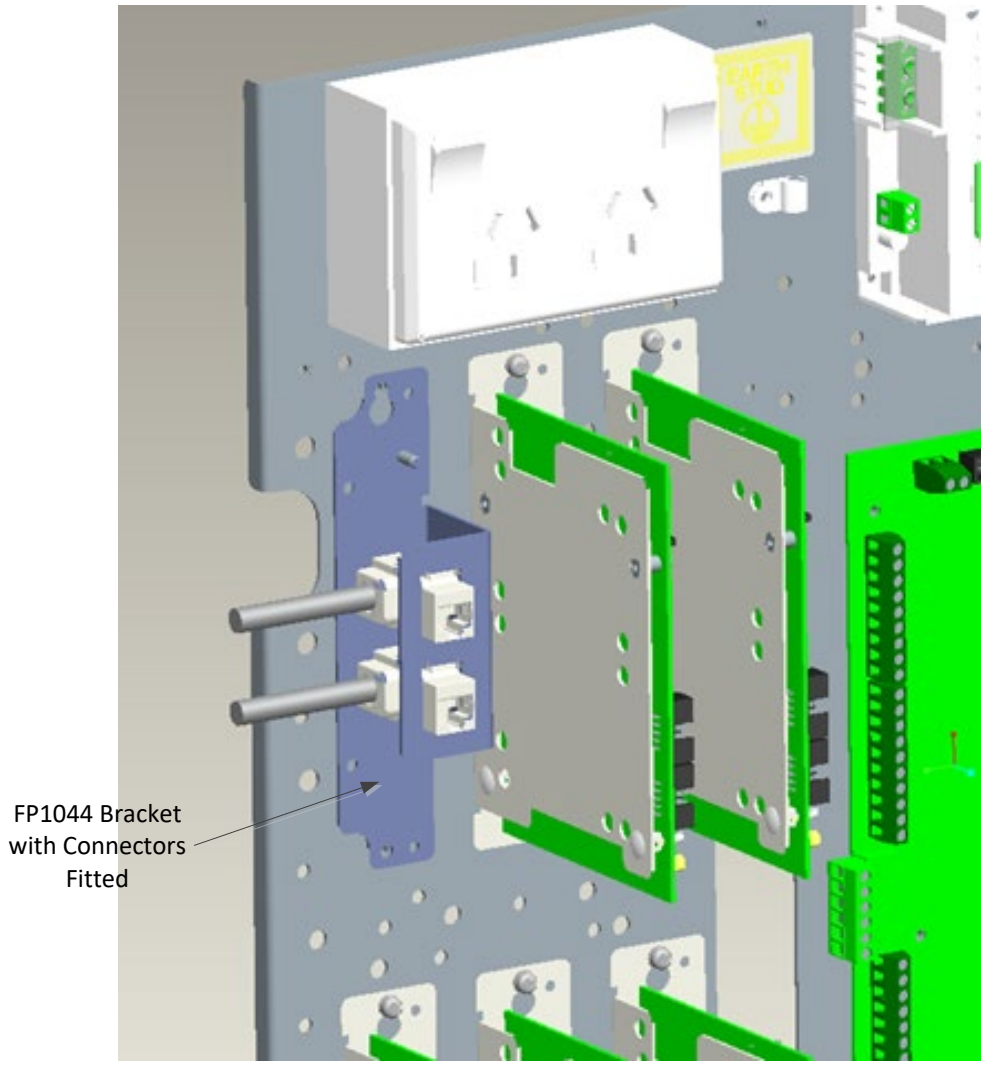
2. The choice of format used should match the patch leads used, but the most important thing is that each wire terminates to the same pin number at each end of the cable.

3. Where one end is not to be earthed, do not expose the braid. For example, leave the outer PVC sheath covering the shield wires so that they do not contact the metal of the connector.

4.8.4 Fire Rated Fibre & Cable

Fire-rated fibre cables and fire-rated shielded twisted pair data cable are commercially available.

The AMP-Twist-6S SL is suitable for only 24-22 AWG solid wire or 26-24 AWG stranded wire, and so is not suitable for the Firetuf 910245 example above.



The Cat 6 shielded cable is terminated in the AMP-Twist-6S SL connectors that then clip into the bracket supplied with the FP1044 kit.

Figure 4-10 – Example using FP1044 kit STP Termination Bracket

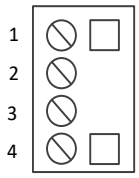
4.9 Westermo Ethernet Extender Wiring

When mounting the Westermo DDW-120 Ethernet Extender make sure there is at least 10mm of air gap on each side of the unit to allow ventilation.

Configuration of the Westermo DDW-120 Ethernet Extender is detailed in section 5.7.

4.9.1 Power Supply Wiring

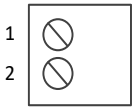
The DDW-120 requires a 12-48VDC power supply supplied through the 4-way screw terminal situated at the base of the DDW-120. It has two diode-coupled inputs (A, B), either can be used.



Power Connection	
Position	Description
1	Common (0V)
2	+ Voltage A (+24V)
3	+ Voltage B (+24V)
4	Common (0V)

4.9.2 Connecting the SHDSL Line

Connect the two-wire circuit (preferably a twisted pair) to the DSL screw terminals 1 and 2 (polarity not important) situated at the base of the DDW-120.



DSL Screw Connector 1 and 2		
Position	Direction	Description
1	In/Out	2-Wire Receive/Transmit SHDSL
2	In/Out	2-Wire Receive/Transmit SHDSL

Refer to the Westermo User Manual for cable length versus data speed performance.

4.9.3 Connecting the Ethernet Line

Connect an Ethernet patch cable from the Moxa to the RJ45 TX-Port on the front of the DDW-120. The factory setting for the DDW-120 is ‘plug and play’ mode where the TX-Port is enabled for:

- Ethernet Auto-Negotiation enabled
- Auto MDI/MDI-X
- Auto-Polarity enabled.

The DDW-120 will automatically sense the data rate of the connected Ethernet device and cable type.

In the example shown in Figure 4-8 a pair of Westermo DDW-120 units could be inserted in any of the Moxa RJ45 to Moxa RJ45 links.

5. Configuration

5.1 Resetting to Factory Default

Even though most of the required PIB configuration can be done using the PIB's configuration web page, this requires that both the PIB and your PC have IP addresses, and that you know the configuration password set in the PIB.

If you can't get access for whatever reason, you may need to reset the PIB's configuration to its default state.

5.1.1 Using RSSI Button During Power-Up

1. If there is a mini-jumper installed in the J10 SERIAL DIAG [DOOR] connector, remove it.
2. Hold the Fault Reset SW1 [RSSI] button down as power is applied to the PIB until all the green LEDs flash together (without the yellow LEDs flashing at the same time).
3. Re-fit the mini-jumper if it was removed in step 1, and power the PIB down and up again.

Note that this method will not reset the "Prevent PIB from acting as a DHCP server" setting. This setting can be cleared only by the configuration web page, or a diagnostic terminal using a serial connection (see section 8.5).

5.1.2 Using Diagnostic Terminal or Telnet

Enter the command **default_config** using the PIB's diagnostic terminal, remote access to the PIB's diagnostics, or web based access to the PIB's diagnostics (see section 8 for more details).

5.2 IP Addressing Scenarios

This section describes how to design an IP addressing scheme. For details of how to actually program the IP addresses and so on, see section 5.5.1.

5.2.1 A Standalone Network Using a PIB's DHCP Server

Program all PIBs to select "Use DHCP for IP Settings" (this is the default).

If this is a standalone network, insert the mini-jumper in the DHCP SERVER J13 [TAMPER] connector on only one PIB to enable its DHCP server.

For small networks (less than approximately 20 panels) you usually do not need any message filtering, however, if filtering of transmitted data is required, enter the message filtering by SID number rather than by IP address.

One disadvantage of this method is that all PIBs will be assigned random IP addresses, and it may be difficult to remember them. Random IP addresses also cannot be used with the VoIP proxy functionality as the IP addresses are used as dialling targets for other VoIP devices. Use one of the methods below to assign fixed addresses based on SID number.

5.2.2 A Standalone Network Using Static Addressing

Assign an IP address to each PIB manually, for example 10.1.1.X, where X is the Panel-Link SID of the connected panel. Program all PIBs to **deselect** "Use DHCP for IP Settings". Program each PIB Netmask to 255.0.0.0 and Gateway to 10.0.0.1 (even though there is no Gateway).

If this is a standalone network, insert the mini-jumper in the DHCP SERVER J13 [TAMPER] connector on one PIB to enable its DHCP server. This is required only so that a PC connected to the network can obtain an IP address.

5.2.3 The Customer's Network Using Static Addressing

Obtain a range of IP addresses (for allocation to the PIBs) from the customer. Ideally obtain a range of IP addresses that will be easy to remember based on the panel SID numbers.

Program an IP address to each PIB manually. Program all PIBs to **deselect** "Use DHCP for IP Settings". Program each PIB Netmask and Gateway to values advised by the customer.

Do not enable the PIB's DHCP server, i.e., do not insert the mini-jumper in the DHCP SERVER J13 [TAMPER] connector.

5.2.4 The Customer's Network Using Fixed DHCP Assignments

Advise the customer of the MAC addresses of all the PIBs to be used on the network and ask the customer to program their DHCP server(s) to assign a fixed IP address for each MAC address (ideally using a range of IP addresses that will be easy to remember based on SID number).

Program all PIBs to select "Use DHCP for IP Settings" (this is the default).

Do not enable the PIB's DHCP server, i.e., do not insert the mini-jumper in the DHCP SERVER J13 [TAMPER] connector.

5.2.5 A Network Which Passes Through Routers (using static addressing)

Please note this is a specialised scenario. Do not attempt this unless you have suitable IP knowledge and experience.

Program an IP address to each PIB manually, for example in the range 10.1.Y.X, where X is the Panel-Link SID of the connected panel, and Y is different for each subnet. Program all PIBs to **deselect** "Use DHCP for IP Settings". Program each PIB with Netmask set to 255.255.255.0 and Gateway (typically) set to 10.1.Y.1. Note if address 10.1.Y.1 is used for the gateway, it should not be used to match SID 1.

Note that once the PIBs are programmed thus, you will likely need to program your laptop with a static IP address, netmask, and gateway which are compatible with the subnet it is connected to, or connect and program a DHCP server on the network, or program the (fibre) switches to allocate an IP address for the port(s) that a laptop may connect to. Note - the PIB's DHCP server is not suitable for this environment.

5.3 Finding the IP Address of a PIB

If the IP address of a PIB is unknown, e.g., if it has been set to a fixed (static) address and you don't know what it is, or if the address is obtained by DHCP, use one of the methods below: -

1. If you know the IP address of any **other** PIB, browse to that PIB as described in section 5.4. The home (status) page will show the node-names and IP addresses of all other PIBs it is communicating with.
2. Run the PIB_Finder.exe program on a PC connected to the network (see section 7). Over 10 seconds or so this will locate all PIBs on the same sub-net and display their IP addresses, node names and the SID(s) located at each. (Note this will not find PIBs that have "Disable PIB Identification Broadcast" ticked or that have a different port number.)
3. If you have a standalone network and have enabled the DHCP server on one PIB, when you connect a laptop to the network it will be allocated an IP address by this DHCP server. Run the command **ipconfig /all** on the PC, and look for the DHCP server's address in the output. Use a web browser to browse to this IP address (e.g., enter 10.5.1.1 in the browser's address bar). The home (status) page will show the node-names and IP addresses of all other PIBs it is communicating with.
4. Otherwise, connect a terminal emulator such as Wincomms (set to 38400,N,8,1) to the PIB serial port with a null modem cable (such as LM0076). Connect a mini-jumper to the SERIAL DIAG J10 [DOOR] terminals to enable serial diagnostics. Power the PIB down and up. Its IP address will be logged to the terminal.

5.4 Connecting to a PIB with a Web Browser

5.4.1 Getting an IP Address for your PC

The PIB is usually configured by using a web browser. Connect your PC to a spare Ethernet port on the PIB network. Note that the network will need a DHCP server in order for your PC to get an IP address. If it is a customer's network this will almost certainly be available. If it is a standalone network, you can set up one PIB to act as a DHCP server by inserting its DHCP SERVER J13 [TAMPER] link. Check that its DHCP SERVER [PSTN link] LED (LD4) turns on. If not see section 8.5 for how to re-enable the DHCP server.

Alternatively, to configure a single PIB before it is connected to the network, you can connect your PC Ethernet port directly to the PIB Ethernet port. (With most PCs any Ethernet cable will suffice, however with an older PC you may need a cross-over cable.) You will need to enable the DHCP server on the PIB, see the preceding paragraph.

Your PC may think it is still connected to a previous network and retain its previous IP address / netmask / gateway settings, even after you connect it to the PIB or PIB network. You will need to either power it down and up while it is connected to the PIB network, or open a command prompt and enter the following commands.

```
ipconfig /release ↵
ipconfig /renew↵
```

5.4.2 Browsing to the PIB

See section 5.3 for details on how to find the IP address of the PIB.

Run a web browser such as Internet Explorer and type A.B.C.D <Enter> in the address bar, where A.B.C.D is the (numeric) IP address of the PIB.

Alternately, you can select a PIB from the Discovered PIBs tab in the PIB_Finder program and click the button Access Selected PIB Status; the selected PIB status page will be displayed in the default web browser.

Figure 5-1 shows an example browser window of the PIB's home (status) screen.

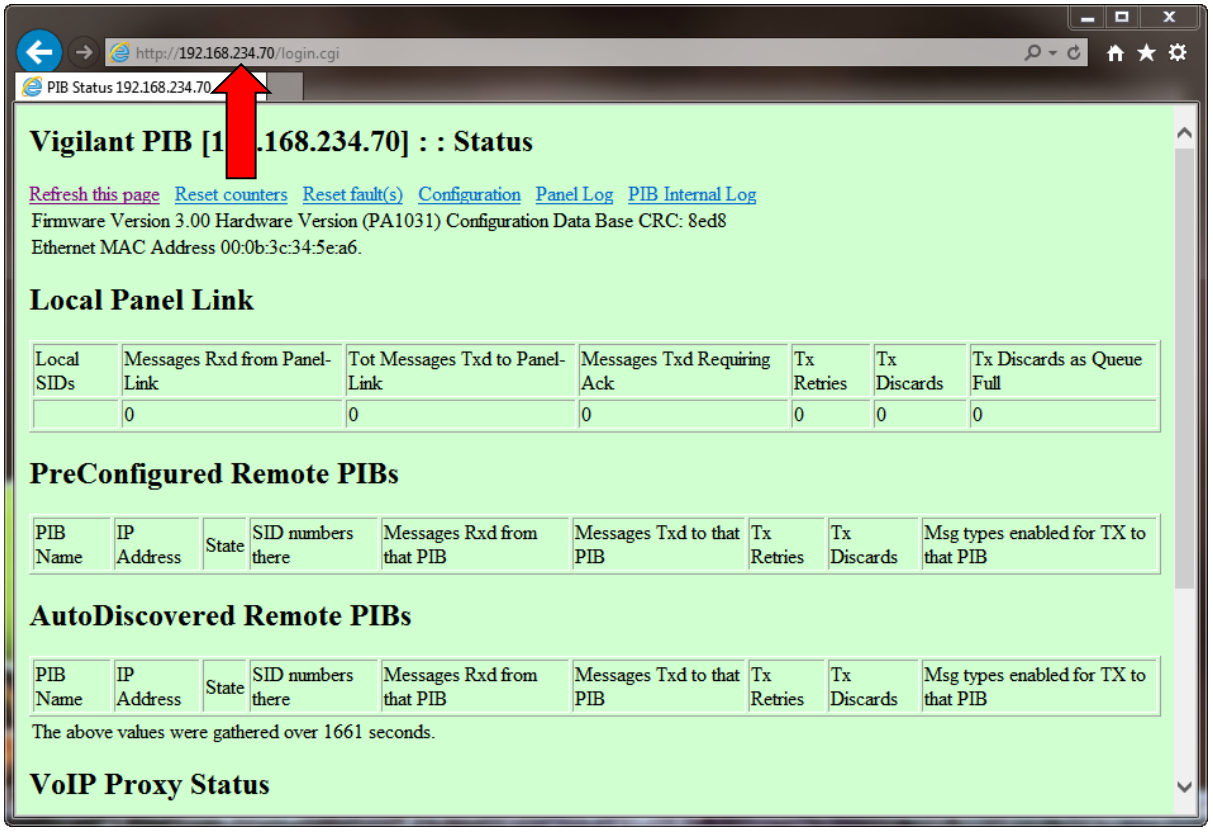


Figure 5-1 – Example of PIB's home (status) page

Use the links at the top of the screen (Configuration, Panel Log, and PIB Internal Log) to browse to other pages.

Note – this home or status page is further described in section 6.

Note – the PIB may require login before accessing its web pages if a password was set previously on the configuration page. Enter the programmed password and click **Log In**.

5.5 Accessing the Configuration Page

Browse to the PIB as described in 5.4. Click Configuration at the top of the page.

You will see the colour-coded configuration screen split up in to the sections below.

Once you have entered the required configuration click on the **Submit Changes** button at the bottom of the screen. See section 5.5.7 below.

5.5.1 Local IP (The light green section)

See Figure 5-2.

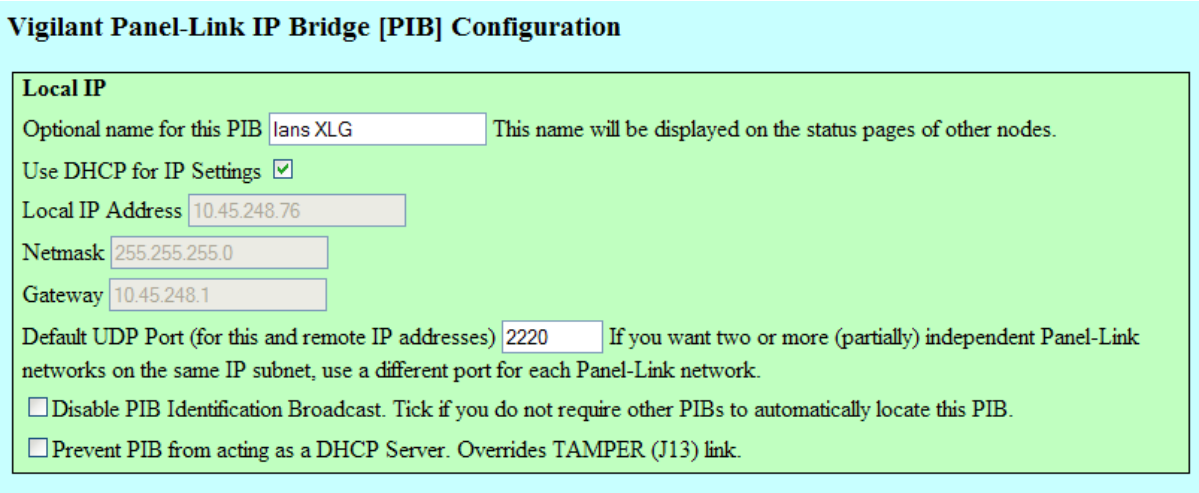


Figure 5-2 – Local IP Configuration

See section 5.2 for examples of IP addressing.

Optional name for this PIB.

Enter a name for this PIB, e.g. its location. This name will be displayed on web pages relating to this PIB, and on the status pages of other PIBs. The name itself is not used for addressing.

Use DHCP for IP Settings

This is ticked by default. This default setting can be used for simple networks when a DHCP server is available on the network, or one PIB is set to act as a DHCP server. The setting is not appropriate for use with the VoIP proxy functionality.

Tick if this PIB is to get its IP address, Netmask, and Gateway from a DHCP server on the network. Untick if you want to enter a static IP address, netmask, and gateway.

Note that if you tick “Use DHCP for IP Settings”, entries for the Local IP Address, Netmask, and Gateway are not required and will grey out. However they will display the current IP settings that have been obtained from the DHCP server (once an address has been obtained).

Local IP Address

Enter the IP address of this PIB, if DHCP is not being used.

Netmask

Enter the Netmask of the local subnet. Note when converted to binary this must consist of contiguous 1s then contiguous 0s when read from left to right. The 1s define which bits of an IP address must match this PIB's IP address for the address to be on the local subnet.

Gateway

Enter the IP address of the gateway. This is the IP address of the router used to forward messages to IP addresses that are not on the local subnet. The PIB will obtain the MAC address of this router and send messages to IP addresses that are not on the local subnet to that MAC address (the router).

Default Port (for this and remote IP addresses)

Use 2220 by default. All PIBs that communicate with each other must use the same port. Conversely if you want different groups of **independent** PIBs (where each group communicates with no other groups) you can use a different port (e.g. 2221, 2222, 2223, etc) for each independent group. If using a customer-supplied network you should consult with the customer to avoid conflict with other UDP applications. Do not use a port number less than 1024. When the VoIP proxy functionality of a PIB is used without a Panel-Link networking device attached the Default Port should be set to a unique port number that no other PIB is using – this effectively disables Panel-Link networking.

Disable PIB Identification Broadcast

This setting is un-ticked by default and can usually be left un-ticked.

Tick this if the customer has requested that you minimise broadcasts on their network, or if for some reason you do not want this PIB to broadcast its presence to other PIBs. If this box is ticked, then other PIBs on the same subnet will not be able automatically locate this PIB and you will need to explicitly program the IP address of this PIB in other PIBs and/or vice versa (the same as you do for PIBs that are on different subnets.)

Prevent PIB from acting as a DHCP server

WARNING:

DO NOT SELECT THIS OPTION UNLESS YOU REQUIRE THE DHCP SERVER TO ALWAYS BE DISABLED!

This setting is un-ticked by default and can usually be left un-ticked.

Tick this if you do not want the PIB to **ever** enable its DHCP server, even if the DHCP SERVER J13 [TAMPER] jumper is inserted. This setting would be ticked mainly to prevent the PIB from interfering with a customer's network if the jumper was inadvertently inserted. Note this setting is not reset when the configuration is reset to default (see section 5.1).

5.5.2 Local Panel-Link (The pale yellow section)

See Figure 5-3.

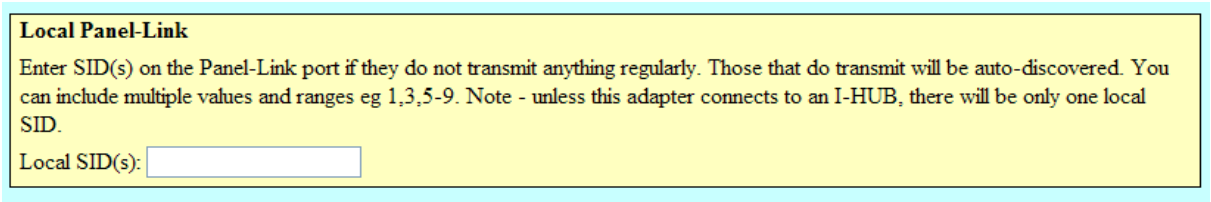


Figure 5-3 – Local Panel Link Configuration

Local SIDs

This setting is blank by default, and can usually be left blank.

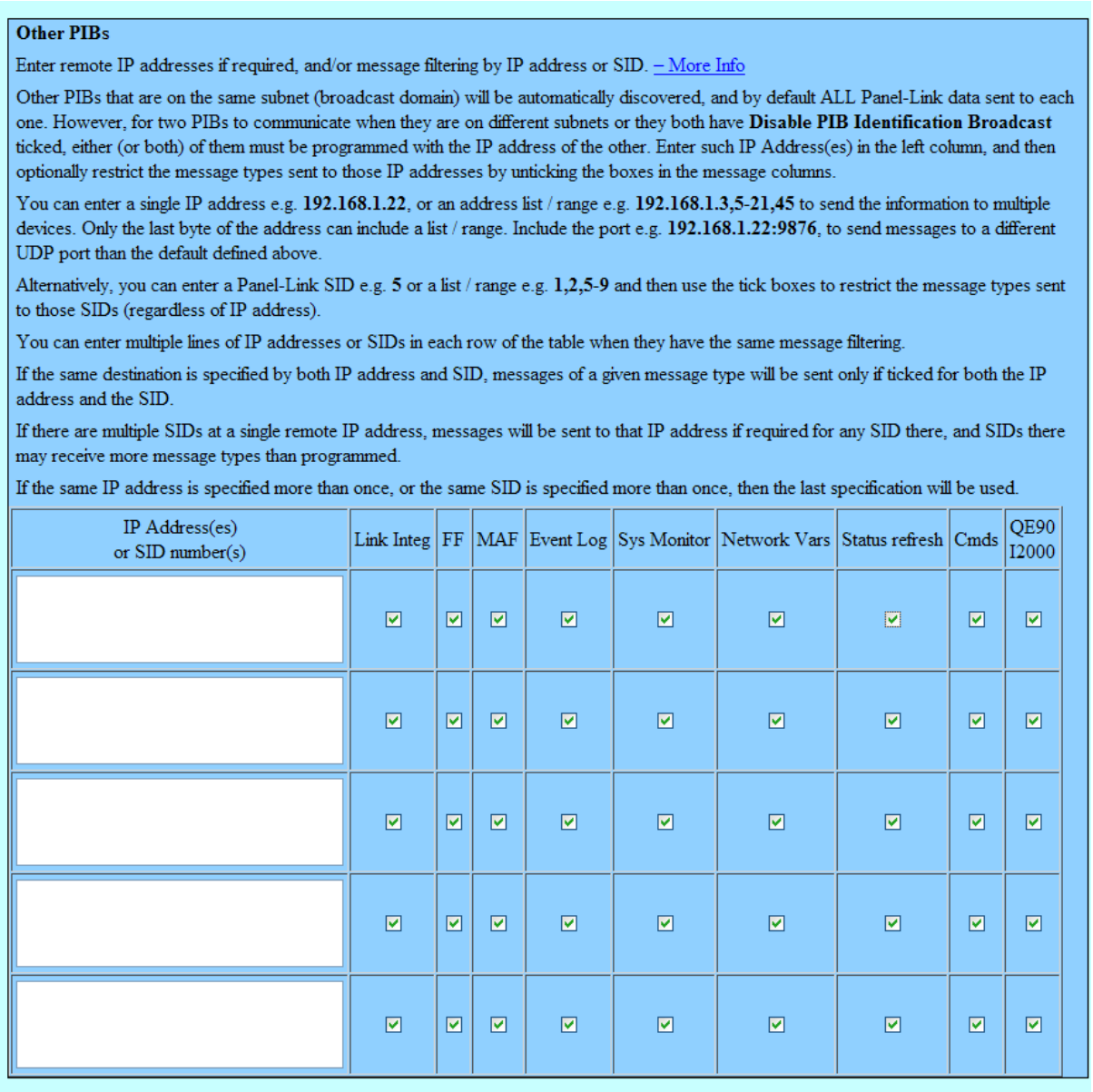
Enter the SIDs of the panels connected to the PIB if they do not transmit Link Integrity or anything else regularly. If all connected panels are transmitting link integrity and/or another regular transmission (and any intermediate I-HUBs are forwarding it) then you can leave this entry blank. Note – a regular transmission must be transmitted at least once every 45 seconds.

The PIBs need to know the location of particular SIDs for two reasons:

1. When a non broadcast message is sent from one SID to another SID, the “source PIB” needs to know which PIB the destination SID is located on.
2. When message filtering is used (see section 5.5.3), the source PIB needs to know which PIB the “filtered” SIDs are located on so that it can decide which messages to pass to that PIB.

5.5.3 Other PIBs (The sky blue section)

See Figure 5-4.



Other PIBs

Enter remote IP addresses if required, and/or message filtering by IP address or SID. – More Info

Other PIBs that are on the same subnet (broadcast domain) will be automatically discovered, and by default ALL Panel-Link data sent to each one. However, for two PIBs to communicate when they are on different subnets or they both have **Disable PIB Identification Broadcast** ticked, either (or both) of them must be programmed with the IP address of the other. Enter such IP Address(es) in the left column, and then optionally restrict the message types sent to those IP addresses by unticking the boxes in the message columns.

You can enter a single IP address e.g. **192.168.1.22**, or an address list / range e.g. **192.168.1.3,5-21,45** to send the information to multiple devices. Only the last byte of the address can include a list / range. Include the port e.g. **192.168.1.22:9876**, to send messages to a different UDP port than the default defined above.

Alternatively, you can enter a Panel-Link SID e.g. **5** or a list / range e.g. **1,2,5-9** and then use the tick boxes to restrict the message types sent to those SIDs (regardless of IP address).

You can enter multiple lines of IP addresses or SIDs in each row of the table when they have the same message filtering.

If the same destination is specified by both IP address and SID, messages of a given message type will be sent only if ticked for both the IP address and the SID.

If there are multiple SIDs at a single remote IP address, messages will be sent to that IP address if required for any SID there, and SIDs there may receive more message types than programmed.

If the same IP address is specified more than once, or the same SID is specified more than once, then the last specification will be used.

IP Address(es) or SID number(s)	Link Integ	FF	MAF	Event Log	Sys Monitor	Network Vars	Status refresh	Cmds	QE90 I2000
	☑	☑	☑	☑	☑	☑	☑	☑	☑
	☑	☑	☑	☑	☑	☑	☑	☑	☑
	☑	☑	☑	☑	☑	☑	☑	☑	☑
	☑	☑	☑	☑	☑	☑	☑	☑	☑
	☑	☑	☑	☑	☑	☑	☑	☑	☑

Figure 5-4 – Other PIBs Configuration

This is used:

1. To define PIBs that will not be automatically found because they are not on the same subnet or their identification broadcasts have been turned off.
2. To specify (or restrict) which message types are sent to which PIBs (message filtering).
3. To pass messages between two different logical IP networks that have different port numbers.

On a small network where other PIBs are located automatically, it is usually not necessary to enter anything here.

However, IP addresses must be entered for all PIBs that are not on the same subnet (or this PIB's IP address can be entered at the **other** PIBs that are on a different subnet).

Programming by IP Address

Address lists and/or ranges can be entered in the last byte of the IP address (I.e. after the 3rd dot). For example, 10.1.1.5,10-13,22 would include 10.1.1.5, 10.1.1.10, 10.1.1.11, 10.1.1.12, 10.1.1.13, and 10.1.1.22. This PIB will attempt to transmit to every IP address in the range, so they must all be present or a fault will be generated.

For each IP address (range), the message types to be transmitted can be configured. This can be used to transmit, for example, all information to a master or head-end panel or graphics terminal, and transmit only some information (e.g. Network variables) to one or two other panels, and nothing to the rest of the panels on the network.

You typically need such message filtering only in a large network (more than about 40 panels) and its main purpose is to avoid sending information to panels that do not require it, as continual reception of un-required data may slow a panel down.

If an IP address is included twice (possibly the first time in a range, and the second time by itself or in a smaller range), the last definition will be used.

The IP address (list) can include a port number after a colon on the end (e.g., 10.1.1.5,10-13,22:2226). This is used to transmit data to a different UDP port to the Default port defined under Local IP. For example, this could be used to “leak” some data from one logical network to another.

Programming by SID Number

If the entered data is not in IP format, it will be assumed to be a SID number, or a list / range of SID numbers (e.g. 1,6,12-18). For each list, the message types can be configured.

This can be used as an easier[2] method to transmit, for example, all information to a “head-end” panel or graphics terminal, and transmit only some information (e.g. Network variables) to one or two other panels, and nothing to the rest of the panels on the network.

If a SID is included twice (possibly the first time in a range, and the second time by itself or in a smaller range), the last definition will be used for that SID.

To transmit to only one or two other SIDs in the presence of multiple other SIDs that are automatically located, you could enter one row with SIDs 1-254 with all message types de-selected, and the next row with the one or two required SIDs listed and the required message types selected. Note, the PIB ignores any SIDs specified (in a list/range) that do not exist on the network.

If there are multiple SIDs at a remote IP address, a message type will be transmitted to that IP address if any SID there requires it.

If the same IP address is referenced by both IP address and SID number, a particular message type will be transmitted only if it is enabled for **both** the IP address configuration **and** the SID configuration.

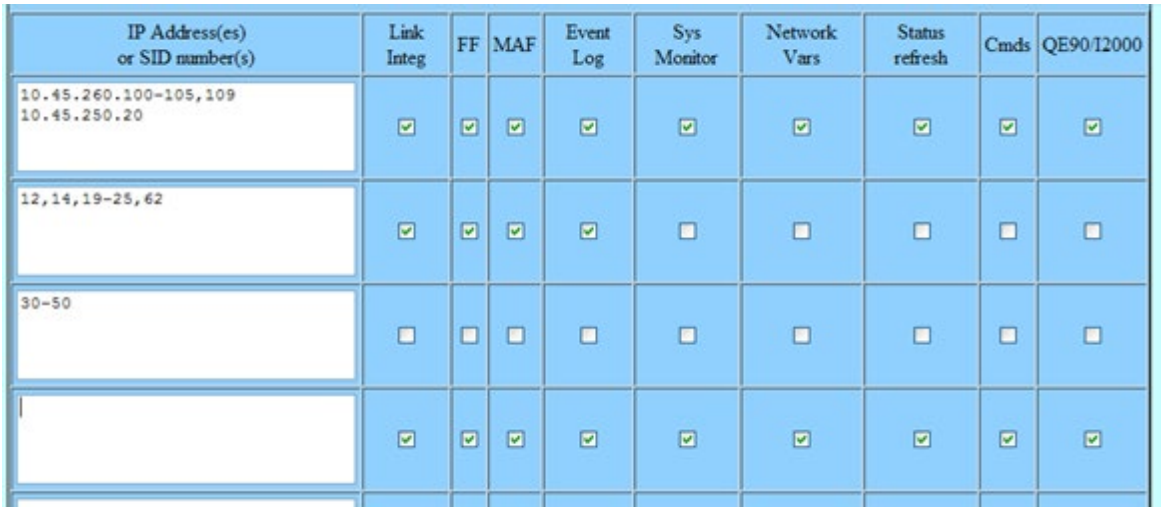
You can enter multiple IP addresses (or ranges / lists) and/or multiple SID numbers (or ranges / lists) in each row of the table, when they all have the same set of

[2] Easier than configuring the message types by IP address.

message types ticked. (Type <Enter> with the cursor positioned at the end of the previous IP address / SID line.)

Example 1

Consider the example in Figure 5-5.



IP Address(es) or SID number(s)	Link Integ	FF	MAF	Event Log	Sys Monitor	Network Vars	Status refresh	Cmds	QE90/I2000
10.45.260.100-105,109 10.45.250.20	☑	☑	☑	☑	☑	☑	☑	☑	☑
12,14,19-25,62	☑	☑	☑	☑	☐	☐	☐	☐	☐
30-50	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☑	☑	☑	☑	☑	☑	☑	☑	☑

Figure 5-5 – Other PIBs Example 1

The first row defines the IP addresses of the other PIBs -

10.45.260.100, 10.45.260.101, 10.45.260.102, 10.45.260.103, 10.45.260.104,

10.45.260.105, 10.45.260.109, and 10.45.250.20.

Each of these other PIBs must be present, otherwise a fault will be generated.

Unless otherwise specified by SID number, all message types are sent from this PIB to each other PIB listed (as all message types are ticked).

The second row specifies that only Link Integrity, FF, MAF, and Event log message types are to be sent to SIDs 12, 14, 19 through 25, and 62, irrespective of their IP address.

The third row specifies that no message types will be sent to SIDs 30 through 50.

Note - for any other SIDs present on the network (at any PIBs automatically located or those specified by IP addresses in the first row), all message types will be sent to them.

Example 2

Consider the example in Figure 5-6.

This example could be used at a sub-FIP on a network where SID 6 is the master FIP and SID 7 is an XLG Server and they both require all Fire message types, but no messages except Network Variables are to be sent between sub-FIPs (and no QE20/QE90 / I2000 messages are required).

IP Address(es) or SID number(s)	Link Integ	FF	MAF	Event Log	Sys Monitor	Network Vars	Status refresh	Cmds	QE90 I2000
10.1.1.1-15	☑	☑	☑	☑	☑	☑	☑	☑	☐
1-250	☐	☐	☐	☐	☐	☑	☐	☐	☐
6,7	☑	☑	☑	☑	☑	☑	☑	☑	☑

Figure 5-6 – Other PIBs Example 2

The first row defines the IP addresses of the other PIBs -

10.1.1.1, 10.1.1.2, 10.1.1.3, etc up to 10.1.1.15

Each of these other PIBs must be present otherwise a fault will be generated.

Unless otherwise restricted by SID number, all message types except QE20/QE90 / I2000 are sent from this PIB to each of the PIBs listed (as all message types except for QE90 / I2000 are ticked).

The second row specifies that only the Network Vars message type is to be sent to any other SID, unless specified otherwise in succeeding rows. This is a convenient way of disabling nearly everything so that exceptions can follow. (Note – it does not matter that many SIDs in the range 1-250 will not exist. SIDs in the range that are not found will be ignored.)

The third row specifies that all message types will be sent to SIDs 6 and 7 (if they are found) regardless of which IP address they are located at. However, note that in spite of the QE90 / I2000 box being ticked, such message types will not be sent if these SIDs are located at the IP addresses specified in the first row.

5.5.4 Local Hardware (the pink section)

See Figure 5-7.

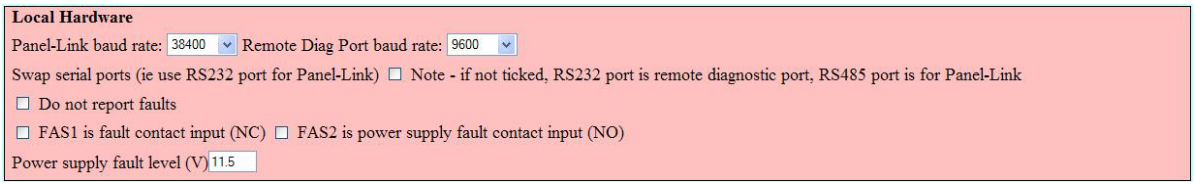


Figure 5-7 – Serial Configuration

Enter the baud rates for the Panel-Link and remote access Diagnostic ports.

The default Panel-Link and remote diagnostic port baud rates vary by product (and can be programmed to different rates in most products), so it will be necessary to match the programming in the PIB to that of the connected device.

For Panel-Link, MX4428 and F3200/NDU default to 9600 baud, *MX1* defaults to 38400. Refer to the User Manual of other products.

Note that when the PIB's RS232 port is configured for internal diagnostics of the PIB (with a mini-jumper in the SERIAL DIAG J10 [DOOR] connector), 38400 baud is used regardless of what is set here. Also note that whenever the PIB powers up it will emit some messages at 38400 baud.

The “Do not report faults” option box can be ticked to prevent the PIB reporting local faults (internal and external) to other PIBs in the network. This can be used when the PIB is a non-critical unit on the network.

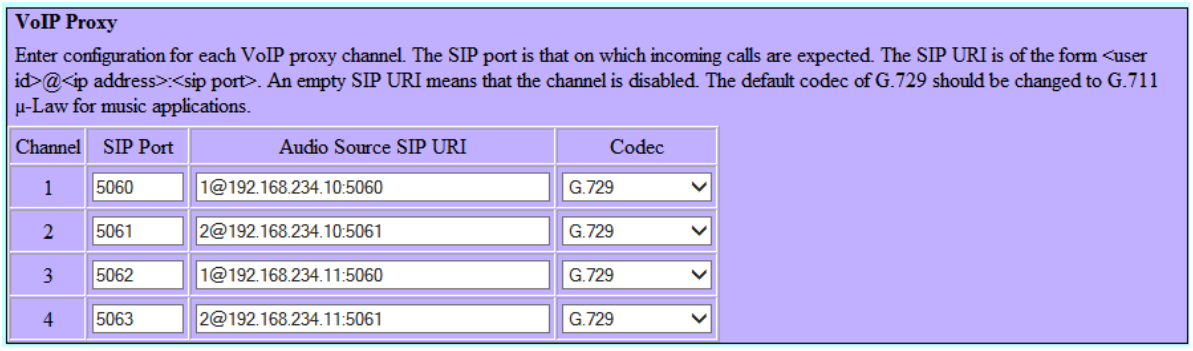
When you tick “FAS1 is fault contact input”, a fault will be generated in the PIB when the terminals are open circuit (and no fault when they are shorted). This fault will illuminate the PIB Fault LED, display on the PIB status web page, contribute to the operation of the PIB’s open collector outputs, and is sent to certain panel types for annunciation. (The FAS1 input is typically connected to the Moxa relay and used to indicate link failure on the Moxa ring).

When the “FAS2 is power supply fault contact input” is ticked the FAS2 terminals will generate a power fault in the PIB when the FAS2 terminals are short circuit (and no fault when they are opened). This fault will turn on the PIB Power Fault LED, display on the PIB status web page and is sent to certain panel types for annunciation.

The “power supply fault level (V)” box allows entry of the PSU voltage below which a PSU fault will be generated. Set this to 0V if no fault is to be generated from the PIB’s supply voltage.

5.5.5 VoIP Proxy (the magenta section)

See Figure 5-8.



VoIP Proxy

Enter configuration for each VoIP proxy channel. The SIP port is that on which incoming calls are expected. The SIP URI is of the form <user id>@<ip address>:<sip port>. An empty SIP URI means that the channel is disabled. The default codec of G.729 should be changed to G.711 µ-Law for music applications.

Channel	SIP Port	Audio Source SIP URI	Codec
1	5060	1@192.168.234.10:5060	G.729
2	5061	2@192.168.234.10:5061	G.729
3	5062	1@192.168.234.11:5060	G.729
4	5063	2@192.168.234.11:5061	G.729

Figure 5-8 – VoIP Proxy Configuration

The PIB’s VoIP Proxy function provides streaming of VoIP data from a VoIP connection on 1 or more ATAs to up to 31 remote nodes. The PIB supports up to 4 separate VoIP proxy channels connecting to different sources.

For each channel the “SIP Port” may be configured. By default these will be 5060 to 5063. Channels can have the same port number as other channels if required – incoming calls will be differentiated based on the SIP user ID (channel number) instead.

The “Audio Source SIP URI” by default will be blank – in this state the channel is disabled. The SIP URI is what the VoIP proxy will dial to obtain audio to stream to incoming callers on the channel. To enable the channel enter a SIP URI of the form <user id>@<ip address>:<sip port>. For example, with an SPA122 / SPA2102 ATA with default configuration and an IP address of 192.168.234.4, the URI for line 1 will be 1@192.168.234.4:5060, and for line 2 it will be 2@192.168.234.4:5061.

“Codec” defaults to G.729 as this requires the least IP network capacity. This is a suitable choice for voice applications. For background music, higher fidelity sound will be achieved with the G.711 µ-Law codec choice. Other possible choices are G.711 A-law and G.726. The Cisco SPA122 and Linksys SPA2102 ATAs support all the available codec choices, but some other VoIP devices may not. Most notably

G.729 codec support is often omitted. A message will be logged in the PIB internal log if the codec choice isn't supported by a VoIP device (audio source or caller).

For other VoIP devices to dial the VoIP proxy on the PIB the SIP URI for a channel will be of the form <channel number>@<PIB IP address>:<channel SIP port>.

5.5.6 Passwords

Refer to the cyan section of Figure 5-9.

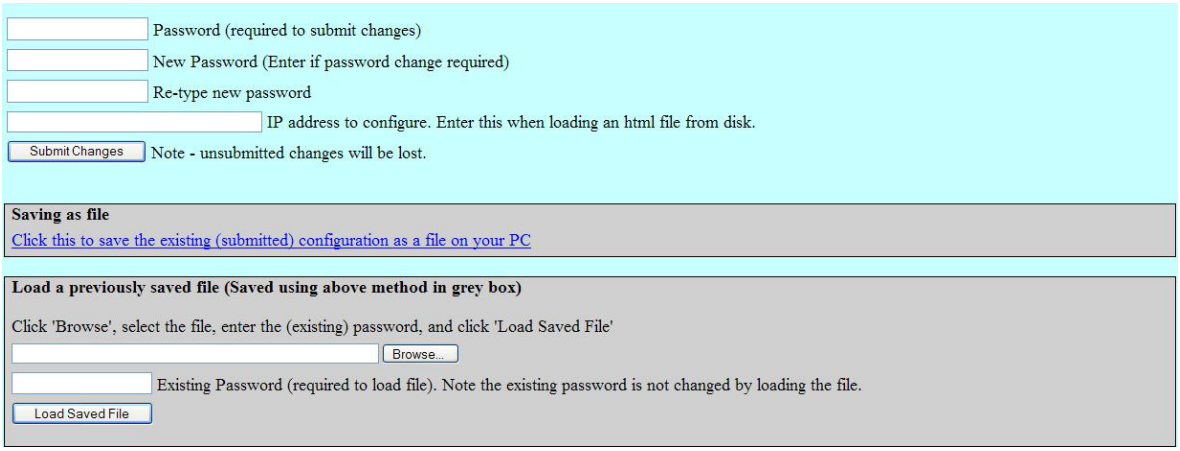


Figure 5-9 –Password, Submit, Save / Load as File Configuration

You can set (or change) a password by typing the password in the New Password (and type it identically in the Retype New Password field) and pressing Submit Changes.

Once a password has been set, it must be entered every time in the Password field before Submit Changes is clicked to submit any configuration changes.

Although when the PIB configuration is reset there is no password, once a password has been set it cannot be reset to nothing again. (If you type nothing in the New Password field, it assumes that you don't want to change the password.)

Note: once a password has been set the PIB will require login to access any of its web pages. A login will expire after 10 minutes of no activity.

5.5.7 Submit Changes

Refer to the cyan section of Figure 5-9.

Whenever you change the configuration, you must click Submit Changes. You will be shown a screen advising you of whether the changes were accepted, or whether there was some error in the entries. If there was an error you must correct it or the PIB's configuration may be left in an invalid state.

5.5.8 Saving As File

This allows the PIB's configuration to be saved to a file on the PC. Use your browser's normal means to save the file (like a file you download from the Internet).

5.5.9 Load a Previously Saved File

This allows the PIB's configuration to be loaded from a previously saved file on the PC. Refer to the text on-screen in the grey section of Figure 5-9. Click on **Browse**

to select the file. Enter the PIB's current password, which will not be changed by loading the file, and then click on **Load Saved File** to load the configuration.

5.5.10 Alternate Method of Saving / Loading a Configuration

Instead of the method documented in sections 5.5.8 and 5.5.9, you can save a configuration by bringing up the configuration page in your web browser and saving it on your PC using the "Save As" facility of your web browser. It is recommended to use the html only format.

To restore the configuration of the PIB (or to a new PIB), open the saved page in your web browser (you can then edit it if required). Then enter the IP address of the PIB to receive the configuration in to the "IP address to configure" box and then click "Submit". This will write the configuration to the PIB. Check a successful update screen is shown.

The advantage of this method is that you can review saved files off-line. The disadvantage is that it can be a little fiddly. Please see the notes below –

- With many versions of Internet Explorer, when you load the html file from disk, it will ask for permission to "Run scripts or active content that could access your computer". You must allow it - rest assured that the scripts on the page do not access your computer.
- With Firefox version 4 and above, there is no "File | Open File" command. However the "New Tab" and "New Window" commands will allow you to open a file.
- With Google Chrome there are no menu commands for File Save or File Open. To save a page, type Control+S. To open a page, click in the URL bar then type Control+O.

5.6 Moxa Switch

5.6.1 Programming Steps

For simple non-duplicated networks the Moxa switch will work using the factory-default settings. However, for fault-tolerant ring operation, or to assign a specific IP address to the Moxa switch, it will need to be configured. If the Moxa does not appear to work as a switch, and may have had some prior settings, other than factory default, then set it to factory default before programming the required ring settings. In the EDS configurator (as described following) select the "Reset to Factory Default" option and click "activate".

These instructions work for a Moxa EDS-405A switch with V3.1 or V3.4 firmware and factory-default settings.

If newer firmware is available from the Moxa website (www.moxa.com) then this should be used.

To configure the Moxa switch a PC/laptop with a web browser, Moxa's configurator program edscfgui.exe (available on the CD with the switch or from Moxa's website) and an Ethernet connection is required.

Connect the PC/laptop and the PIB to the Moxa switch using Ethernet cables.

Fit the DHCP Server [TAMPER] link J13 on the PIB to enable it as a DHCP server.

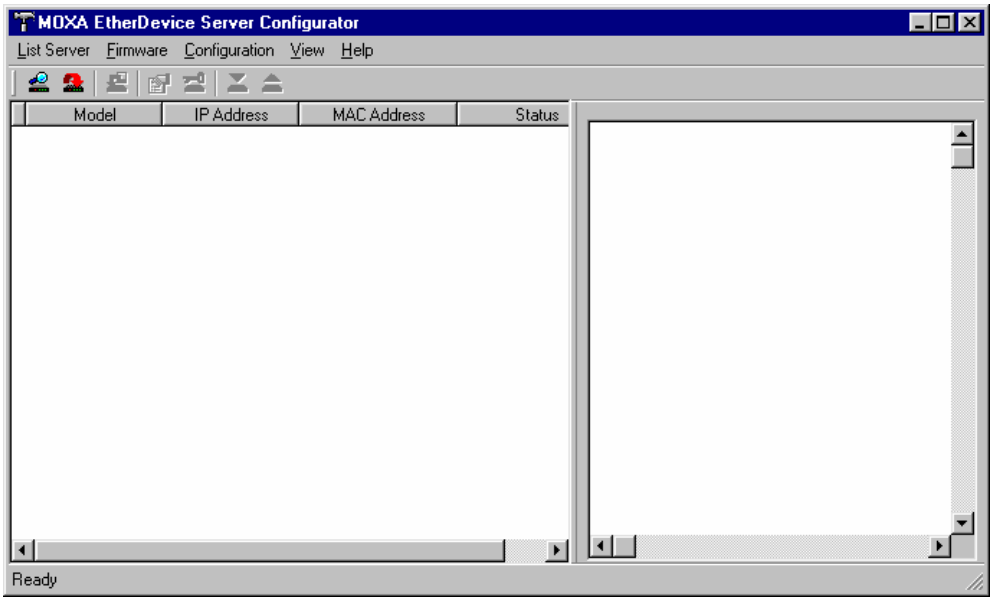
Power up the Moxa switch and PIB. The PIB will allocate an IP address to the computer.

To start EDS Configurator, run the executable file edscfgui.exe.

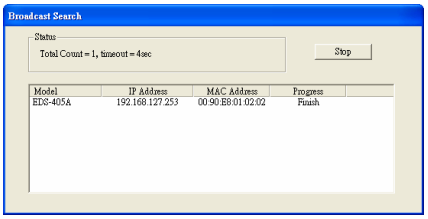
For example, double click the icon 

to run the program.

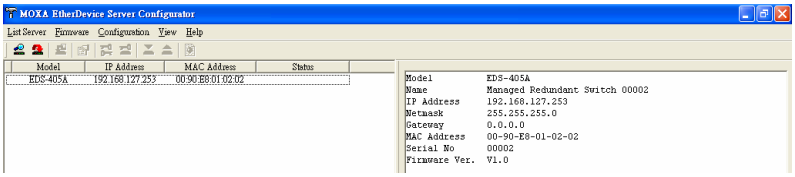
The Moxa EtherDevice Server Configurator window will open, as shown.



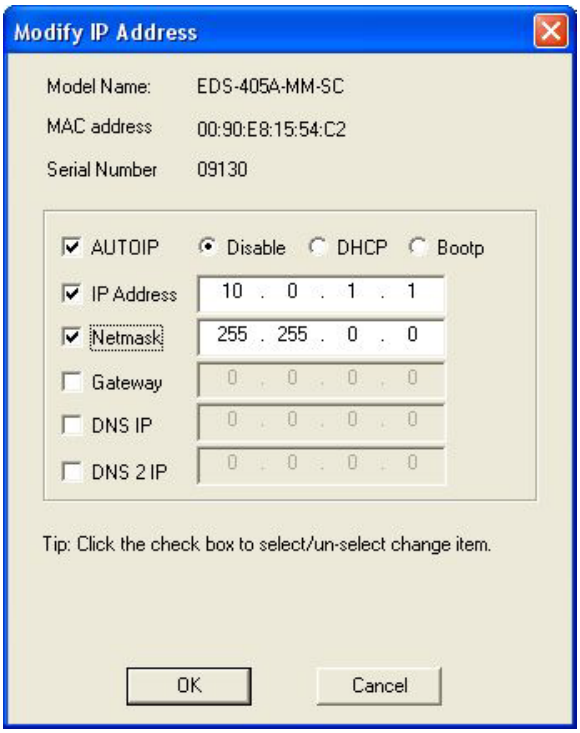
Use the Broadcast Search utility to search for all Moxa switches that are connected to the LAN. Note that since the search is done by MAC address, Broadcast Search will not be able to locate switches connected outside the PC LAN. Start by clicking the Broadcast Search icon, or by selecting Broadcast Search from the List Server menu. The Broadcast Search window will open, displaying a list of all switches located on the network, as well as the progress of the search.



Once the search is complete, the Configurator window will display a list of all switches that were located.



Right click on the selected switch and select Modify Configuration from the popup menu to allow modification of the IP settings.



Tick the AUTOIP and select Disable.

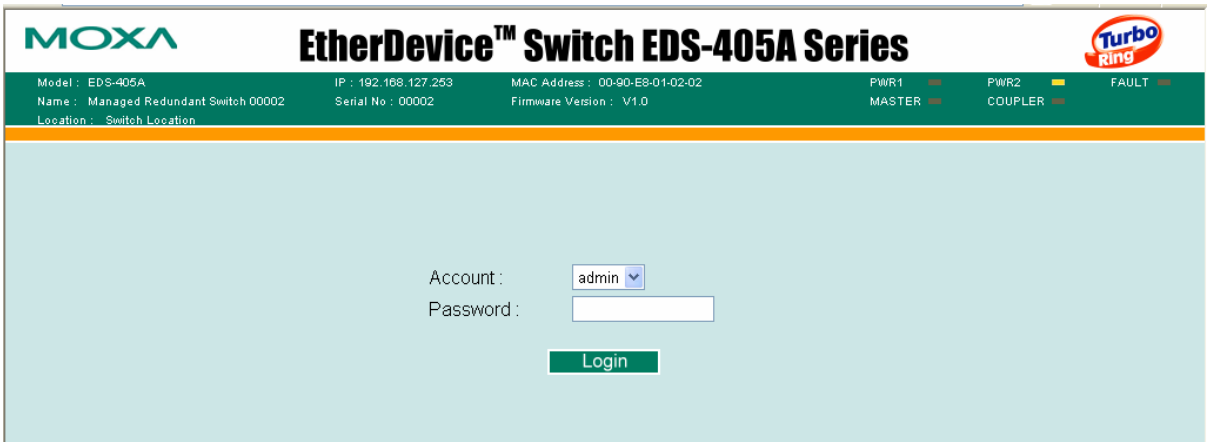
Tick IP Address and enter the IP address for the switch.

Tick Netmask and enter the Netmask.

Click OK to store the new configuration in the switch.

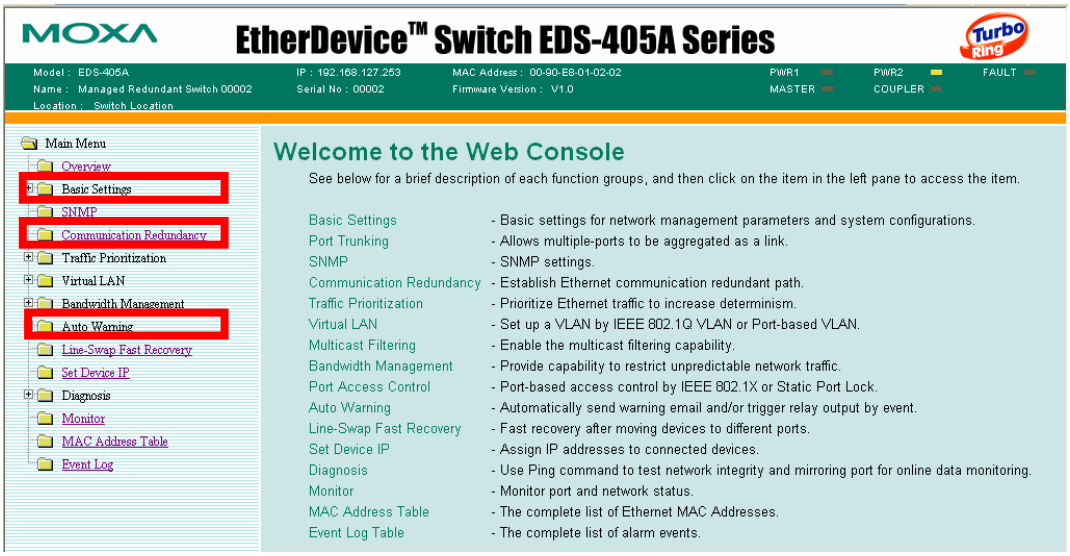
The switch should automatically be re-found at its new IP address in the Configurator window.

Right click the switch and on the popup menu select Web Console. This will run the web browser and connect to the web server inside the switch.



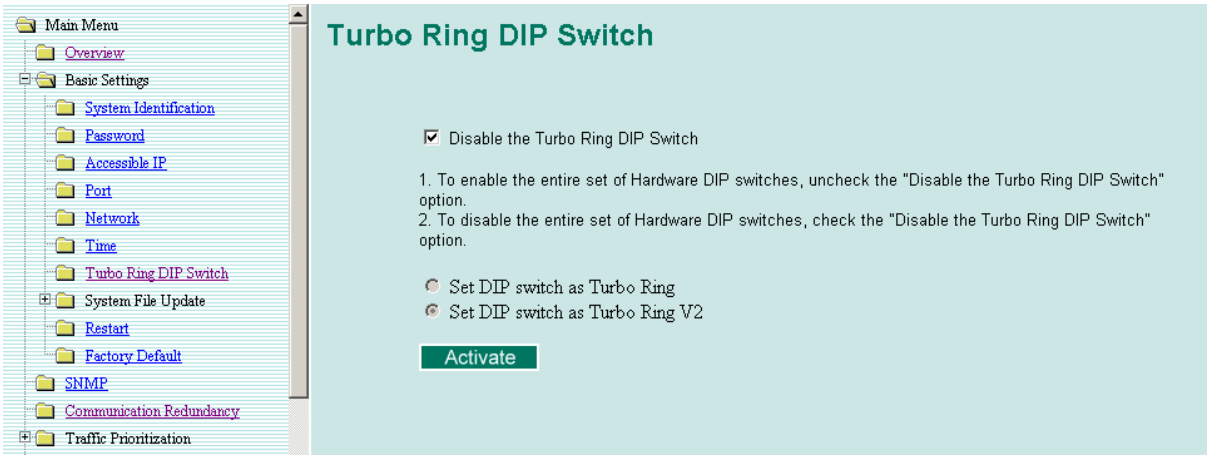
Select the admin account and click Login (by default the password is not set).

This will display the menu for the switch.



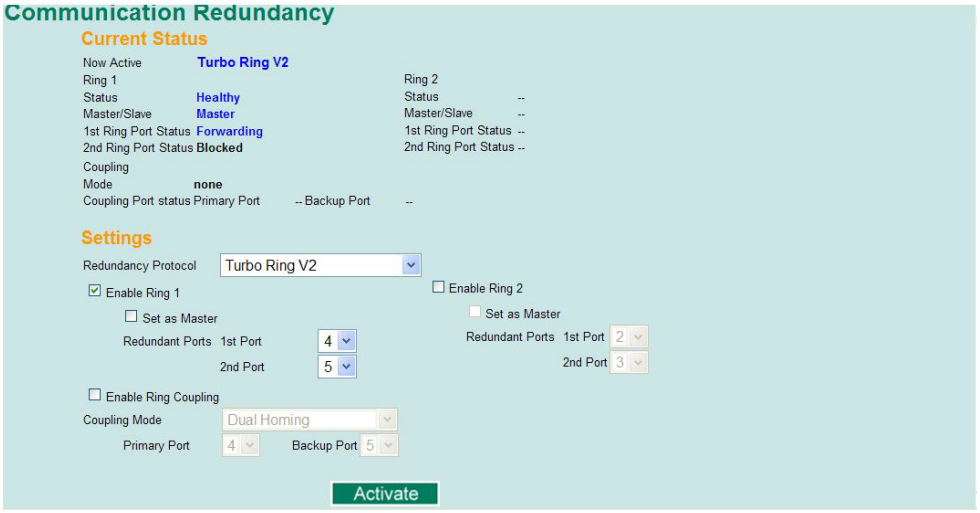
The menus to be used are Basic Settings | Turbo Ring DIP Switch, Communication Redundancy and Auto Warning.

Click on the + sign beside Basic Settings to expand it, then select Turbo Ring DIP Switch. Select the following options.

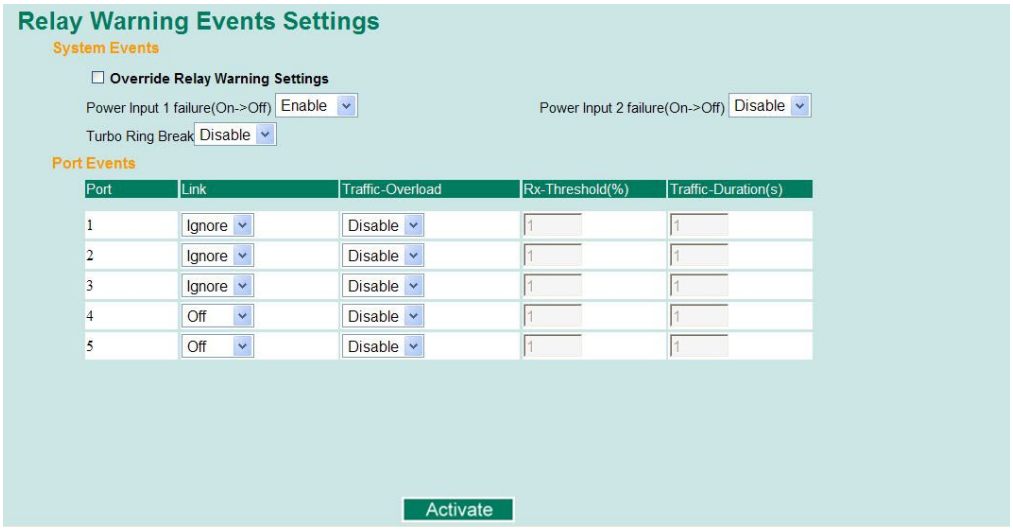


Then click Activate.

Click Communication Redundancy and then enter the relevant details. Turbo Ring V2 is used and the Redundant Ports need to match the port numbers being used for the ring (ports 4 and 5 for the fibre ring in this example). If this switch is to be the ring master then tick the Set As Master option. The ring master switch can be used to report ring breaks, and which switch is the master also affects some details of how the ring redundancy works. Click Activate.



Expand the Auto Warning Tab -> Relay Warning -> Event Setup menu.



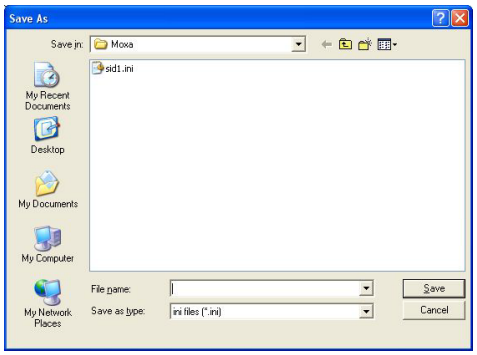
Set the “Power Input1 failure(On->Off)” to Enable if power is applied to the Moxa V1 Power Connection, otherwise set to Disable. Set the “Power Input2 failure(On->Off)” to Enable if power is applied to the Moxa V2 Power Connection, otherwise set to Disable.

Set “Turbo Ring Break” to Enable if this Moxa switch is configured to act as a master and you would like it to signal a fault for a break anywhere on the ring. This setting has no effect if the Moxa switch is not the master. Refer to Section 11 for more detail on fault signal monitoring.

In the “Link” column, select Off for the two ports that are used for the ring, then click Activate.

After completing this, press Alt-Tab to switch back to the edscfgui.exe window and save the configuration as a text file for backup purposes.

Right click the switch (from the Server list) and then select Export Configuration from the menu.



Type the name of the file in the File name box and click Save to save the configuration.

Click OK when the Export configuration to file OK message appears.

5.6.2 Saving the Configuration Using the ABC-01

The Moxa Automatic Backup Configurator (ABC-01) is a small device that can be used to store the configuration from a Moxa switch and:

- Restore this into a replacement unit sometime in the future, or
- Copy the configuration to other units on the site.

The ABC-01 plugs into the RS232 console port on the top of the Moxa switch, beside the power connector. Do not plug it into the Ethernet connectors on the front of the switch.

To save the configuration, plug in the ABC-01, use the web console (see Section 5.6.1) and on the Basic Settings | System File Upgrade | Backup Media page click on the Save Configuration option. This will write the configuration to the ABC-01. Label the ABC-01 with the configuration and date, and keep for later use.

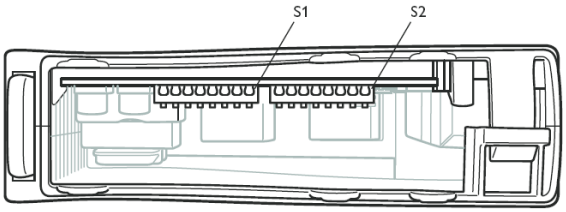
5.7 Westermo DDW-120 Ethernet Extender Configuration

The Westermo DDW-120 Ethernet Extenders work as a pair. One has to be configured as CO (Central Office) and one as CPE (Customer Premises Equipment). This configuration is made with DIP-switches situated under the lid of the DDW-120. The factory default setting is CPE.

5.7.1 DIP-Switch Settings

Prevent damage to internal electronics from electrostatic discharge a (ESD) by discharging your body to a grounding point (e.g., use of wrist strap).

NOTE: DIP-Switch alterations are effective only after a power on.

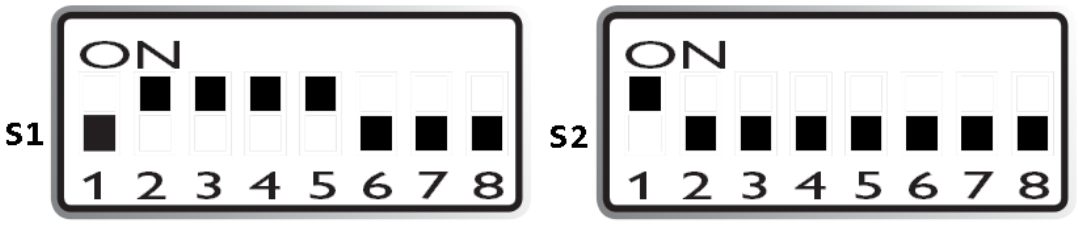


To configure the DDW-120 to be CO, DIP-Switch S1 position 4 must be ON, and for CPE S1 position 4 is OFF.

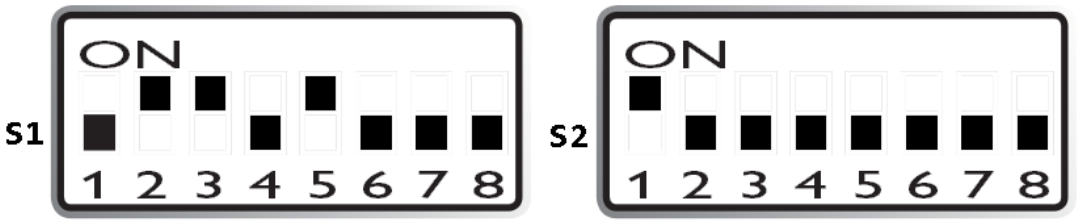
Recommended Settings:

The recommended settings to use are: Standard Speed, Auto Baud Reliable Mode, LFF Enabled, Ethernet Auto-Negotiation Enabled, plus CPE for one end, and CPO for the other.

CPO



CPE



5.8 EXAMPLE CONFIGURATION

This example describes a means of allocating IP addresses and programming the PIBs and Moxa switches for operation in a network.

The example consists of 3 panels, each with a PIB and dual fibre Moxa switch arranged in a fault-tolerant ring. One panel (say SID 1) will be the master panel and the other two panels will be sub-panels (say SIDs 2 and 3).

To allow easy determination of the IP address for each PIB and Moxa switch it is suggested the SID number of the panel the units are to be installed in be the bottom number of the allocated IP address and the next higher number specify the device type (PIB=0, Moxa=1). Following this method the IP addresses are allocated as follows:

SID	PIB	Moxa
1	10.0.0.1	10.0.1.1

2	10.0.0.2	10.0.1.2
3	10.0.0.3	10.0.1.3

For all devices a suitable NetMask would be 255.255.0.0.

Table 5.8 provides a form where this information can be recorded, along with the MAC addresses of the equipment installed at each location, plus any passwords should they be programmed.

It is recommended this table be completed for each site, with the details in the order units are wired around the ring. This will greatly simplify fault finding.

Using a Moxa ABC-01 can simplify the programming process for the Moxa units. Program one Moxa as required, then save the configuration to the ABC-01, and use this to load the parameters into each Moxa. Once the ring is fully operational the Moxa Configurator can be used to program the IP address into each Moxa as long as the MAC address and location are known.

5.8.1 PC Setup

To enable programming, configuration and diagnostics it is recommended the PC (laptop) has PIB_Finder and the Moxa configurator edscfgui.exe installed. Also the user should be familiar with using the IPConfig command–line program to display the PC's IP settings and release and renew its IP address.

5.8.2 PIB & Moxa Setup

It is recommended that the PIBs and panels be commissioned onto the ring one at a time, starting with the main panel and proceeding around the ring in a logical fashion. Record the details onto Table 5.8 as each location is configured.

In the following procedure it is assumed the PIB and Moxa are brand new and so come with their factory-default settings, and that the fibres are disconnected from each Moxa switch.

At the panel:

- Connect the PIB's Ethernet port to the Moxa switch;
- Connect the PC's Ethernet port to the Moxa switch;
- Disconnect the two fibre connections from the Moxa switch;
- Fit a mini-jumper to the DHCP Server [Tamper] J13 connector on the PIB; then
- Power up the panel and the laptop.

PIB Configuration

After about a minute run the PIB_Finder program on the PC and:

- Check there is an IP address of 10.x.x.x shown at the top of the PIB_Finder window;
- Click on the **Start** button;
- After 10 seconds check a PIB has been located in the Message Log window;
- Click on the **Discovered PIBs** tab and double click on the PIB listed. This will run the Web Browser to display the status page for the PIB.

- Click on the Configuration link to show the PIB Configuration page, and enter a **Name** for the PIB;
- Untick **Use DHCP for IP Settings**;
- Enter the required **Local IP Address** and **NetMask**;
- Tick the **FAS1 is fault contact input** box;
- Enter any other required programming;
- Then click on **Submit Changes** to save the configuration.

Moxa Configuration

If using the ABC-01 plug this in before powering up the Moxa switch.

Otherwise, run the edscfgui.exe program on the PC and click on the **Broadcast Search** button (menu: List Server, Broadcast Search) to find the Moxa switch. Wait for the search to complete with one Moxa switch found.

Right click on the line and select Modify Configuration.

Tick **AutoIP** and **Disable**. Tick **IP Address** and enter the IP address. Tick **Netmask** and enter the Netmask. Click **OK.**

This will cause the switch to re-start at its new IP address and this should be re-found in the Configurator window.

Right click on the line and select Web Console. This will run the web browser to show the Moxa switch internal web server.

- Click Login (by default the admin account has no password);
- On the left hand side explorer window click on the + sign for **Basic Settings** and then on **System**.
- Enter a Switch Location (e.g., the building name and SID number) and click **Activate**.
- Click on **Turbo Ring DIP Switch** on the left hand side and select **Set DIP switch as Turbo Ring V2**.
  Tick **Disable the Turbo Ring DIP switch**.
  Click **Activate**.
- Click **Communication Redundancy** on the left hand side and make sure the Redundancy Protocol is **Turbo Ring V2**, with **Enable Ring 1** ticked, and the **Redundant Ports** set to **4** and **5**. Click on **Activate**.
- Click on the + sign for **Auto Warning**, then the + sign for **Relay Warning**, then on **Event Setup**.
  Check **Override Relay Warning Settings** is not ticked.
  Select **Power Input 1 Failure (on/off)** as **Enable** if power is applied to the Moxa V1 Power Connection (otherwise set to **Disable**).
  Select **Power Input 2 Failure (on/off)** as **Disable** (however if power is applied to V2 – set this to **Enable**).
  For Ports 4 and 5 set the Link field to **Off** and the rest to **Ignore**.
  For the master panel of a ring where any panels are not directly monitoring the fibre link status of the switch via the PIB status or OC output wired into a fault-generating input, then set **Turbo Ring Break** to Enable so that a fault anywhere on the ring will cause the master switch to operate its relay and

create a fault. Otherwise set the **Turbo Ring Break** as Disable. Click **Activate.**

Save all the PIB and Moxa configurations so that they can be easily restored in the advent of a unit failure.

5.8.3 Check Local Connectivity

Power down the panel (including the PIB and Moxa switch) and power up again. Wait until the PC obtains its IP address.
Run PIB_Finder and check it finds the programmed PIB at its correct IP address.
Display the PIB Status window from the Discovered PIBs list and check it is correct.
Run the edscfgui.exe program and check it finds the Moxa switch at its correct IP address.

5.8.4 Check Ring Connectivity

For sub-panels plug the fibre from the preceding panel into the correct port. Check the 100M LED beside the port starts flashing.

Run PIB_Finder and check that it finds all the PIBs that should be connected (those back to and including the master panel).

Remove the DHCP Server [Tamper] J13 mini-jumper at the sub-panel.

For all panels plug the fibre to the next panel into the correct fibre port on the Moxa. As it should be disconnected at the next panel, the 100M LED will remain out.

Move onto the next panel.

5.8.5 Final Check of Ring at Master Panel

Once all PIBs and Moxa units on the ring have been configured, return to the master panel, plug in the remaining fibre and check the fault status on the Moxa switch has cleared. Use PIB_Finder and check all the PIBs are found. Display the status of one PIB and check it has found all the other PIBs, and that there are no faults present.

If the fire panels have been correctly programmed for networking and are connected to their respective PIBs, then check that the **SID Numbers There** field for each PIB includes the SIDs for the panels at that PIB.

Carry out any remaining programming and then fully test the system – including that ring breaks at each Moxa unit set the correct fault statuses.

5.8.6 Things That Could Go Wrong

Broken Fibres, Incorrectly Labelled Fibres

If connectivity is not achieved to preceding PIBs when the fibre is plugged in, thoroughly check the fibre for breaks, excessive bending or compression, incorrect routing or swapped Tx/Rx labels.

Also check that each Moxa unit is programmed correctly – especially the Communications Redundancy settings.

SIDs Move Position on the Loop

If panels (SIDs) appear to move position on the loop – for example the warnings: SIDxx was on Panel-Link now at IP address, or SIDxx was an IP, now on Panel-Link, are generated, then the usual cause is a PIB receiving its own transmission on its Panel-Link port. The PIB requires a 4-wire connection (separate Tx and Tx signals) to the panel/I-HUB it is connected to. If it "hears" its own transmissions (i.e., messages from a panel on another PIB) then it thinks the panel now appears on its Panel-Link port and broadcasts this information. This can confuse the PIB network. Check the wiring from the PIB to its connected device. This problem can occur if the connection has long wiring (>2m) and is open circuit on the receive signal.

Moxa Ring Break Detection Doesn't Work

Check the programming of the Moxa switches, especially the Communications Redundancy settings. Check relay wiring to PIB.

Moxa Ring Break with DDW-120 Ethernet Extender

If a Moxa is indicating a link failure on a port that connects to the next Moxa via a pair of Westermo DDW-120 Ethernet Extenders, then check the DIP switch settings of both DDW-120 units and the connectivity of the cable and use the LEDs on the DDW-120 to localise the fault.

Note that SW1.5 LFF should be ON (enabled). This feeds a fault on the DSL line back to each Moxa via the Ethernet port so the Moxa sees a broken cable as an Ethernet link fault. It also feeds a fault on the Ethernet port across the DSL connection to the other Westermo.

Note also that after a power-up, the Westermo units may take a few minutes to establish connectivity and clear the fault.

Table 5.8 – PIB Loop Setup

SITE:							
PIB Location	Panel SIDs	PIB IP Address	PIB MAC Address	PIB Password	Moxa IP Address	Moxa Mac Address	Moxa Password
RECORD DETAILS IN THE ORDER UNITS ARE WIRED AROUND THE LOOP							

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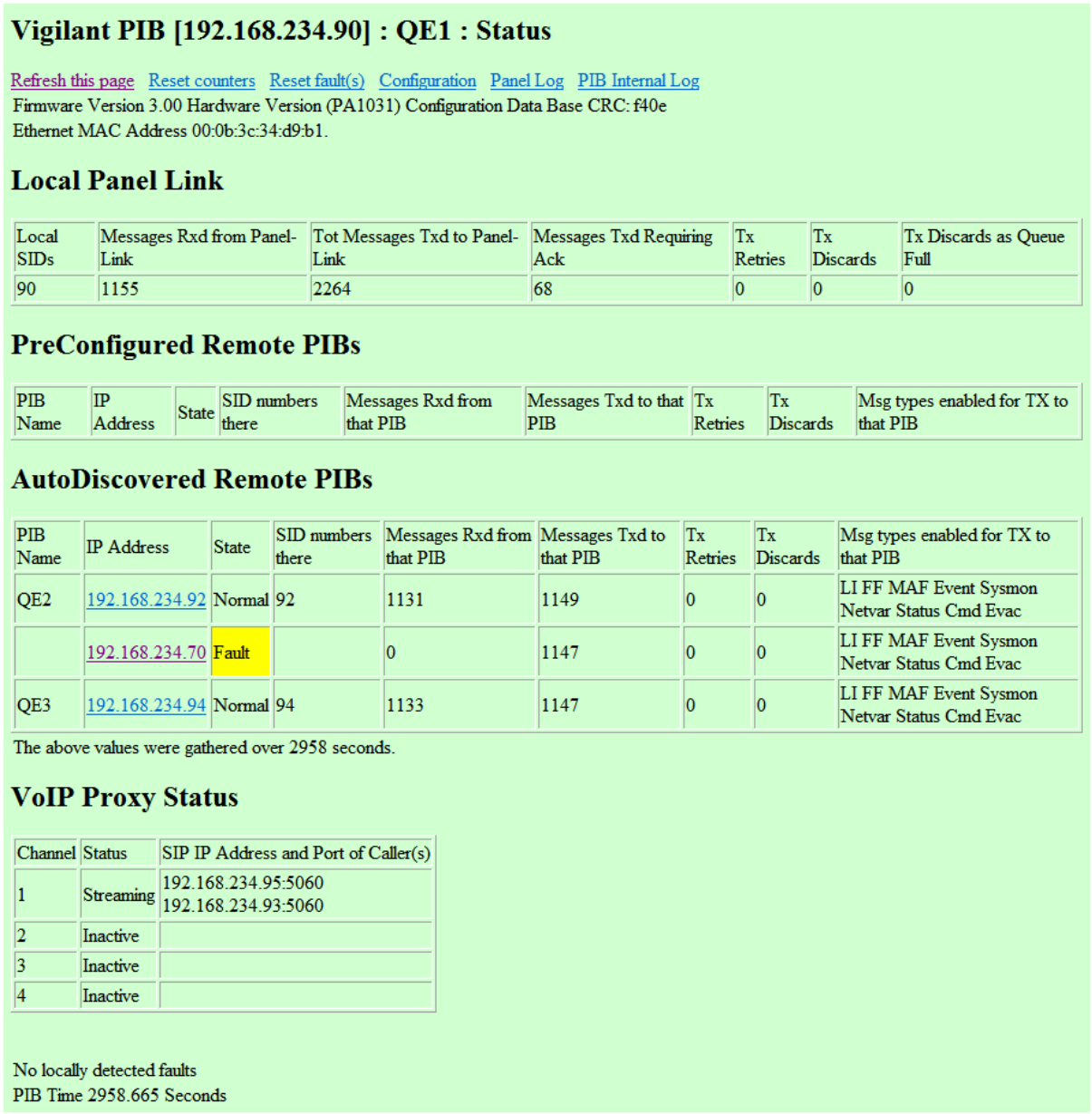
6. PIB Status

To see the status page of a PIB, browse to its status page as described in section 5.4. A screen such as that in Figure 6-1 should be displayed.



Vigilant PIB [192.168.234.90] : QE1 : Status

Refresh this page Reset counters Reset fault(s) Configuration Panel Log PIB Internal Log
Firmware Version 3.00 Hardware Version (PA1031) Configuration Data Base CRC: f40e
Ethernet MAC Address 00:0b:3c:34:d9:b1.

Local Panel Link

Local SIDs	Messages Rxd from Panel-Link	Tot Messages Txd to Panel-Link	Messages Txd Requiring Ack	Tx Retries	Tx Discards	Tx Discards as Queue Full
90	1155	2264	68	0	0	0

PreConfigured Remote PIBs

PIB Name	IP Address	State	SID numbers there	Messages Rxd from that PIB	Messages Txd to that PIB	Tx Retries	Tx Discards	Msg types enabled for TX to that PIB

AutoDiscovered Remote PIBs

PIB Name	IP Address	State	SID numbers there	Messages Rxd from that PIB	Messages Txd to that PIB	Tx Retries	Tx Discards	Msg types enabled for TX to that PIB
QE2	192.168.234.92	Normal	92	1131	1149	0	0	LI FF MAF Event Sysmon Netvar Status Cmd Evac
	192.168.234.70	Fault		0	1147	0	0	LI FF MAF Event Sysmon Netvar Status Cmd Evac
QE3	192.168.234.94	Normal	94	1133	1147	0	0	LI FF MAF Event Sysmon Netvar Status Cmd Evac

The above values were gathered over 2958 seconds.

VoIP Proxy Status

Channel	Status	SIP IP Address and Port of Caller(s)
1	Streaming	192.168.234.95:5060 192.168.234.93:5060
2	Inactive	
3	Inactive	
4	Inactive	

No locally detected faults
PIB Time 2958.665 Seconds

Figure 6-1 – Example PIB Status Page.

The status page first details the PIB's IP address, programmed name, the name of the web page (Status), followed by links to the other PIB web pages. It then shows the software version number, Ethernet MAC address, and the time to renew the IP address if DHCP is enabled. It then shows the CRC of the configuration – this should be recorded.

The Local Panel-Link table shows the SIDs that have been located, or configured, on the PIB's local Panel-Link port, the number of messages received and transmitted on Panel-Link, the number of messages transmitted that require an acknowledgement, and the number of retries and discards. Note the number of retries should be very

small (< 0.1% of the number of messages requiring an ACK) and the number of discards should be zero. If it is not, the reason should be investigated.

The Pre-Configured Remote PIBs table lists the PIBs that have been entered into the other PIBs table of the configuration. It shows the name, IP address (which you can click on to view that PIB's status page), State (see below), the SID of the (directly or indirectly) connected Panel-Link devices, the number of messages received, sent, retried, or discarded, and the message types that are sent to that PIB. Note the number of retries should be very small (< 0.1% of the number of messages requiring an ACK) and the number of discards should be zero. If it is not the reason should be investigated.

A second table is shown for those PIBs that have been automatically discovered, displaying the same information as the previous table.

The VoIP Proxy Status table lists the status of the four audio channels, it also lists the IP address and SIP port of any callers to each channel. The possible channel states are Inactive, Called, Ringing, Streaming, and Closing. The Called and Ringing states will be shown when the audio source is initially being contacted. After the audio source has picked up and audio is streaming, the Streaming status will be shown. Channels that are disabled, or that currently have no callers will show the Inactive status.

If a fault has occurred, a yellow bar will be shown at the bottom of the screen with the fault message. More details (and prior fault messages) can be found on the PIB's Internal Log screen (use the PIB Internal Log link at the top of the status page).

The possible PIB fault messages are listed below.

- DHCP Server no response
- Fail to contact DHCP Server
- Program CRC fault
- Configuration Data Base CRC fault
- Plink Message Discarded (message sent on serial port not acknowledged)
- Power Supply fault
- Power fault contact input is active
- External fault contact input is active

If a warning has occurred in the last 3 minutes, a yellow warning bar will be shown at the bottom of the screen with one of the following messages. A warning doesn't cause the PIB to signal fault, but are recorded for information purposes.

- Previously auto detected node 10.10.45.10 has vanished
- SID 22 has vanished from IP address
- SID 11 was on IP, now on Panel-link
- SID 11 was on Panel-Link now at IP address
- Unknown location for SID 44
- UDP Data RX CRC Error
- UDP RX data too short
- UDP RX plink msg too short
- UDP RX plink msg wrong length
- RX Plink message CRC Error
- IP queue full, message discarded
- Rejected call to unknown VoIP channel, from 192.168.1.43:5060
- Rejected call to disabled VoIP channel 1, from 192.168.1.43:5060
- Rejected call to VoIP channel 2 on wrong port 5060, from 192.168.1.43:5060

- Rejected call from 192.168.1.43:5060 as codec or media transport is not supported by VoIP channel 1
- Rejected call as concurrent VoIP calls limit exceeded
- Audio source for VoIP channel 1 rejected call as codec or media transport is not supported
- Audio source for VoIP channel 1 rejected call as line is busy
- Audio source for VoIP channel 1 rejected call
- VoIP caller 192.168.1.43:5060 stopped communicating
- Overrun seen on VoIP channel 1
- VoIP channel 1 audio source didn't respond to call
- VoIP channel 1 audio source stopped communicating
- VoIP channel 1 audio source didn't answer
- VoIP channel 1 audio source stopped sending audio

Specific addresses, channels, and other numbers shown above in the possible messages above are just shown as an example. Others numbers could appear in their place.

In the State field shown for the remote PIBs the following can be displayed:

- Normal or Fault to indicate the current status of that PIB.
- Blank, Signals Flt, or Flt Master to indicate how that PIB will report its fault. If it is blank then faults are not reported directly by the PIB and another PIB that has the Flt_Master status will report the PIB's fault as a remote PIB fault. If it is Signals_Flt, then the PIB will report its faults to the connected panel. If it is Flt Master, then the PIB will report faults from remote PIBs that do not report their own faults.

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7. Using PIB_Finder.exe

The PIB_Finder.exe program can be run on a PC connected to the network to discover all the PIBs that are transmitting their SID list broadcast message. Enter the UDP port (default 2220) used by the PIB(s) to be discovered and click “Start”. Within 10 seconds it will display the IP address, MAC address, Node Name, connected SIDs and Status of each PIB in the local subnet. This can be used to find the IP address of a PIB when it cannot be found otherwise. The display will add this information to the Message Log as it is received from each PIB (e.g., once every 10 seconds).

All discovered PIBs will be listed in the Discovered PIBs tab. See Figure 7-1. Select the required PIB from the list and click the **Access Selected PIB Status** button to open the PIB’s Status page in the default web browser. This status page includes links to the other PIBs.

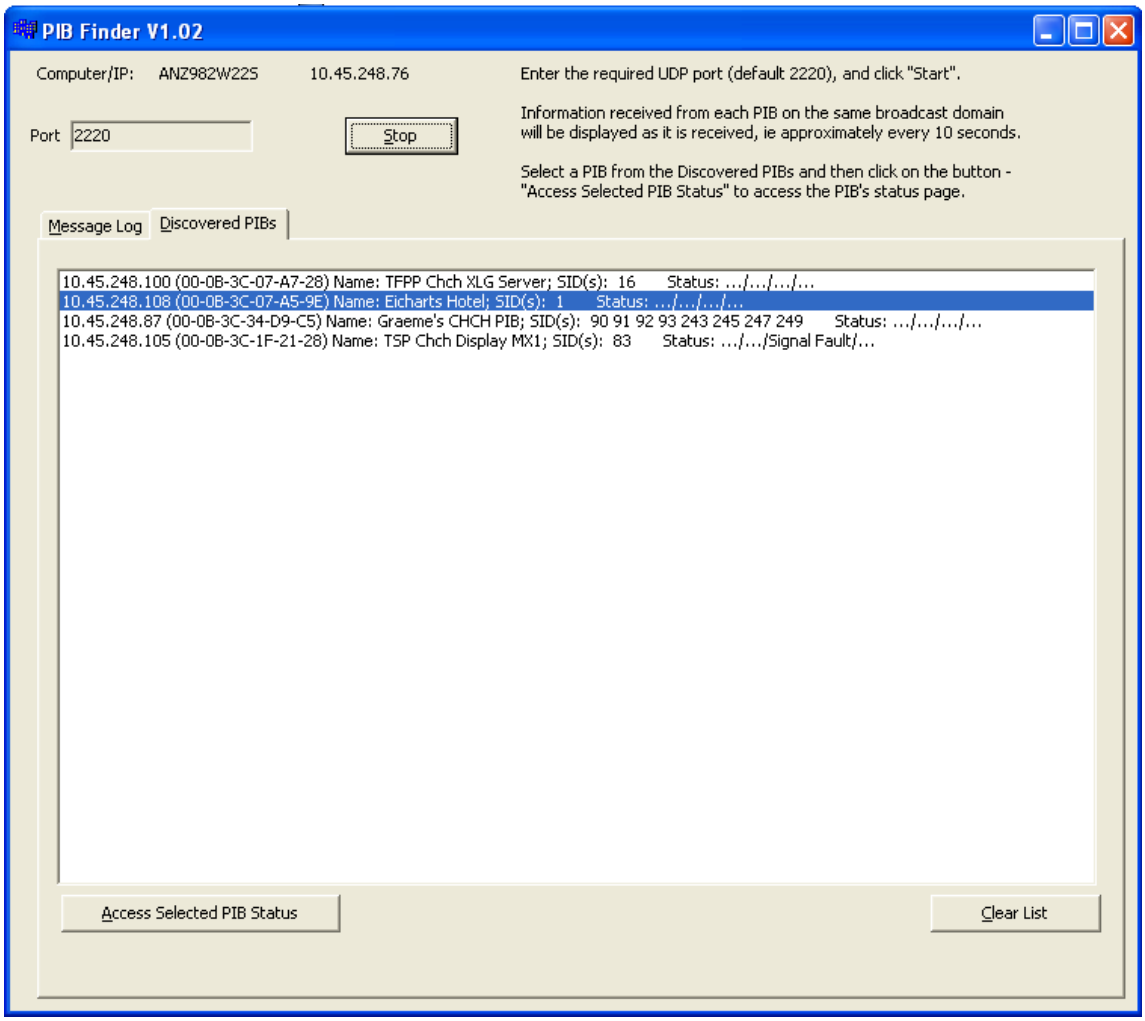

Figure 7-1 – Discovered PIBs in PIB_Finder.

Note: The MAC address for the PIB will be shown as ??-??-??-??-??-?? if the PC cannot communicate with the PIB. This indicates an IP addressing problem (on different subnets) or a partial connection fault between the PC and the PIB.

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8. PIB Internal Diagnostics

There are three methods to obtain access to the PIB's internal diagnostics. The information displayed includes a log of faults and significant events.

8.1 Using the PIB's Serial Port

Connect a PC running a terminal emulator such as Wincomms (set to 38400,N,8,1) to the PIB serial port with a null modem cable such as LM0076. Connect a mini-jumper across the SERIAL DIAG J10 [DOOR] connector terminals to enable serial diagnostics. Re-start the PIB by powering it down and up (Note this stops the serial port from being used for remote access to the panel's serial diagnostics.) This mode will remain active until the PIB is powered up again with the mini-jumper removed. Type help <Enter> to see the list of commands. See section 8.4 for a description of the commands.

8.2 Using Telnet

Connect a PC running a terminal emulator with Telnet capability such as WinComms or SmartConfig to a spare Ethernet port on the network. Open a connection to A.B.C.D:1023 where A.B.C.D is the IP address of the PIB you want to connect to. If the PIB has a password configured, this will be prompted for, before access is given.Type help <Enter> to see the list of commands. See section 8.4 for a description of the commands.

8.3 Using Web Browser

Click the "PIB Internal Log" link on the PIB's status page to display the PIB's Internal Log page – see Figure 8-1. Send commands by typing them in the **Input PIB Diagnostic Command** box provided and clicking "Submit Command". Click Reload this page (once) as required to see the updating output (or click the Reload this page every 2 seconds link to see a snapshot of the output every 2 seconds.)

Note the web browser view shows the last 100 lines or so of diagnostic output. It is not possible to retrieve information older than this.

Submit a command "help" to see a list of commands. See section 8.4 for a description of the commands.

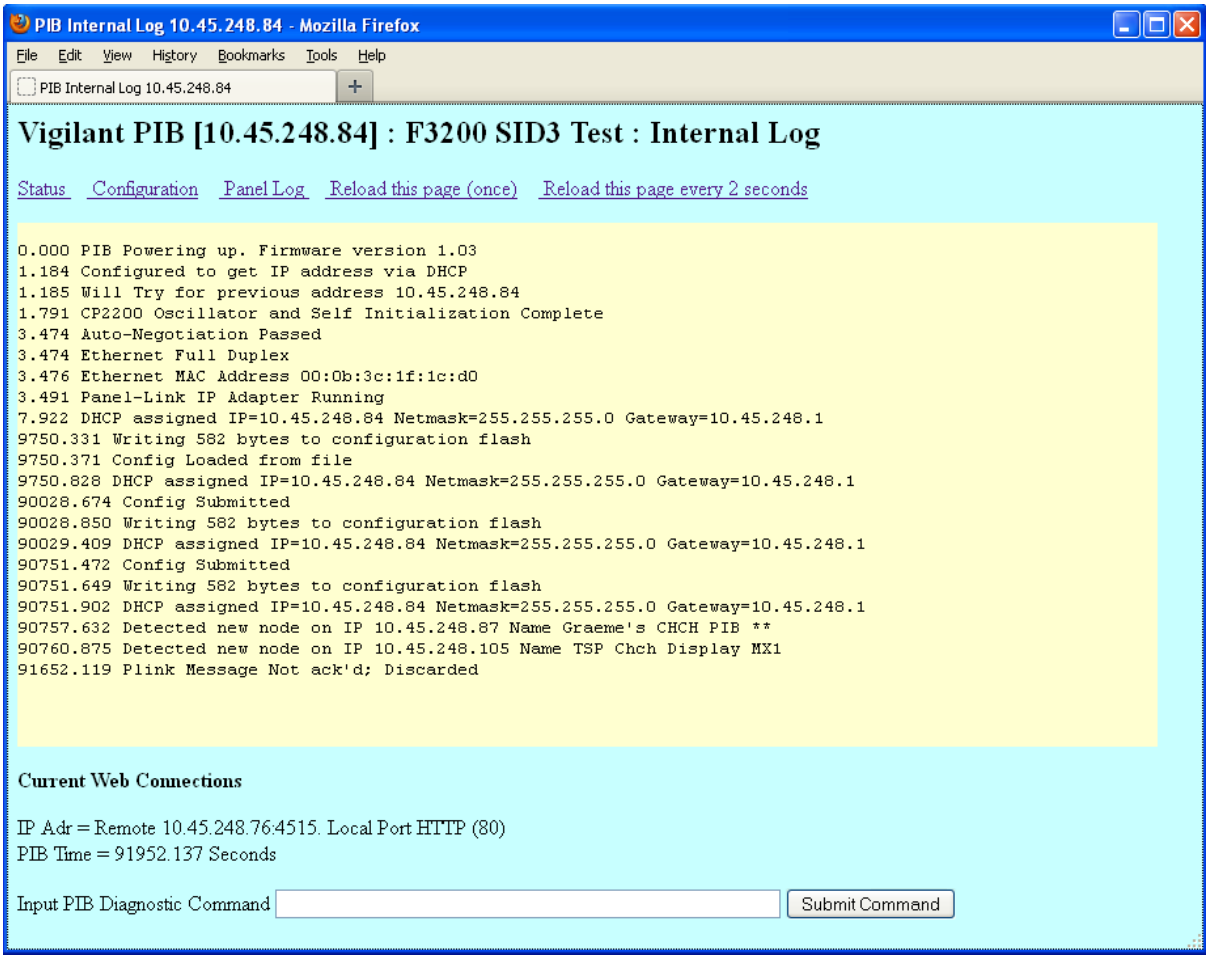

Figure 8-1 – Web access to PIB internal log

Note : after sending a command by clicking the “Submit Command” button, the same command can be re-sent as required by using the browser’s “Reload” button. On the other hand, the links Reload this page (once) and Reload this page every 2 seconds do not re-send the command.

8.4 Commands

The above three methods (in sections 8.1, 8.2, and 8.3) all display the same information and allow the same commands to be entered. However to capture a large amount of data, Telnet or the PIB’s serial port may be more suitable.

All methods will display certain information when the PIB powers up. For example: –

```
0.001 PIB Powering up. Firmware version 0.19
1.057 Configured to get IP address via DHCP
1.663 CP2200 Oscillator and Self Initialization Complete
3.592 Auto-Negotiation Passed
3.592 Ethernet Full Duplex
3.593 Ethernet MAC Address 00:0b:3c:07:a7:28
3.607 Panel-Link IP Adapter Running
3.964 DHCP assigned IP=10.45.248.55 Netmask=255.255.255.0 Gateway=10.45.248.1
```

Note the Firmware version number in the powering up message, and the MAC address and IP address details a few lines down (the firmware version and MAC address are also available on the Status page.)

All lines contain the “PIB time” in seconds with a resolution of 1 msec. This is the time since the PIB was powered up. Please note it will reset back to 0.000 after 4294967.295 seconds, approximately 50 days.

Type help <Enter> to see a list of commands, and a brief summary of the function of on-board LEDs, switches, and links.

Commands available are:–

config allows programming of essential IP settings (see section 8.5).

restart_PIB will re-start the PIB. A message that it will re-start will be displayed. Note that if you are accessing the PIB via Telnet, the Telnet connection will be closed. Re-open it after 40 seconds to check that the PIB has re-started successfully. If accessing the PIB via a web-browser, after 40 seconds click the Reload this page (once) link to check that the PIB has re-started successfully (do not use the browser’s “refresh” or “reload page” feature or you will re-start the PIB again.)

default_config will reset the PIB’s configuration to the default. This can be used to start configuration again if you have forgotten the configuration password. Note, it does not reset the “Prevent PIB from acting as a DHCP Server” setting (see section 8.5).

ping will send an ICMP ping message to the ip address entered. This can be used to check IP connectivity with other devices. Note the web page may need to be refreshed to update the window with the results of the ping command.

An unrecognised command such as **help** will display the above list of commands.

The remaining commands (**stat, arp**, **+ xxx** and **– xxx**) should only be used under the directions of Johnson Controls Technical Support.

8.5 Initial Configuration Using a Serial Port

Connect to the PIB using its serial port as described in section 8.1.

Enter the **default_config** command to set the PIB’s configuration to the factory default.

Enter the **config** command and answer the questions. The following is an example of the configuration that can be performed. Typed entries are bold and underlined.

```
Config↵
Password :↵
In the following settings just type <Enter> to leave the setting as is.
Prevent PIB from acting as a DHCP Server. (Y/N). Currently N :n↵
Use DHCP to get IP Settings (Y/N). Currently Y :n↵
Enter IP Address. Currently 10.45.248.62 :10.45.248.123↵
Enter Netmask. Currently 255.255.255.0 :255.255.254.0↵
Enter Gateway. Currently 10.45.248.1 :↵
```

Notes

- The password was empty. This is the case after the configuration has been set to the default.
- If Y had been entered for the question `Use DHCP to get IP Settings`, the remaining three entries would have been skipped.
- By entering N for `Prevent PIB from acting as a DHCP Server` and Y for `Use DHCP to get IP Settings`, you can then power the PIB down, enable its DHCP server by inserting a jumper in the DHCP SERVER [TAMPER] (J13) connector, and continue its configuration using an Ethernet connection to your PC using the web interface described in section 5.4.
- If you are assigning static addresses, enter N for `Use DHCP to get IP Settings`, and then enter the static IP address, Netmask, and Gateway. You can then connect the PIB to the network and complete its configuration using the web interface as described in section 5.4.
- Pressing just the Enter key leaves a setting unchanged.

9. Remote Panel Diagnostics

9.1 Panel Connection

The PIB can be used to provide remote access to the diagnostics port of a connected *MX1*, MX4428 or F3200 panel, or any other device that has a serial port for diagnostics. The RS232 port of the PIB needs to be connected to the diagnostics port of the panel. The default baud rate for F3200 and MX4428 is 9600, *MX1* is 19200, and you can configure other baud rates as described in section 5.5.4.

9.2 Using Telnet

Connect a PC running a terminal emulator with Telnet capability such as Wincomms or SmartConfig to a spare Ethernet port. Open a connection to A.B.C.D:23 where A.B.C.D is the IP address of the PIB you want to "connect" to. Note 23 is the default port for Telnet so usually you do not need to enter it.

9.3 Using Web Browser

Click the Panel Log link on the PIB's status page to see the panel log screen (an example is shown in Figure 9-1. Send commands by typing them in the **Input Command to Send to Panel** box provided and clicking "Submit Command". Click the Reload this page (once) link to see the updating output or click the Reload this page every 2 seconds link to see a snapshot of the output every two seconds.

Approximately the last 100 lines from the connected device are available in the scrolling window. Lines prior to this cannot be recalled.

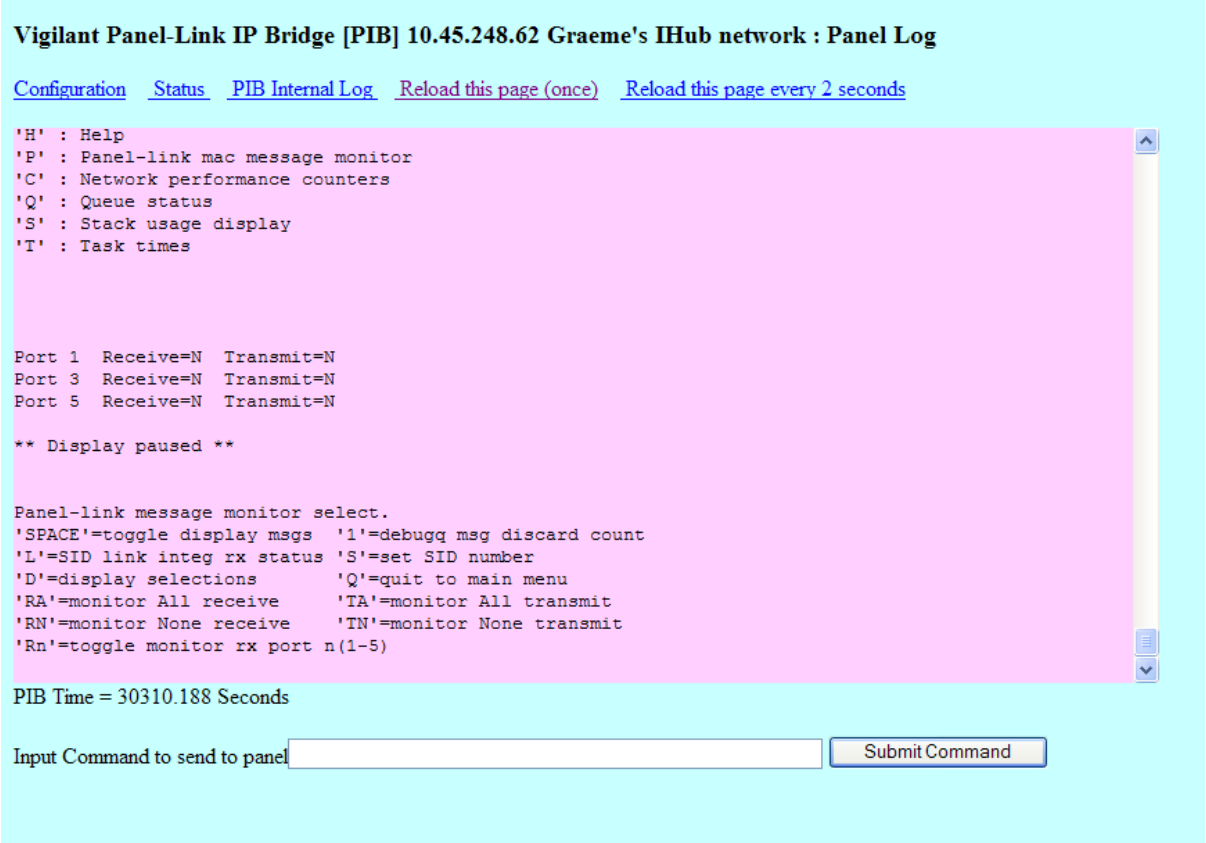

Figure 9-1 – Web access to Panel Diagnostics (in this case I-HUB diagnostics)

9.4 Using PanelX in Tandem Mode

Configure a Panel Connection into PanelX using TCP/IP Connection with the appropriate IP address, port/service set to “telnet”, and SID number.

Connect to the panel using PanelX to bring up the panel’s keyboard image.

9.5 Using PanelX for Serial Diagnostics

Configure a Panel Connection into PanelX using a TCP/IP Connection with the appropriate IP address, port/service set to “telnet”, and SID number.

Connect to the Panel using PanelX to bring up the panel’s keyboard image. Enter “C” on the keyboard or select “Close Tandem Mode” on the File menu. A warning window will display “Do you really want the FIP to leave Tandem mode ?”. Click the “Yes” button. The screen will change to Terminal mode with a connection to the panel’s diagnostics port. To re-enter Tandem mode, Select “Connect to …” from the file menu and re-connect to the current connection.

10. Fault Finding in a Large Network

10.1 Fault Finding a Ring Network That Uses Moxa Switches

Note: if the ring is broken somewhere, the master Moxa switch will turn its red fault LED On.

Note: if a panel is turned off and the Moxa switch is powered by the same power switch as the rest of the equipment in the panel, the links on each side of the panel will appear “down”. However all other panels will keep working as long as they have power. If you need to power down a panel for an extended time, you could use a fibre connector to bypass the switch.

To locate where a break is, use a web-browser and the following method to browse to each of the Moxa switches in turn until one that is adjacent to a break is found. If you know the order the switches are wired in, you could check only every second switch.

On the Moxa logon screen, leave the username as Admin and the Password blank, and click Logon.

Then on the menu screen that comes up, click “Communications redundancy”. Look at the status for Ring 1.

Healthy indicates the entire ring is complete. Break indicates the ring is broken somewhere.

Master indicates this switch is the ring master, and **Slave** indicates this switch is not the master. This information is not relevant in determining the location of a break.

Link Down (for a ring port) indicates the ring segment connected to this port is broken or the switch on the other end is powered down or faulty. Check the status of the switches on either side to find the other end of the broken segment.

Forwarding (for a ring port) indicates the segment connected to the port is good and data is being forwarded over it.

Blocked (for a ring port) indicates the segment connected to the port is good but data is not being forwarded over it, in order to deliberately break the ring under normal conditions to stop packets from circulating forever. This will be shown only while the ring is intact, and will not be shown if the ring is broken.

On the Moxa 5 and 8 port switches the two highest numbered ports (4 and 5 for 5-port switches, or 7 and 8 for 8-port switches) are the default ring ports. However other ports may have been configured as the ring ports, for example, when the switch has fibre ports but one or both adjacent panel connections use copper cable.

For fault finding of VoIP functionality on a QE90 network refer to the QE90 IP Networking and VIF User Manual (LT0528).

For fault finding of VoIP functionality on a QE20 network refer to the QE20 Design Manual LT0726 and the QE20 Service Manual LT0709.

10.2 Advanced Fault Finding in a Large Network

Some other techniques that could be used for locating ring breaks in a large network are listed below. Some of these will require a degree of IP experience to set up.

- Create a second break by unplugging a cable, and then:
  - observe which panels then go off-line, or
  - "Ping" various panels on the network to find which are accessible.
- Set up a syslog server on a PC attached to the network, and set up the Moxa switches to send a fault log to this server.
- Set up the Moxa switches to send email on a fault condition.
- Use some network management software from the switch supplier – http://www.moxa.com/product/network_management_software.htm.
- Use an SNMP (Simple Network Management Protocol) product.

11. FAULT MONITORING

11.1.1 How PIB Faults are Signalled

The PIB has two ways of signalling a fault as follows.

The PIB has an open collector output (OC2) that switches off when the PIB has detected a fault or is powered down. This output can be wired to an input on a fire panel or QE20/QE90 which can signal a fault to a monitoring service. The OC2 fault output is also compatible with the FAS1 fault input of the PIB. This allows chaining of PIB fault outputs so only one input is required at a panel to monitor multiple PIBs.

The PIB can send a PIB Status message to its Panel-Link port and also on the IP network. The PIB Status message can be monitored by another PIB or by an MX1 panel or an I-HUB (with V2.xx or later I-HUB firmware).

If the PIBs are not being used for VoIP proxy functionality and one or more PIBs on the network are connected to either an *MX1* or to an I-HUB (with V2.xx or later firmware) on the Panel-Link port, then the OC2 fault signalling output can be ignored on all PIBs because the *MX1* (or I-HUB) can signal faults for all PIBs, if configured as a “PIB Fault Master”.

When a PIB is used for VoIP proxy functionality only (the Panel-Link networking is disabled), the OC2 fault output **must** be monitored. For PIBs where the Panel-Link networking is utilised, the fact that the network stops communicating with a QE20/QE90 will signal that the PIB is no longer functioning.

11.1.2 Fault Message Generation by the PIB

The PIB can send its fault indications over its Panel-Link port to the connected panel if the panel supports this (e.g., *MX1*).

An *MX1* can be configured as a PIB fault master by enabling the “PIB Fault Master” setting on the local network profile table. An *MX1* that is directly connected to the Panel-Link port of a PIB will always monitor the fault status of that PIB and report faults using controller points 241.33.x.

The PIB sends the fault indication when: –

- The PIB detects a fault itself.
- The PIB (PIB 1) sees that another PIB has detected a fault and the other PIB cannot signal the fault to its local panel, and the panel connected to PIB1 is programmed as a global fault master.

The PIB signals the following conditions separately: –

- Local PIB general fault
- Local external fault input (FAS 1) in the fault state
- Remote PIB general fault
- Remote PIB external fault input (FAS 1) in the fault state.

See section 6 for a description of the PIB faults and warnings.

11.1.3 Configuring the I-HUB's PIB Fault Monitoring

An I-HUB has two configuration parameters relating to PIB fault monitoring as follows. The default setting for both is disabled.

```
IHUB SIGNALLOCALPIBFLTS DISABLE
```

```
IHUB PIBFLTMASTER DISABLE
```

If a PIB has an I-HUB connected to its Panel-Link port and the I-HUB is configured with `SIGNALLOCALPIBFLTS` enabled, or the PIB has an *MX1* connected, then the PIB's faults will always be signalled locally and never remotely.

A PIB whose faults cannot be signalled locally by the device on its Panel-Link port, sends its faults on the IP network where they will be monitored by any other PIB that has a "PIB fault master" connected. An I-HUB can be configured as a PIB fault master with the configuration command

```
IHUB PIBFLTMASTER ENABLE
```

11.1.4 How an I-HUB Signals PIB Faults

An I-HUB that is connected to a PIB and has `SIGNALLOCALPIBFLTS` enabled, signals PIB faults in both its MAF Status message (Panel-Link Application one) and in its I-HUB status message (Panel-Link Application 3). The I-HUB status message can be monitored either by a locally connected MX1 or by a remote MX1 that has the I-HUB configured in its SID list.

If there is no *MX1* available to monitor the I-HUB Application 3 status message, then the I-HUB's MAF status message must be monitored somewhere. Any Vigilant fire panel that supports Panel-Link is able to monitor the MAF status message sent by the I-HUB. This includes MX4428, F3200 and the NDU.

11.1.5 Monitoring IP Ethernet Ring Breaks

If the IP network has duplicated paths for redundancy (i.e. it's configured as a ring), the network switches used are able to signal a break in the ring to their local PIB using a normally closed fault relay output that is connected to the FAS1 input on the PIB. The "FAS1 is fault contact input (NC)" checkbox on the PIB configuration web page must be enabled for this to work. The PIB will then report the fault as described in the previous sections.

11.1.5.1 The Moxa Master Switch

A Moxa switch has the ability to be configured as a "master" either through DIP switch settings or menu configuration. If no switch is set as the master, or erroneously multiple switches are, then the master will be selected automatically.

When a switch is the master the "Turbo Ring Break" option on the "Events Setting" page is observed – refer to section 5.6.1 Moxa Switch. A Moxa switch that is the master with this option set, signals a fault on its fault relay output whenever there is a break anywhere on the IP ring.

The fault relay output of the Moxa switch designated as the master should be connected to the FAS 1 input of its local PIB. If none of the Moxa switches are explicitly configured as a master then the fault relay output of every Moxa switch must be connected to the FAS 1 input of its local PIB.

11.1.6 PSU Fault Monitoring

If the PIB and network switch are powered from a standalone power supply and the PSU has a fault signalling output, then the PSU fault output should be connected to the FAS2 input on the PIB and the PIB should have the “FAS2 is power supply fault contact input (NO)” option on the PIB configuration web page enabled.

11.1.7 Inhibiting PIB Fault Signalling

If the PIB is connected to XLGraphics running on a PC, it may be necessary to enable the “Do not report faults” option on the PIB configuration web page. This is because the PC can sometimes be late acknowledging messages sent by the PIB, resulting in the PIB signalling a nuisance discard fault, even though the message was correctly received by the PC. The PC could also be turned off, or busy with a maintenance task like installing updates.

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12. Module Replacement

12.1 PIB Re-Configuration

If you have a copy of the configuration of the old PIB, it may be loaded into a new PIB as per section 5.5.9 or 5.5.9, depending on how it was saved.

If the old PIB works sufficiently to extract a copy of the configuration, extract it as per section 5.5.8, and load it to the new PIB as per section 5.5.9.

Otherwise you will need to re-enter the required configuration from scratch. Note in many cases no configuration is required (apart from the node name which isn't strictly required but makes diagnostics easier).

If the PIB's IP address has been set to a fixed address by the network administrator configuring the network DHCP server to set the IP address based on the PIB's MAC address, advise the network administrator of the new PIB's MAC address.

Check that the mini-jumpers and connection cables are fitted correctly.

12.2 Moxa Reconfiguration Using the Moxa ABC-01

The Moxa ABC-01 (described in section 5.6.2) allows the configuration to be saved in non-volatile memory and automatically restored on power up. Each time the Moxa switch is powered up it reads the settings from the ABC-01. The ABC-01 also allows the Moxa switch to be easily replaced and obtain the required configuration by simply plugging the ABC-01 containing the required configuration into the Moxa switch and turning it on.

Always note (and preferably label) the cables connected to the various ports before disconnecting and removing a Moxa, then connect a new one the same way. The power/relay connector is demountable so the screw terminals need not be undone.

12.3 Moxa Re-Configuration

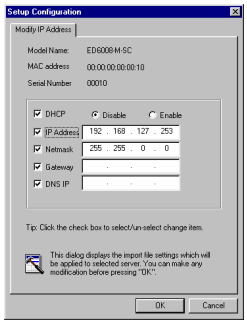
The Moxa Configuration Tool (edscfgui.exe) can be used to import an entire configuration from a text file into a new switch using Import Configuration function. This utility can be used to transfer the configuration from one EDS to another, by first using the Export Configuration function (described in section 5.6 Moxa Configuration) to save a switch configuration to a file, and then using the Import Configuration function. Note, this could give two units on the same network the same IP address so take care. Do the following to import a configuration:

1. Highlight the server (from the Moxa EtherDevice Switch list in the Configurator window's left pane), and then click the Import toolbar icon  , or select Import Configuration from the Configuration menu.

2. Navigate to the text file that contains the desired configuration. Once the file is selected, click Open to initiate the import procedure.

3. The Setup Configuration window will be displayed, with a special note attached at the lower portion of the window. Parameters that have been changed will be

activated with a checkmark.
You may make more changes if necessary, and then click OK to apply the changes.



4. Click **Yes** in response to the following warning message to accept the new settings

12.4 Westermo Ethernet Extender Re-Configuration

The Westermo Ethernet Extender is reconfigured by removing the lid and setting the DIP-Switch settings. Ensure the new DIP-Switch settings match the original DIP-Switch settings.

13. Upgrading PIB Firmware

The PIB firmware versions that have been released are shown in Table 13.1. Generally the most recent should be used. To upgrade the firmware in a PIB obtain the SF0451 file with a name such as SF0451_PIB_V1.03.bin (where the new firmware version is 1.03, for example) and store on your computer.

Using a web browser on the computer connected to the PIB network, browse to

W.X.Y.X/firmware_update__

where w.x.y.z is the IP address of the PIB requiring the firmware update.

Note there are no links to this page from the PIB's other pages.

Follow the instructions shown. Note that it will take about 3 – 10 seconds for the firmware to be loaded (you will be shown a screen confirming this), and then approximately 40 seconds for the PIB to re-start. The browser will re-directed to the new status page after 40 seconds.

On the new status page, check that the version displayed is the new version (V1.03 in the above example).

Upgrading from V1.02 and onwards to V2.02 (the latest at time of publishing) does not require any change to the configuration (any new settings will be set to default).

Upgrading from earlier versions should have the site-specific configuration reset to factory defaults and re-entered after the firmware upgrade.

All PIBs in the network should be upgraded to the same firmware.

Table 13.1 – Software Versions

Version	Release Date	Improvements / Issues Fixed
1.00	22/04/10	First version. Not released to production units.
1.02	02/08/10	• Allows IP address to be entered from serial port. • Add “stat” diagnostic command. • Allows disable broadcasts and DHCP Server from config page.
1.03	20/03/13	• Maximum baud rate 115200 for Plink Port. • Acknowledge the received Plink message with source or destination address 255. • Plink message Tx retry time 0.5, 1 and 2 seconds. • Add logon page. • Multiple fixes to handle large network operation.
2.00	02/07/13	• Supports PA1091 and PA1031. • Add the power supply fault level input box to the configuration page. • FAS2 can be configured as the power supply fault contact input. • The POWER FAULT led turns on when its voltage is too low or the power fault input is activated.
2.01	17/07/13	• Fixes repeated startup on some units.
2.02	18/08/13	• Fixes Panel-Link ports stops transmitting very occasionally under heavy loading.
2.03	01/10/13	• Fixes issue where Panel-Link serial port occasionally re-transmits the same information again.
3.00	07/07/17	• Add VoIP proxy functionality.
4.0	15/05/23	• Add QE20 Support and ping command.