

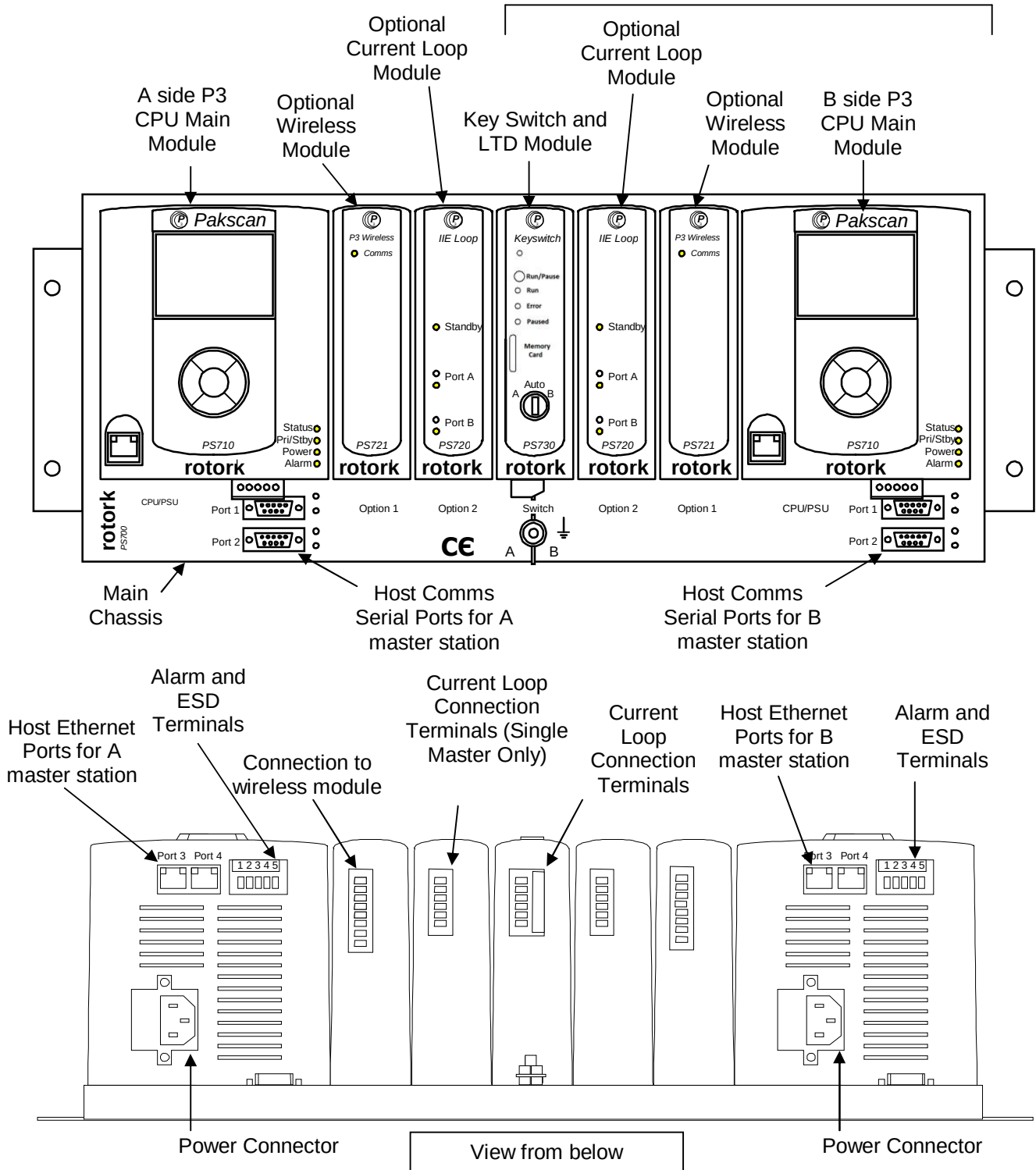
rotork



P3 - Pakscan Master Station Technical Manual

KNOW YOUR MASTER STATION

These modules **not** fitted on single master stations



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Most types of Rotork actuator can be connected to a Pakscan current loop provided they are fitted with the necessary field unit. Information on the respective actuator field units can be found in the appropriate manuals. In this guide, the type of actuator is not considered, though reference is made to both the Integral and IQ actuator types of field unit. The type of field unit does not affect the setting up of the system. The IQ and IQT range of actuator integrate fully with the wireless network. Other actuators or devices can be added to the system using a Wireless Modbus Adaptor (WMA).



A master station fitted with the wired network only requires the PS720 module that fits in to the back plane. A master station fitted with wireless requires a module to be fitted to the back plane (in option 1) and connected to this module, a coordinator module (PS722).

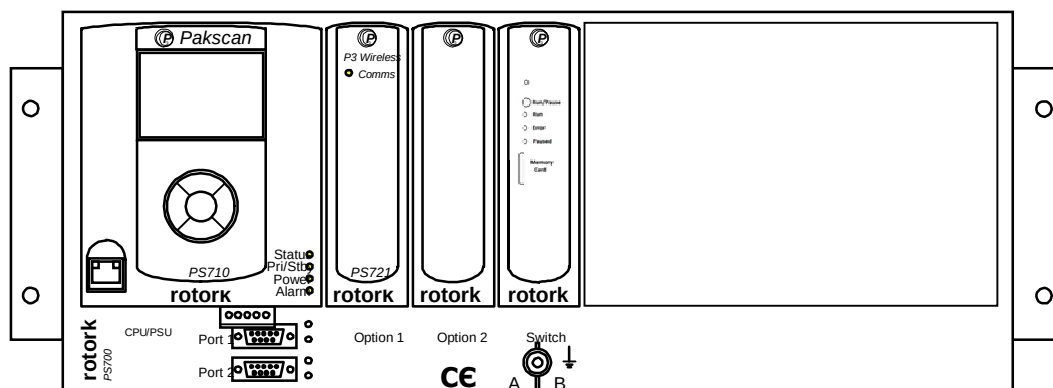


Fig 3: The Pakscan 3 Single Master Station – option: Wireless

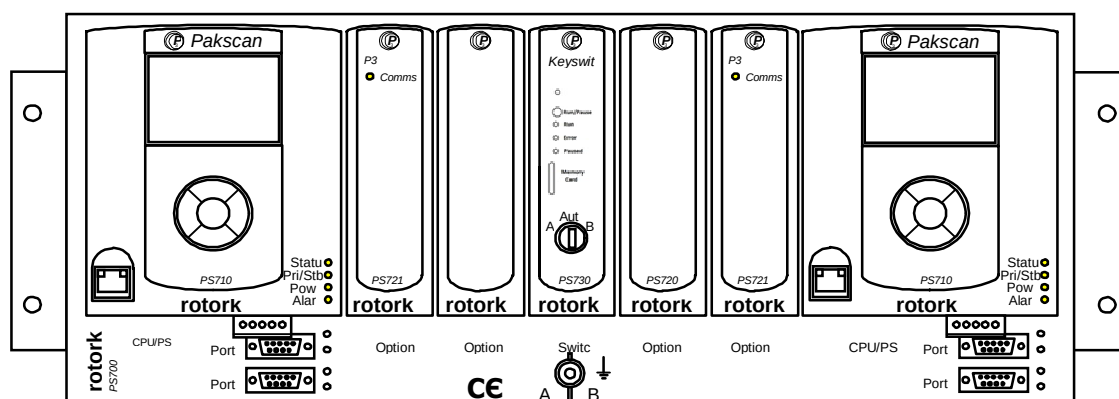


Fig 4: The Pakscan 3 Hot Standby Master Station – option: Wireless

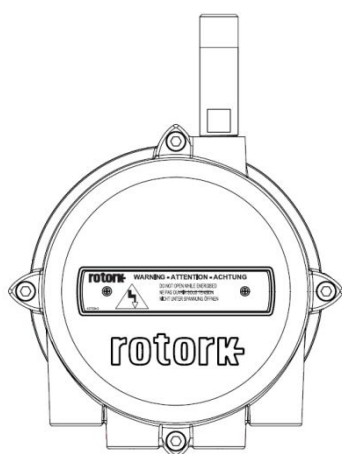


Fig 5: The Pakscan 3 Wireless master station coordinator – PS722. One required for single channel master stations, two for hot standby master stations. The repeater (a device for extending the range of wireless) and the WMA look identical to this.

1. MOUNTING AND CONNECTING THE MASTER STATION

Before mounting the master station, set the communications link switches, as discussed in section 3.

The Pakscan 3 master station (single or hot standby) provides front access for all the user connections, including power feed and the field network connections – either loop wires to the Current Loop module (PS720) or network connection to the Wireless coordinator (PS721 and PS722). The host communication links use plug in D-type connectors for the serial communications and RJ45 connections for the Ethernet links.

- ☐ The field wiring for the current loop, wireless coordinator and the master station alarms are taken to screw terminals on plug in connectors that are fitted from below their appropriate module.
- ☐ Power wiring is connected using an IEC connector in the bottom of the master station module PS710. Two connections are required for a hot standby system.
- ☐ Serial communications (RS-232 or RS-485) plug into 9 way female D-type connectors on the front of the mounting chassis.
- ☐ Ethernet connections use RJ45 connectors on the bottom of the master station module PS710. The connector on the front is intended for connection to a service laptop computer.

1.1 Mechanical Fixing

Room should be left around the module for all the connections and cables, allowing for a suitable bending radius on each lead. Power wiring should be suitably fused or protected with miniature circuit breakers (MCBs) external to the master station.

The master station may be mounted on a flat surface using the mounting brackets provided. Also, the extension brackets allow it to be mounted in a 19-inch rack. In either case it should be located in a way that permits easy access to the pushbuttons and easy viewing of the display panel(s).

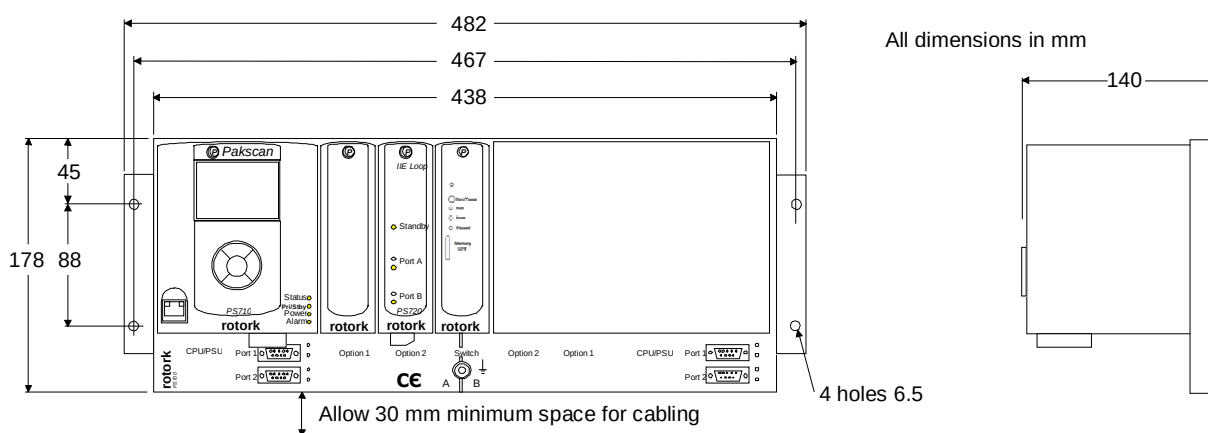


Fig 6: Pakscan 3 surface mounting dimensions.

(Both single and hot standby master stations may be surface mounted)

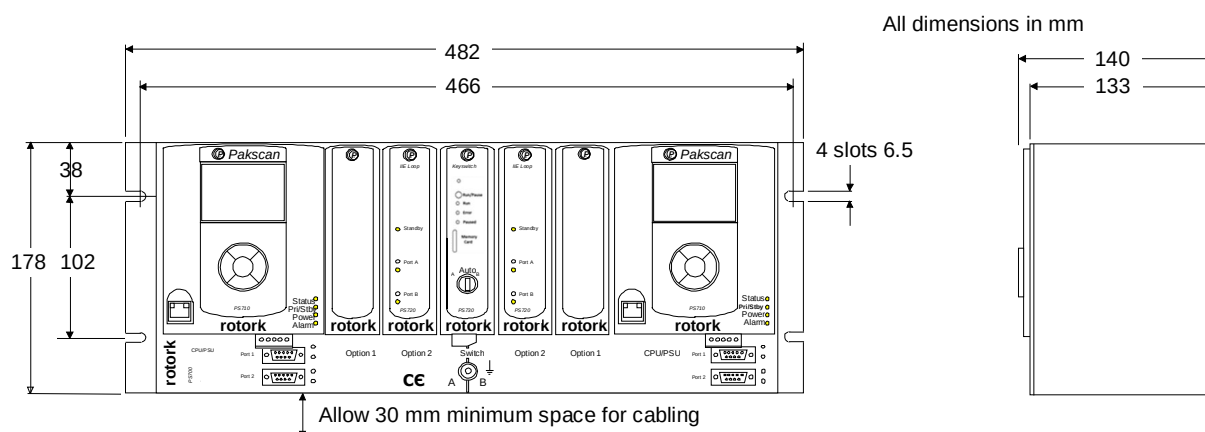


Fig 7: Pakscan 3, 19-inch rack mounting dimensions.
(Both single and hot standby master stations can be panel or rack mounted)

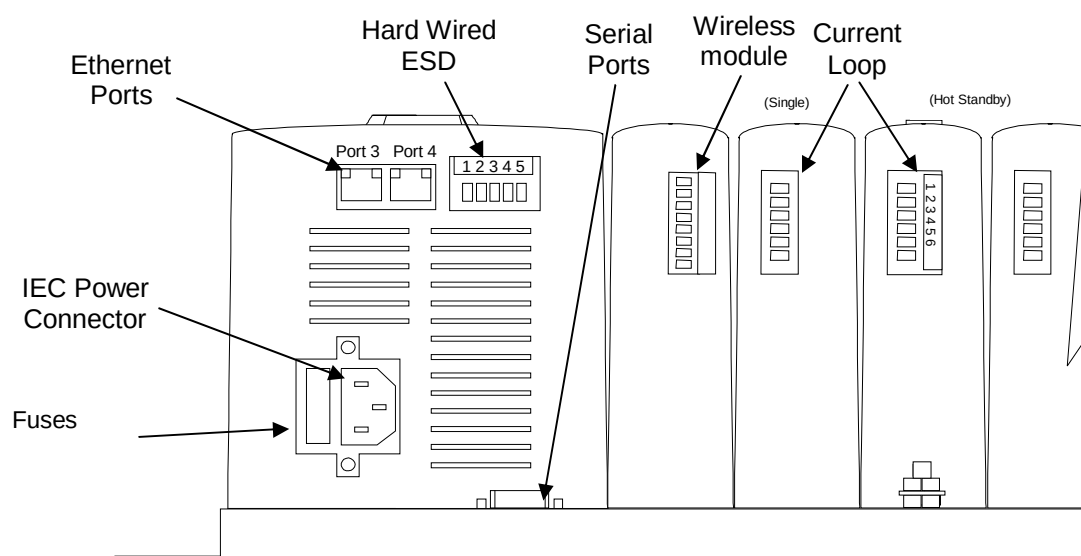
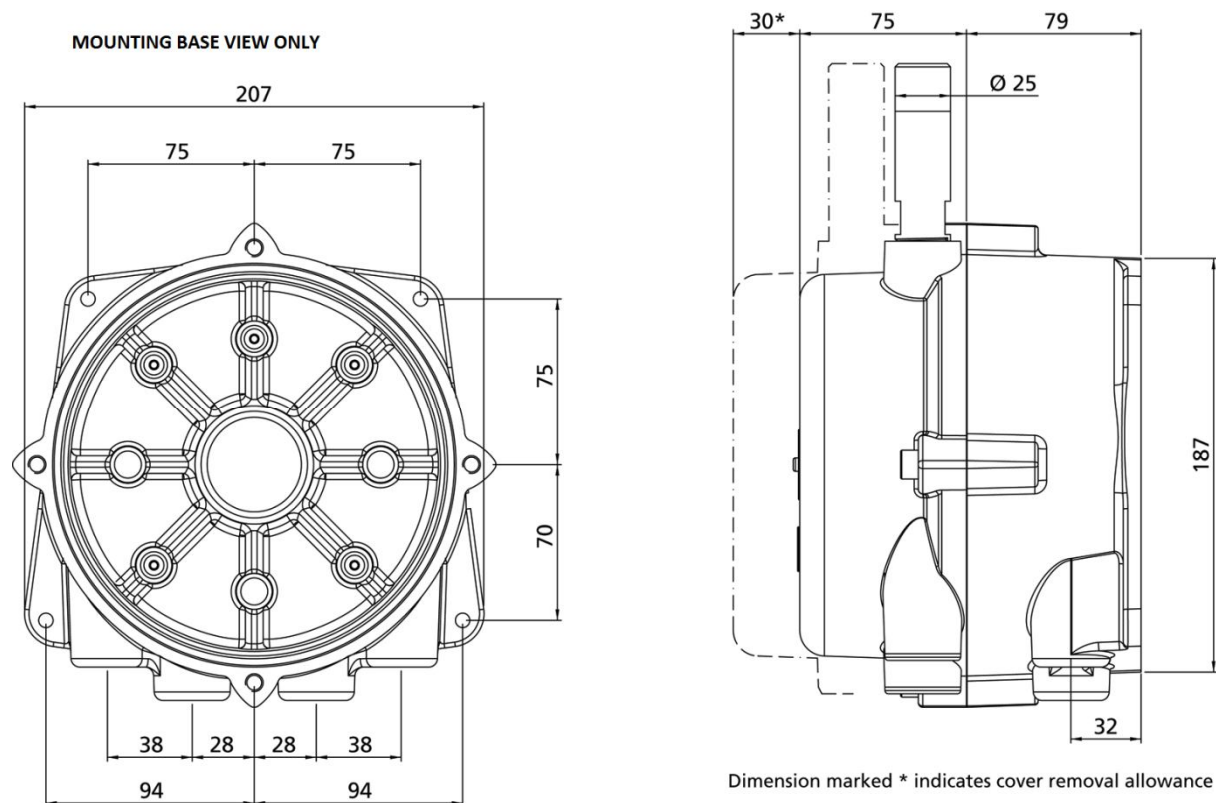


Fig 8: View below the Pakscan P3 master station showing the Connectors
(The B side connections are similar)

Wireless installations will include a Wireless Coordinator and may include Wireless Repeaters and Wireless Modbus Adaptor. These units are identical with regards to mechanical fixing.



Dimensions in mm, Module weight: 4,400g

Fig 9: Wireless co-ordinator WMA and Repeater mounting details

The Wireless Coordinator, Wireless Repeater and Wireless modbus Adaptor may be located in Hazardous locations. If this is the case, please refer to the Hazardous Area notes in the General Safety Information section at the back of this manual.

1.2 Host Serial Communications Connections

The serial data connections are via the D-type connectors below each master station PS710 on the main chassis. They are labelled Port 1 and Port 2 on both the A and B (left and right) sides of the assembly. All the connectors are **9 way female** and they may be set for RS-485 (2-wire) or RS-232 use. On hot standby systems they can be cross coupled to provide seamless communication when the systems change over. The pin-out connections are shown below.

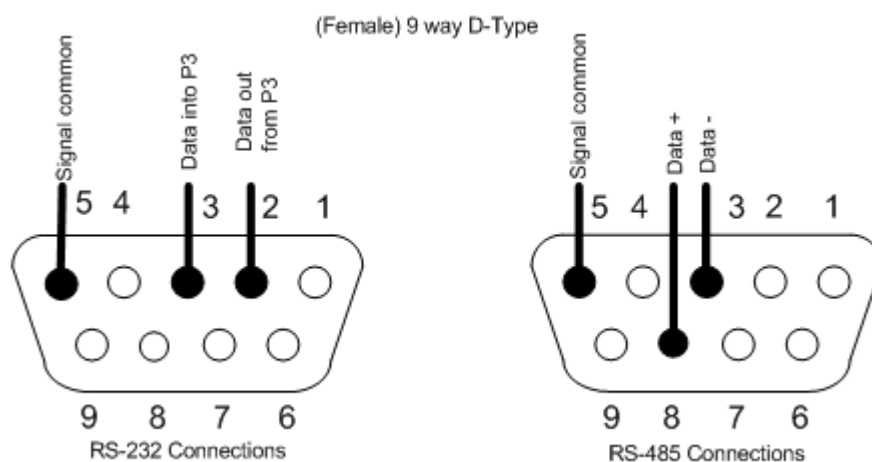


Fig 10: Serial Communication connections

- ☐ With RS-485 it is possible to arrange a multi-drop data highway for the serial communications, whilst RS-232 must be single point communications.

1.3 Ethernet Communications Connections

Each Pakscan P3 CPU module (master station module) has 2 x RJ45 Ethernet connectors for the two host communication ports (accessed from below) marked Port 3 and Port 4. A third RJ45 connector is located on the front of each module. This is provided to allow a portable computer (laptop) to be connected for diagnostic and set up purposes. Standard Ethernet patch cables can be used with these connectors.

All Ethernet cables must be screened, and of good quality. Many screened Ethernet cables of low quality have questionable screening efficacy.

1.4 Power Connector and Fuses

Each Pakscan P3 CPU module has its own internal power supply. A standard IEC connector is provided to allow the mains power (85 to 263V AC – 47 to 63 Hz) to be connected from below the module. The mains IEC socket also includes the two fuses for the system, which must only be replaced with the same and rating 250V 1A 5x20mm anti-surge fuses.

For the 24V DC version, a three pin removable screw terminal connector is provided. There is no internal fuse.

1.7 Wireless Coordinator Connections

A connector is located in the bottom of the (PS721) wireless option module to connect to the Wireless coordinator (PS722). The connection between these should be made using a shielded network cable with 3 pairs of wires – each pair to be twisted. Suitable cable conforms to the specification for RS-422 networks. This cable can be up to 200m long so that the coordinator may be mounted, for example, on the roof of the building containing the master station.

The Communications cable and appropriate glands for the Wireless coordinator will need to be sourced locally, according to site requirements. Connect the Communications cable as shown below, noting that the connections are **NOT** all one to one.

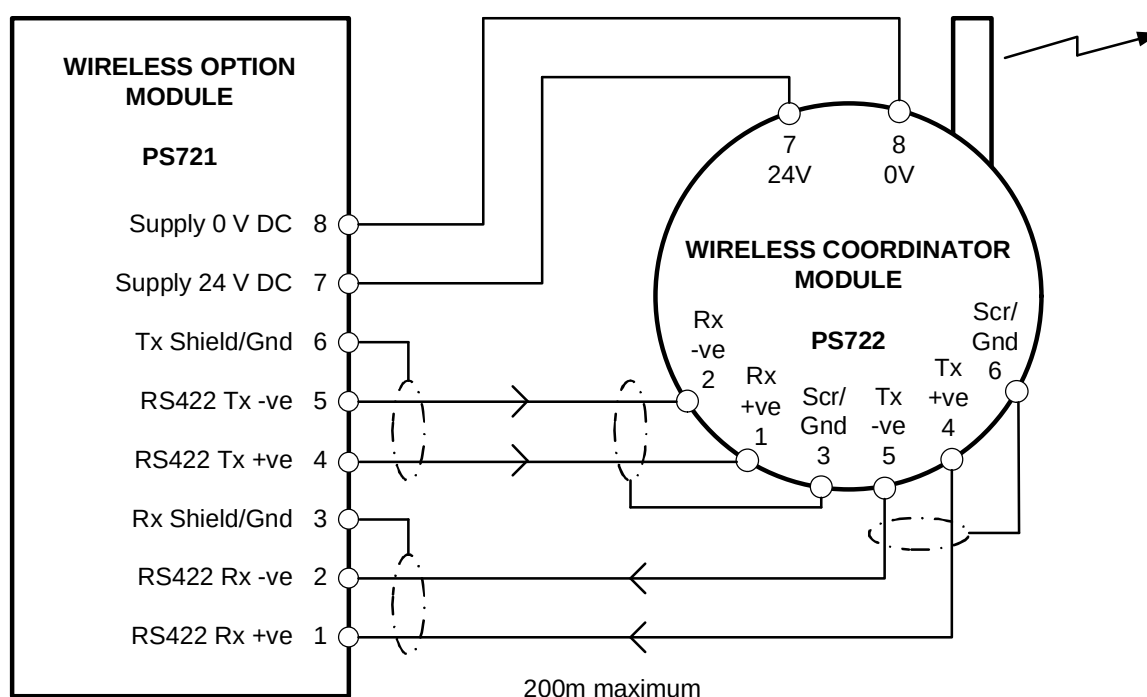


Fig 13: PS721 to PS722 connections (Master station to Wireless Coordinator)

1.8 Wireless Repeater and WMA AC Power Connections

The Wireless Repeater and the WMA will contain a power module for the appropriate power supply requested by the user. The power module is mounted the base half of the module with the wireless module in the other half, the modules will be connected together by an interconnecting loom, connected to SK1 on the power module and SK3A on the wireless module. The mains AC connections are made to the power module connections SK6 and SK5, shown in the Figure below.

SK15, a flying lead, will be fitted to the appropriate tapping for the power supply that the customer has indicated will be used. Fitting to the posts labelled W, X, Y and Z selects the correct voltage. This should be checked for correct fitment before power is applied.

***Power should only be applied with the module fully assembled i.e. the base and the cover connected together with the bolts supplied.
Cable glands used must be appropriate to the classification of the area.***

The Power cable and appropriate glands for the Wireless coordinator will need to be sourced locally, according to site requirements.

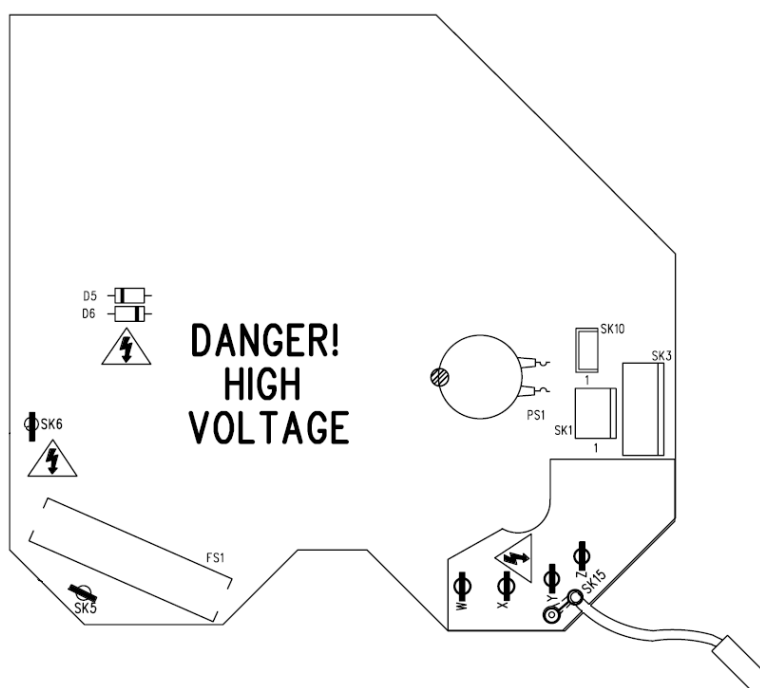


Fig 14: Power module for Wireless Repeater and WMA.

1.9 WMA (Wireless Modbus Adaptor) 24VDC Connections

The WMA may be powered from the Modbus device to which it is connected, assuming the device has the appropriate DC supply available. Under this circumstance the interconnection cable between the device and the WMA should contain 2 shielded pairs, one for power supply and one for the communication signal. The distance between the Modbus device and the WMA should not exceed 10 meters in this case. The power connection on the WMA are pins 7 (+ve) and 8 (0volts) of SK3A.

1.10 WMA (Wireless Modbus Adaptor) Modbus Connections

The WMA connects to a Modbus RTU device enabling a Modbus host to connect through the Pakscan wireless system to the Modbus device. The connection between the Modbus device and the WMA should be made using a shielded network cable with 1 twisted pair of wires. Suitable cable conforms to the specification for RS-485 networks. This cable length will depend on the baud rate chosen for communications.

The Communications cable and appropriate glands for the Wireless coordinator will need to be sourced locally, according to site requirements. Connect the Communications cable as shown below, SK3A is used on the WMA.

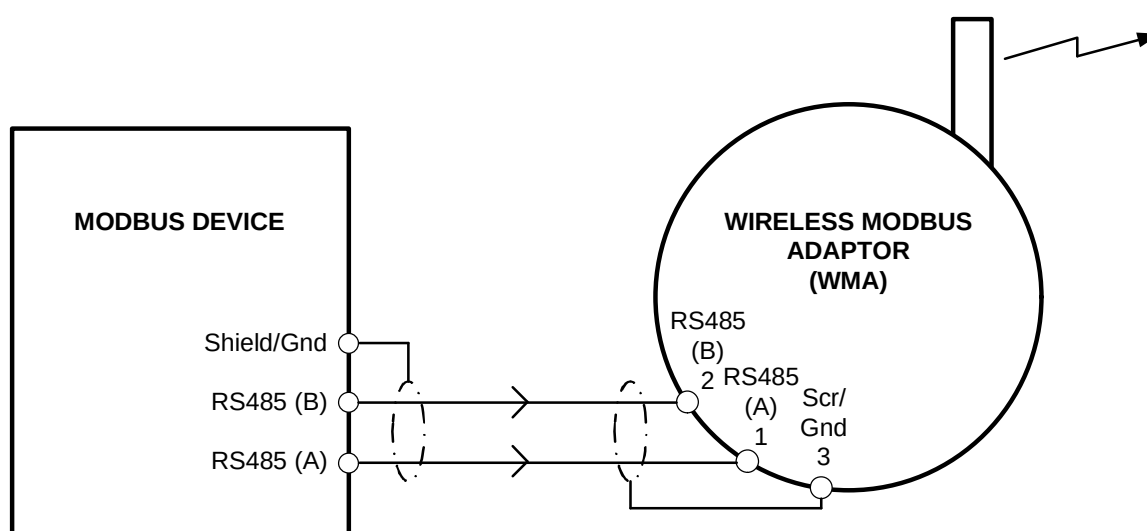


Fig 15: PS721 to PS722 connections (Master station to Wireless Coordinator)

1.11 Setting up the Wireless Repeater and WMA

The Wireless Repeater requires the PAN ID (Personal Area Network Identification number) and RF Channel to be set up for the network to which it is attached. The WMA also requires these parameters and its Modbus communication parameters to be set up. This is achieved using the Modbus interface that is available on both modules.

The Modbus physical connections are detailed in the previous section 'WMA (Wireless Modbus Adapter) Modbus Connections'. For the purpose of configuration, these connections can be temporary, for example, it may be more convenient to make the configuration changes in a workshop before installation on site. For both devices it is likely that configuration is only required once, therefore after installation there should be no need to access the Modbus connections again on the Wireless repeater.

During configuration in a workshop environment, the 2 halves of the module can be separated, such that the Wireless module is disconnected from its power supply module. The wireless module can then be powered, separately, using a 24VDC source as described in the previous section 'WMA (Wireless Modbus Adapter) 24VDC Connections'.

For making configuration changes to the Repeater or WMA, there is a fixed Modbus address of 248. The Wireless Repeater, ONLY requires the PAN ID and RF Channel to be set up, whereas the WMA also requires the Modbus communication parameters (baud rate and parity) to be set up, as appropriate for communicating to the Modbus slave device it is to be connected to. The Modbus slave device address is not required to be set up within the WMA, as the WMA will automatically scan for attached devices using the baud rate and parity set. Up to 10 slave Modbus devices can be connected to the WMA, each device will require a unique Modbus address, within the range 201 to 247. The address must be unique for the host device to be able to access it. Within the master station configuration pages, the Modbus addresses used for the devices fitted to the WMAs are required to be selected. See section 7.5.17 master station configuration.

Changes to RF communication parameters will take place immediately. Changes to modbus communication parameters will take effect after a power cycle and will apply to the Wireless Repeater and WMA when configuring in the future as well as when the WMA communicates to its Modbus device.

The principle of operation of the WMA is shown in the diagram below

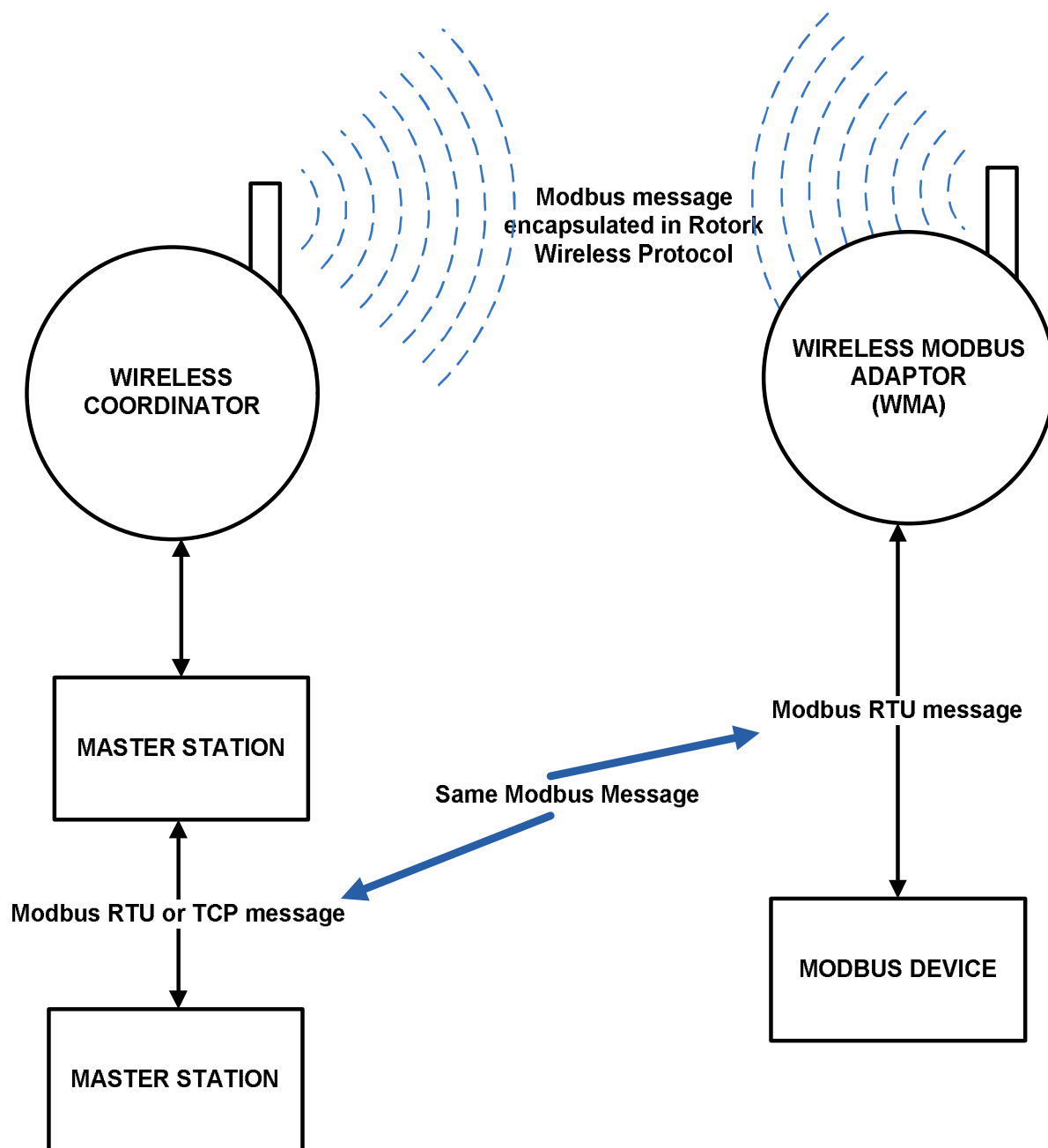


Fig 16: Wireless Repeater and WMA database

The following parameters can be configured when addressing the unit using the configuration Modbus address of 248:

Modbus Register	Modbus Function code	Description	Range	Default Value	Read / Write?
100	03, 04, 06, 16	PAN ID	0000 – FFFFhex (0 – 65535)	DA15 hex	R/W
102	03, 04, 06, 16	RF Channel	16 – 25dec (channel 16 to Channel 25)	22	R/W
104	03, 04 03, 04, 06, 16	WMA: Lowest Modbus Address of device (s) connected to the WMA, if no device is found this will default to 247 Repeater: Address of the repeater, required to be set up for the device to appear in the master station for status info – must be unique in the network	201-247dec 301-315dec	247 301	RO R/W
200	03, 04, 06, 16	Modbus Baud rate	Value 1 to 5: 1–9600 / 2–19200 3–38400 / 4–57600 5–115200	1 (9600)	R/W
201	03, 04, 06, 16	RS485 Parity	Value 1 to 5: 1–None / 2–Odd 3–Even	1 (None)	R/W

Fig 17: Wireless Repeater and WMA database

The baud rate of communications between the WMA and the Device should be set to a value faster than the host will communicate to the master station.

1.12 Front Panel LEDs

There are four Light Emitting Diodes (LEDs) on the front panel of the CPU module, in the bottom right-hand corner. These are fitted to show if a unit is powered-up, which unit is in Primary or Standby mode and whether there are any errors or alarms.

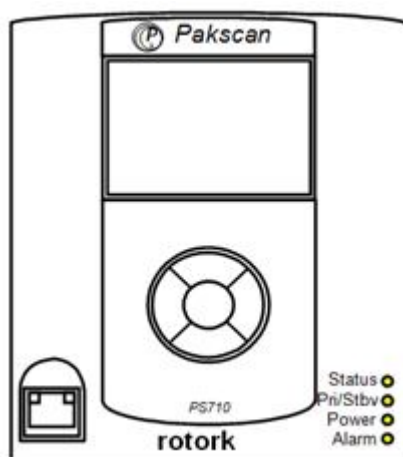


Fig 18: CPU LEDs (Light Emitting Diodes)

On power-up, there is a sequence of colour changes and flashes from the LEDs, which take almost a minute to complete and confirms that all parts of the system are operating correctly:

The Status LED sequence is:	off > amber > flashing green > steady green.
The Pri/Stby LED sequence is:	off > green > off > amber > steady green (amber for standby).
The Power LED sequence is:	off > amber > green > green > steady green.
The Alarm LED sequence is:	off > red > off > red > off.

The Status LED will show steady red if communications with the host is lost over Ethernet, or there is a communications error between the master station and a field unit. The LED shows flashing green only during the power-up sequence. The LED shows steady green to confirm that all applications are running after power-up is completed.

The Pri/Stby LED will show steady green if it is a single unit or if it is the Primary unit of a hot standby pair. The LED will show steady amber if it is the Standby unit in a hot standby pair.

The Power LED is off when there is no power and steady green when power is present. It only shows amber during the power-up sequence.

The Alarm LED will show steady red if there are any alarm conditions in any field unit or the master station. This alarm will not prevent operation of the master station.

2. THE FIELD CURRENT LOOP NETWORK

The Pakscan current loop field network must be correctly cabled and connected to the master station. The values of the field loop resistance and capacitance must be known to determine the loop speed that can be used. If these are not known then the LOWEST loop speed must be set in each actuator and the master station to ensure good field network connectivity.

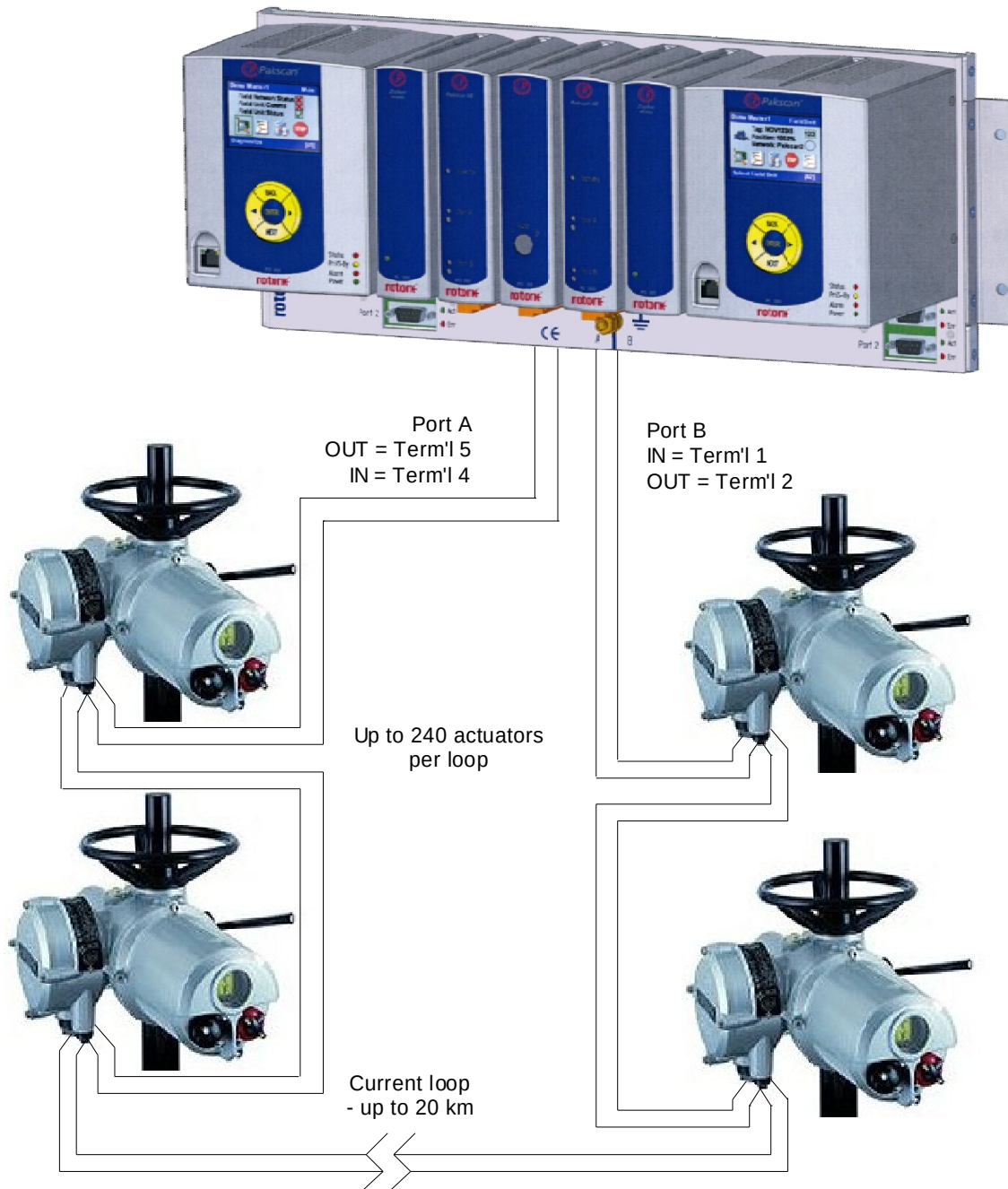


Fig 19: Pakscan P3 Wired Network

2.1 Loop Checks

The most common errors in installing the system occur on the field wiring.

Loop Continuity

With all the field units connected, but none of them powered up, check the continuity of the 2 cores of the Pakscan loop cable. Measure and record the resistance of each core. These measurements will be useful as they can be compared with future measurements to determine if cable resistance has changed significantly or not, this may help identify a cable fault. Cable resistance (R) is the sum of the resistance of both cores.

Screen Continuity

Screen continuity must be continuous between each end of the loop. Ensure the screen is either connected to a signal earth bar at only one point or to terminals on the loop driver plug; pin 3 connects directly to the enclosure earth and pin 6 connects to the enclosure earth via an internal capacitor, preventing an earth loop. Both screens must be connected to the terminals provided on the loop driver, so as to ensure the product meets the European Directive on EMC.

Cable Capacitance

The capacitance (C) between the cores of the cable is critical to system performance. Too high a capacitance for the selected loop baud rate will result in poor communications, or even communication failure. If a suitable meter is available, measure and record the capacitance between the cable cores.

Maximum Loop Speed

The cable resistance must not exceed 500 Ohms (250 Ohms per core) and the total capacitance must not exceed the maximum value for each communication speed. In addition to cable capacitance, each field unit adds a small amount of capacitance to the loop which must also be considered when determining maximum loop speed. Use the measured resistance and capacitance values from the above tests to determine which loop speed should be used.

Baud Rate	R max (ohms)	C max (μ F)①
110	500	4.5
300	500	2.1
600	500	1.54
1200	500	0.6
2400	500	0.3
① Each field unit will add a capacitance of 2.2nF The C max figure given is the maximum value for the network capacitance including the field unit capacitance.		

Test Equipment

A good quality multimeter with capacitance test facility is adequate for testing loop resistance and capacitance. Under no circumstances should any high voltage test equipment be used such as insulation Megga testers when any part of the cable loop is connected to either the master station or actuators. The high test voltages generated by such equipment may damage the Pakscan components.

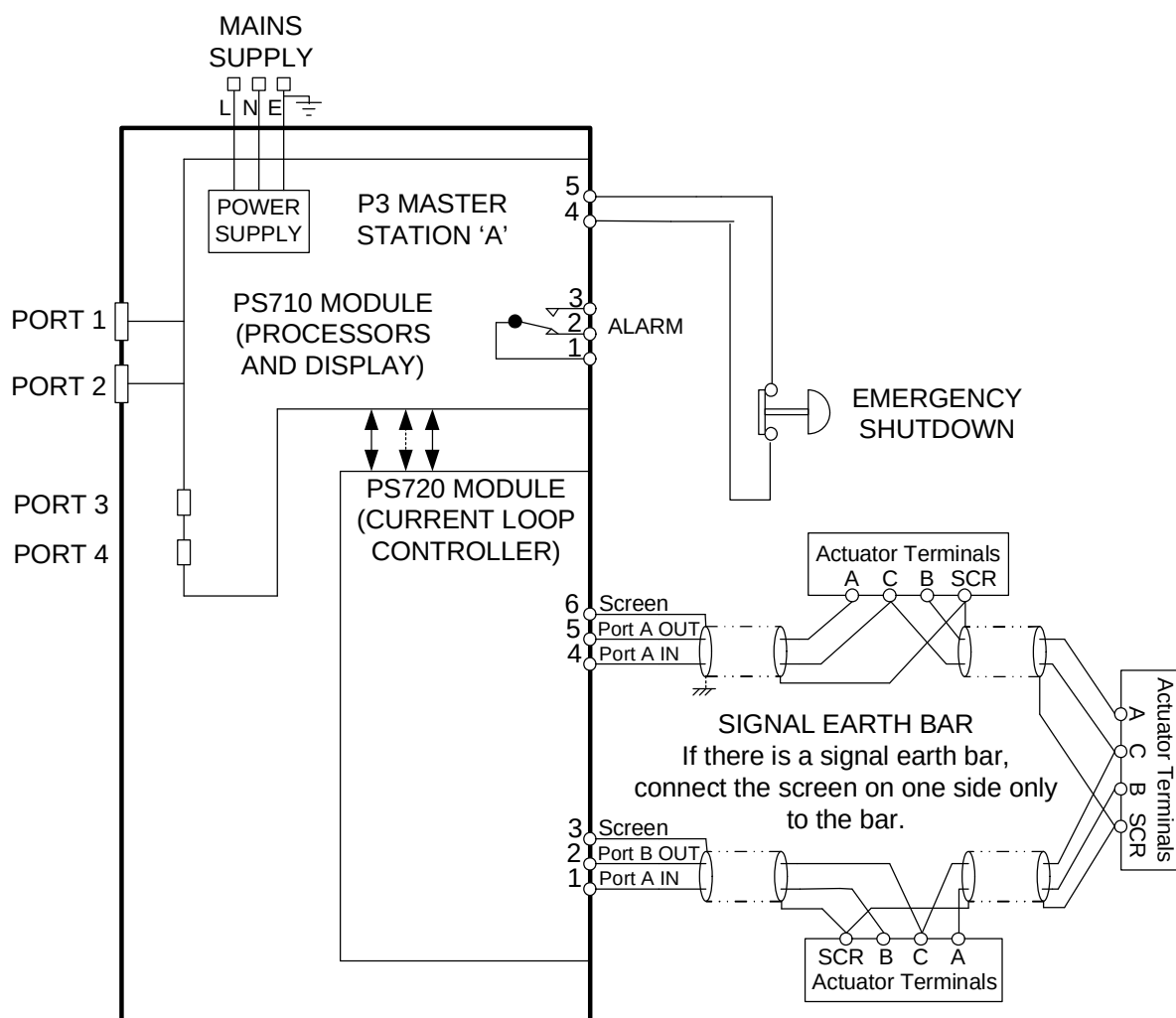


Fig 21: Pakscan P3 Current Wired Loop System Block Diagram (single master station)

Note: If there is no hard-wired ESD requirement a shorting link must be fitted across pin 4 and 5 of the PS710 module

3. THE FIELD WIRELESS NETWORK

A Pakscan wireless network will contain a master station with a PS721 module fitted to its back plane (2 for hot standby). Each of these will connect to a PS722 Wireless coordinator module. The coordinator module is the device that controls and organises the wireless network. For an actuator to be connected on the network it must have a wireless actuator module. The IQ and IQT range of actuators fully integrate into the wireless system. Other devices can be integrated into the system using a Wireless to Modbus adaptor (WMA). The WMA can be attached to any device that has a Modbus interface on it. The host then uses the master station and the wireless network as a transport layer only to send Modbus messages that are directed to a Modbus device.

A network may also require a number of repeaters to overcome wireless dead spots or to ensure a redundant path to all devices.

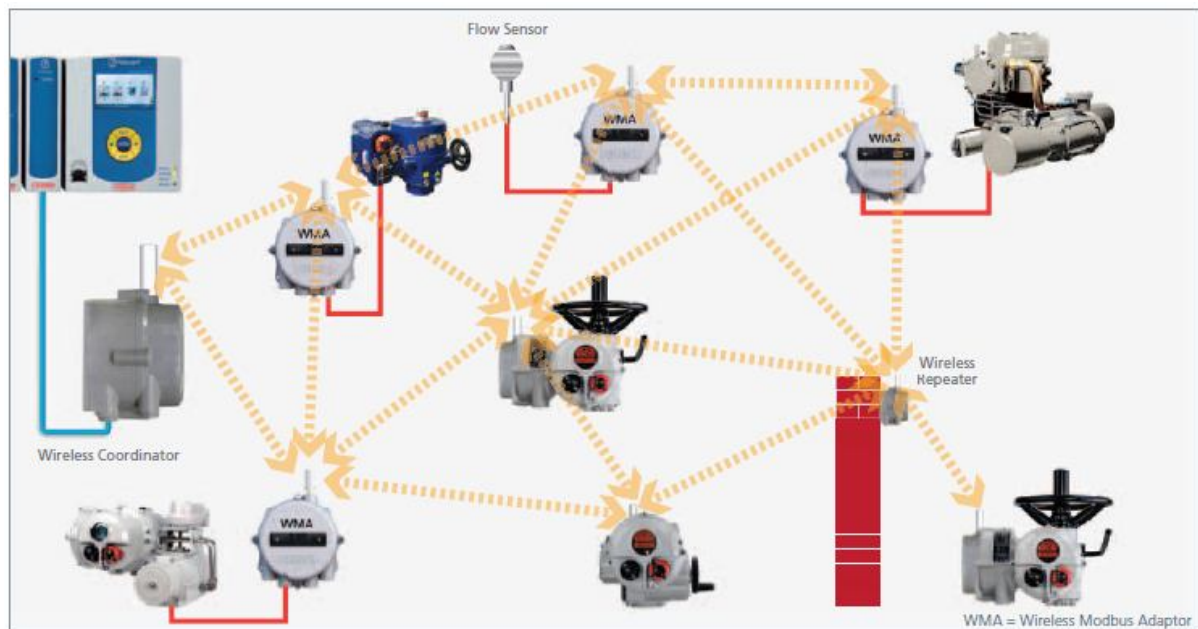


Fig 22: A typical P3 wireless network

Up to 60 devices can be connected in a wireless network. The distances between each node in the network is recommended to be no more than:

- Indoors: 30 metres
- Outside: 100 metres

In practice, it has been found that these distances can be extended, but a site survey is required to confirm this. Each device is able to route messages onto the next device. By this method, the range of the network is increased. It is recommended to have no more than 7 'hops' from the master station to the final device. A 'hop' is where a message routes through a wireless device to get to the destination device.

3.1 Wireless Site Survey

The first step in setting up a wireless network will be a Wireless Site Survey, which would be performed by Rotork Personnel. This will establish the suitability of the site for a wireless network. The survey will establish the levels of background wireless signals within the spectrum of the 2.4 GHz band used for the P3 wireless network and also the potential strength of the wireless signals between the actuator and coordinator locations. This will aid in positioning the coordinator and in deciding upon the need for repeaters.

As a result of the survey, one or more, channels within the band will be found to be suitable for the network. All devices on the network will be shipped with a default channel set.

3.2 Wireless Specification

Network Based on:	IEEE 82.15.4, DSSS (Direct Sequence Spread Spectrum).
Maximum Wireless devices:	60.
Frequency:	2.4GHz band.
Operating Range:	30m indoors, 100m outside.
Network Structure:	Mesh.
Channels available:	16.
Security:	AES and anti-spoofing.
Power:	10mW default, potential for 100mW if the location allows.

3.3 Connecting Up

The IQ and IQT actuators fitted with a wireless module will only require mains power connections and the appropriate glands for the environment to be connected to them. Where a WMA is supplied, power is required to be provided by the user and the user must also provide the necessary cable and glands between the WMA and the device to which it is attached. A repeater also only requires a power cable and glands supplied by the user. The power required for the Repeater and WMA will be indicated on the serial label.

Figure 17 shows the master station block diagram.

The site survey will have indicated the appropriate position to locate the coordinator(s) and any repeaters. Once all the equipment is in place, the user can then proceed to Section 8.2 for commissioning instructions.

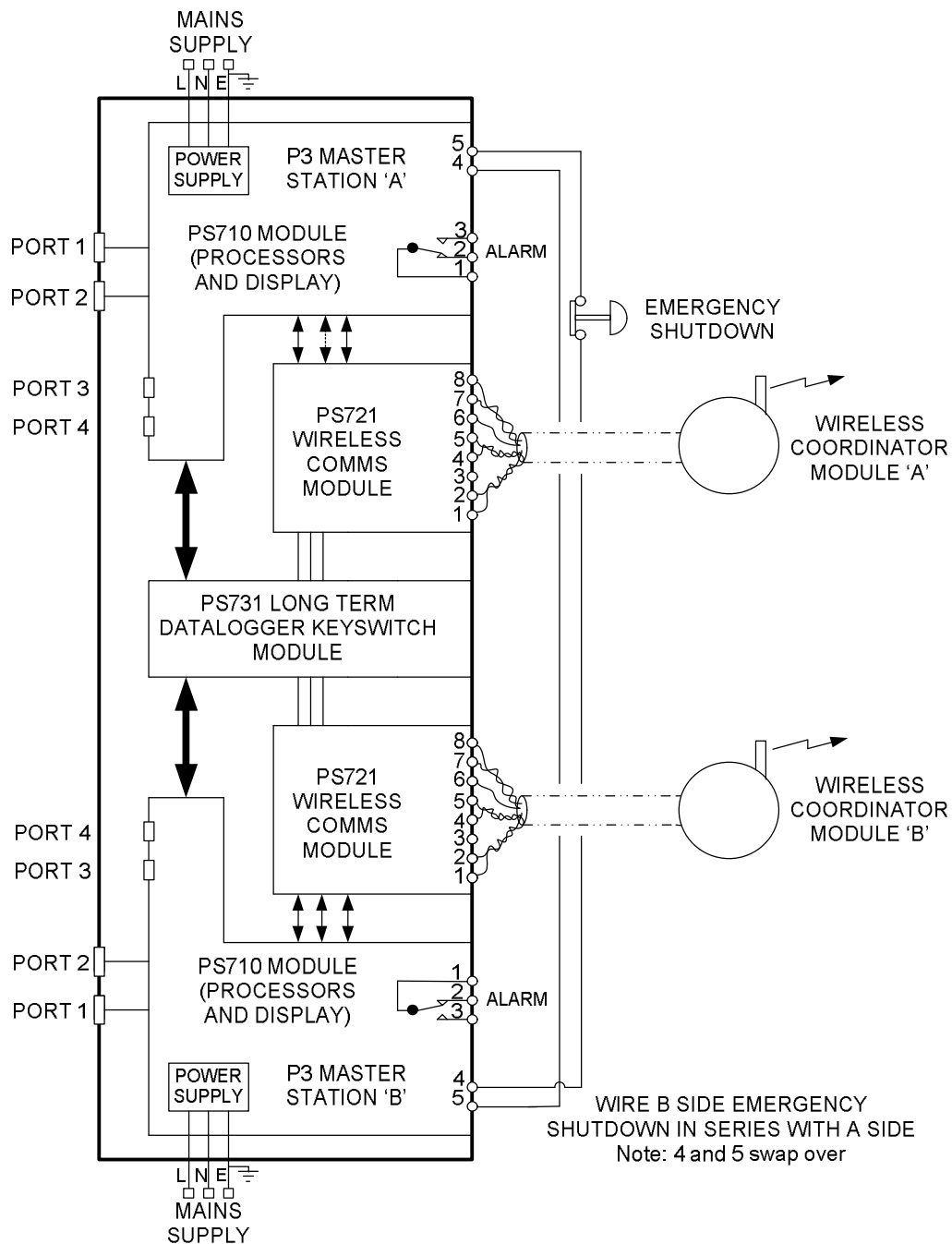


Fig 23: Pakscan P3 Wireless network Block Diagram (hot standby master station)

Note: If there is no hard-wired ESD requirement a shorting link must be fitted across pin 4 and 5 on both side A and side B of the PS710 modules.

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4. CONFIGURING SERIAL COMMUNICATIONS

The Pakscan 3 CPU module has two serial ports. Each of these is configurable for RS-232 or RS-485. Most hot standby systems will probably require two RS-485 connections in a seamless redundant configuration. Single systems may use RS-232 or RS-485.

4.1 Setting Port 1 and 2 for RS-232 or RS-485

The chassis has DIP switches behind the PS710 CPU module for setting the type of serial port that is presented at the port connectors.

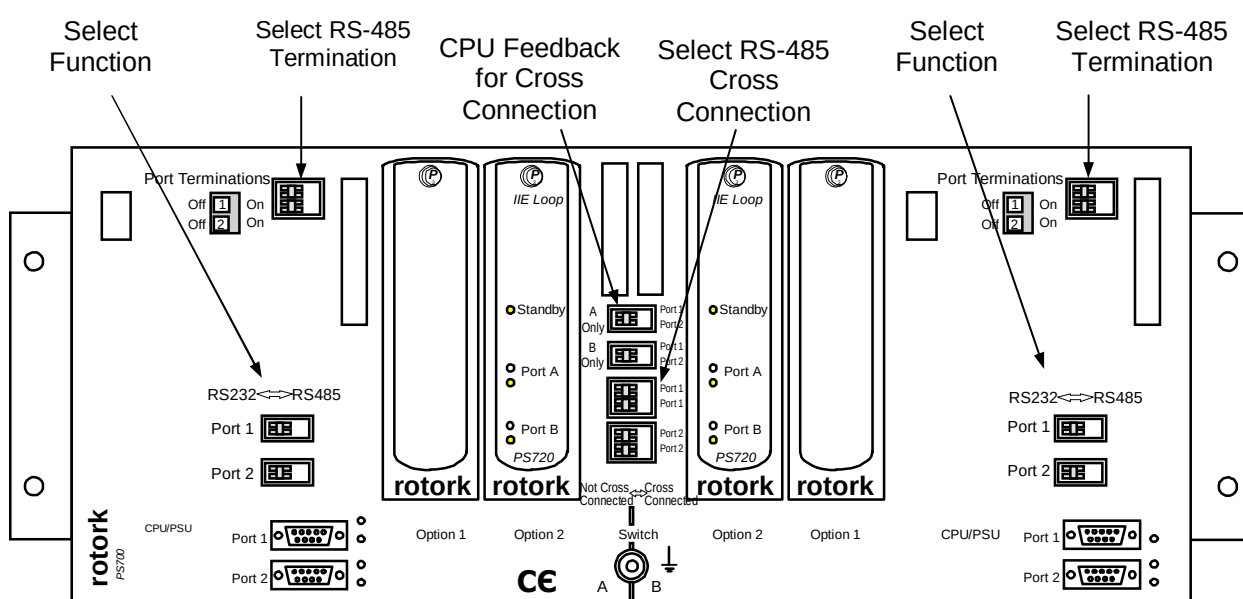
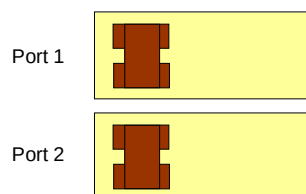


Fig 24: Pakscan P3 Chassis, CPU and Key Switch modules removed

The switches on the backplane behind the PS710 CPU Module are used to set Port 1 and Port 2 parameters.

Port Function

RS-232 ↔ RS-485



Two DIP switches allow each port to be selected between RS-232 and RS-485. For RS-485 slide the appropriate Port switches to the right, for RS-232 they should be on the left.

Each of the two ports may be set independently.

Fig 25: Port Function Switches shown in RS-232 position

RS-485 Termination Resistors

Two DIP switches are used to connect end-of-line termination and biasing resistors to the RS-485 highway. All RS-485 network highways must be terminated at **both ends of the highway**, in this case, at the host controller and at the master station. Only RS-485 highways need termination and biasing resistors. If a CPU port is configured for RS-232, it must never be terminated. Each port can be terminated independently.

Each CPU module serial port sits on an independent highway and should be terminated independently. So, if ports 1 & 2 on a CPU module are both being used for redundant RS-485 communications to a Host controller, then each port may need to be terminated and biased.

However, where more than one CPU Module sits on the same RS-485 highway, then only the one furthest from the host controller needs the biasing and termination resistors to be enabled.

Port Terminations

Off 1 On
Off 2 On

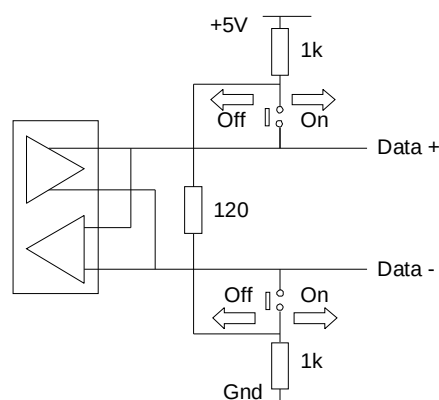
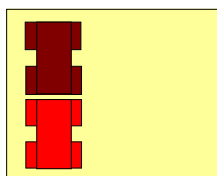


Fig 26: Port Termination Switches shown in Off position

Cross Connection switches

The cross connection switches, found on the backplane behind the PS710 CPU Module, are used to cross connect the serial RS-485 connections. They are only applicable for a hot standby system and should ONLY be set as cross connected for a port that has been selected as RS-485.

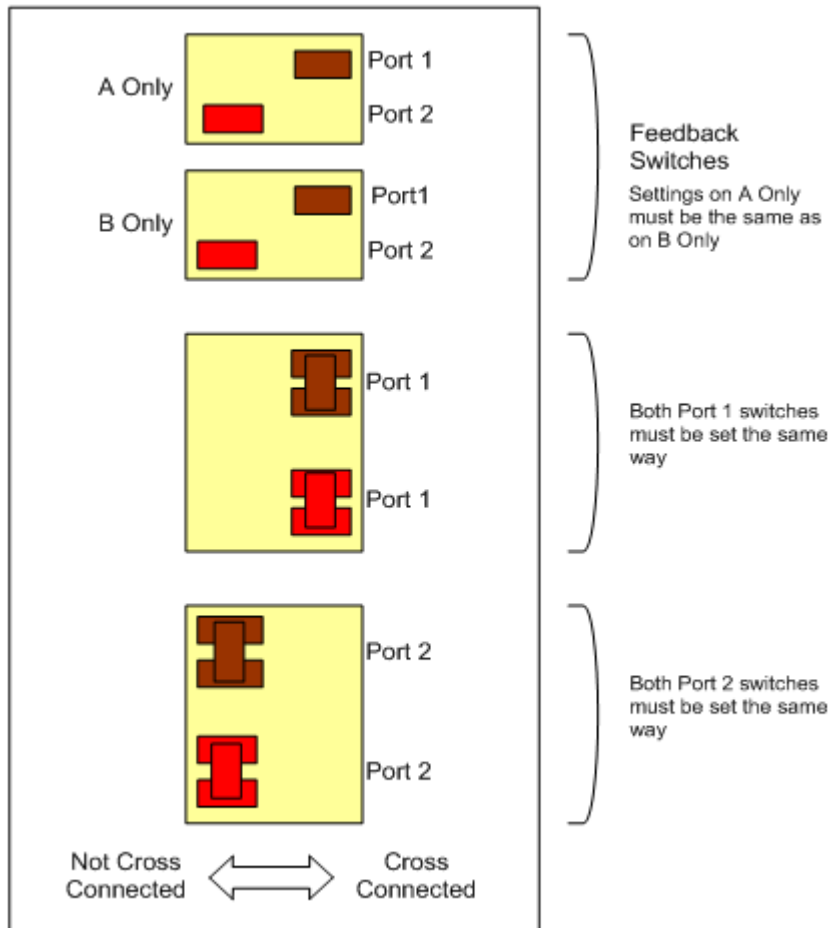


Fig 27: Cross connection switch settings on the backplane behind the Switch Module

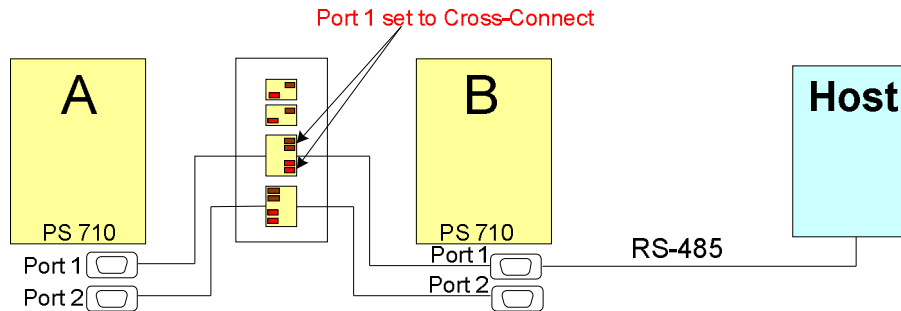
The switches are shown in the Factory Default positions (Hot Standby).

Port 1 is set to Cross-Connected for RS-485 Serial communications. Port 2 is set to Not Cross-Connected for RS-232 Serial Communications.

The feedback switch positions must reflect the Cross-Connection settings for Port 1 and Port 2. These switches are used, by the master station CPU, to indicate to the user (via the HMI or web pages) the position of the cross-connect switches.

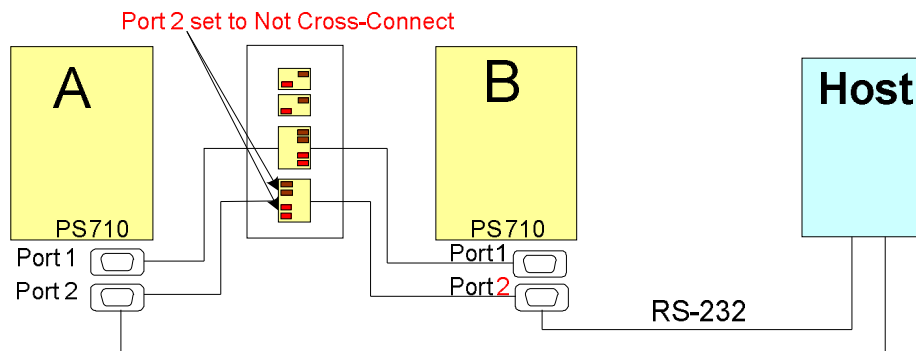
Typical Serial Host connections to the P3 master station and appropriate switch settings:

Hot Standby RS-485 communications



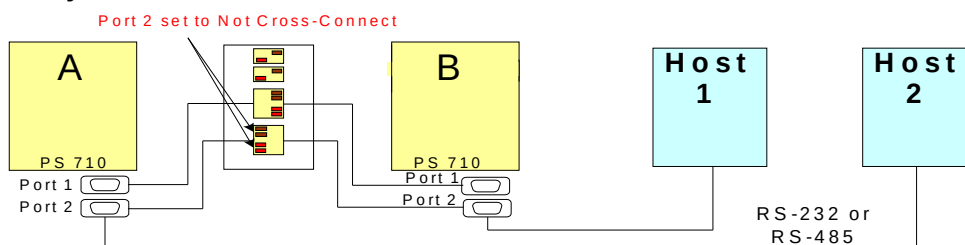
Communications between the Host and the master stations uses the Modbus protocol. Because the Master A is cross-connected to Master B, they both share the same Modbus address. The standby action must then be set to passive. Thus, the host can have two-way communications with the Primary (Main) module and the Standby module will only listen to the messages.

Hot Standby RS-232 Communications



With RS-232, communications between the Host and Hot Standby master station must be point-to-point. Multi-drop connection is not allowed, so separate cables must be run from the Host to each side of the master station. Also, the Cross-Connect switch must be set to Not Cross-Connect. The standby action must be set to active, so that the Host has full communications with Master A and Master B. Note: only actuator commands sent to the Primary CPU Module will be actioned.

Hot Standby dual Host RS-232 or RS-485 communications



Fully dual-redundant system. Port 2 set to RS-232 or RS-485 to match Host communication

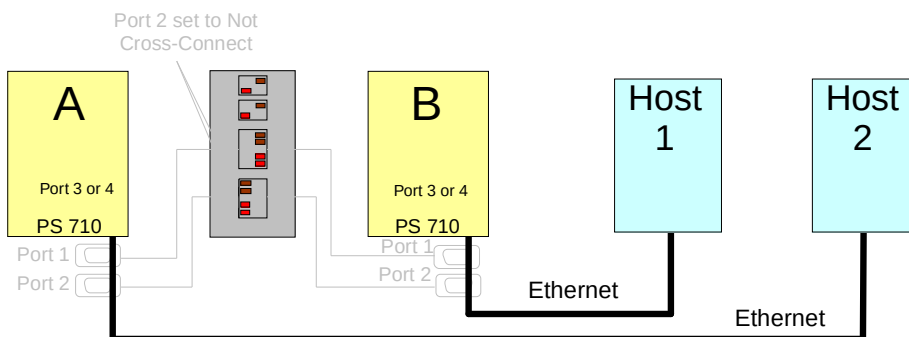
Fig 28: Hot Standby Serial Communications

5. CONFIGURING ETHERNET COMMUNICATIONS

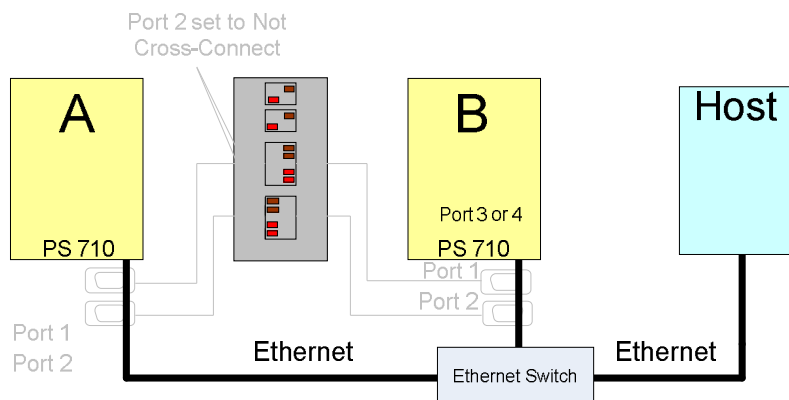
Pakscan 3 master stations come complete with two Ethernet ports for connection to host systems. A third Ethernet port is also available for connection to a computer for configuration purposes. The master station is ready to use with Ethernet and Modbus TCP protocol for the host to access data and control the actuators on the field network. The IP address is factory set to the default value and can be changed during set up of the master station.

The Pakscan master station defaults to the same IP address on both ports, and can use the same address on the A and B master stations. It is possible to change the IP address on either master station, but ports 3 and 4 of each CPU Module always have the same address.

Hot Standby Ethernet communications



Ethernet comms between Hosts and master station are made using Port 3 or Port 4. The Cross-Connect switches can be in either position, or set appropriately for any additional serial comms. In this case, with two Hosts, Standby must be set to Active. The IP address of Master A and Master B can be set to be the same or different, with Standby Active.



Where an Ethernet switch is used to connect a Host to the hot standby master station and the IP address is set the same for Master A and B, then Standby must be set to Passive.

Fig 29: Hot Standby Ethernet Communications

Hot Standby Redundant Host, Redundant Ethernet communications

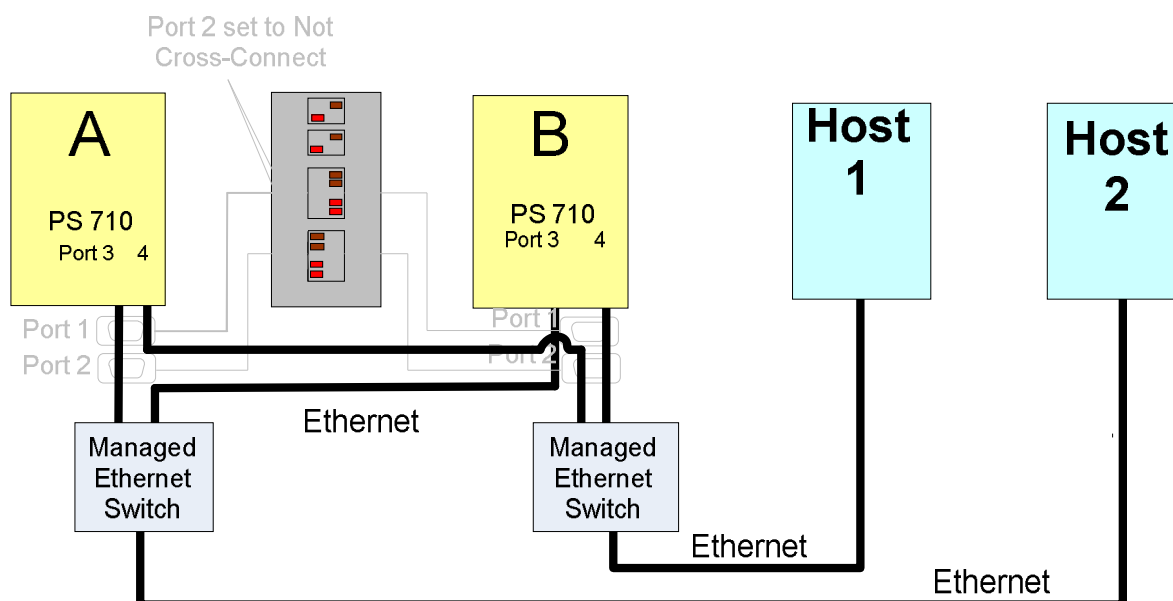


Fig 30: Hot Standby, Dual Redundant Ethernet Communications

For full Ethernet communications redundancy, use two Hosts and two managed Ethernet switches. Managed Ethernet switches with rapid spanning tree protocol are required. This type of switch is able to prevent Ethernet Storms, where messages are re-circulated continuously.

Ethernet communications between Hosts and master station are made using Port 3 and Port 4. In this case, with two Hosts, Standby must be set to Passive. The IP addresses of Master A and Master B can be set to be the same with Standby Passive, or different, with Standby Active.

The Pakscan P3 master station defaults to the same IP address on all ports. It is possible to change the IP address for Master A and Master B independently, but all ports for each master will have the same address. In a hot standby system, if the Copy IP Settings option is selected, both sides of the master station will have the same IP address.

5.1 Default Ethernet Settings

The default Ethernet parameters set in each Pakscan 3 CPU Module are given below:

DHCP	Static			
Default IP address	10	200	1	1
Default Subnet mask	255	255	255	0
Standby Action	Passive			

Note: changes to the IP address, Subnet Mask or clock settings will cause a re-boot of the CPU module.

5.2 Ethernet Security

When connecting the master station to an Ethernet network, care should be taken to consider security of the master station.

There are a number of Ethernet services available in the master station and, where appropriate, the user should ensure that the Ethernet infrastructure is able to protect the master station from unwanted access to a service.

Transmission Control Protocol (TCP) and Internet Protocol (IP) are the core protocols utilised in Local Area Networks (LANs) and computer networking. Within these networks a 'port' is an endpoint to a logical connection – not to be confused with the physical port!

The port number in this case refers to the type of port. For example, port 80 is used for HTTP web page traffic.

The ports that are available at the master station are:

Port description	Port number
Telnet	23
FTP	21
HTTP	80
HTTPS	443
Modbus/TCP	502, 50003, 50004, 50005, 50006, 50007, 50008 and 50009

Ethernet products, like routers, can prevent other Ethernet equipment on the same LAN from accessing certain services in the master station. If web page access were not required, the most secure set up would be to prevent all but Modbus traffic entering the master station.

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6. SETTING UP THE MASTER STATION BY THE KEYPAD

The Pakscan 3 master station CPU module has a full colour display and 5 button input pad. All the settings for the performance of the master station, the Option module fitted and the Field Network can be made using these facilities. The keypad and screen also allows every connected actuator to be interrogated and its status monitored. Finally, the actuators and valves can be moved using these facilities.

Alternatively, a computer with an Internet browser facility can be used with the internal web server pages. These pages allow the whole system to be set up and modified. In addition, they allow the connected actuators to be viewed and controlled.

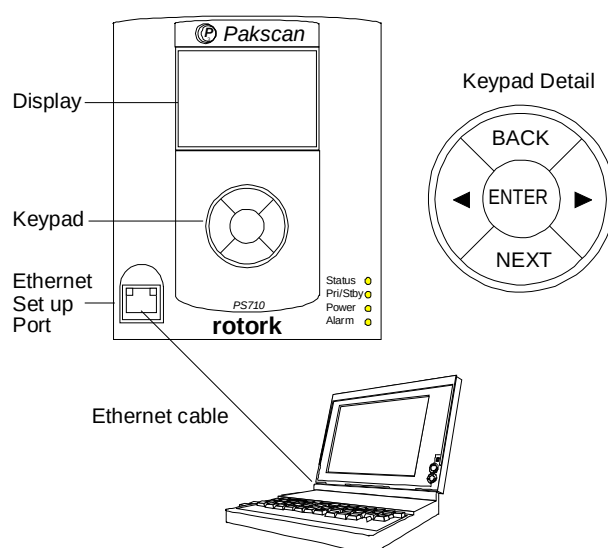


Fig 31: Pakscan P3 Main module connection to laptop and keypad detail

6.1 Using the Keypad

The keypad controls the movement through the display screens and the movement within each screen, as well as the ability to input data or requests.

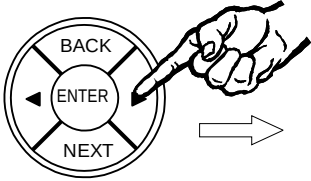
- ☐ **◀ (Left) and ▶ (Right) arrow keys** Allow active items within a page display to be highlighted. If the item is selected and a numeric input is needed, then these keys increase or decrease the number.
- ☐ **ENTER** Selects a highlighted element on the screen or completes the entry of information.
- ☐ **BACK and NEXT** **BACK** moves up one level in the menu of the displays, returning to the previous screen viewed. **NEXT** only functions if there is more data to show than fits on the screen. When there is additional data, a small arrow is shown on the right side of the screen. It points down (↓) for **NEXT** and up (↑) for **BACK** to operate.

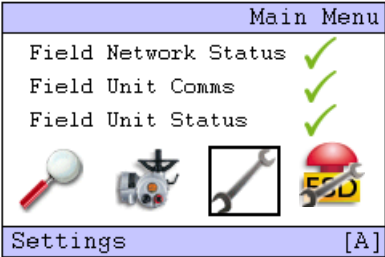
6.2 The Screen Display

The opening, or top screen display shows the network status and three icons (four icons, if keypad ESD is enabled – see below).

	Main Menu Field Network Status ✓ Field Unit Comms ✓ Field Unit Status ✓    Diagnostics [A]	Menu Section Current Status Menu Location
Network Information		
Selected Icon Highlighted		
Selected Icon Function		

The Diagnostics icon (Magnifying Glass) will have a black square around it. The position of the square indicates the part of the menu that will be accessed if the **ENTER** key is pressed. The highlighted icon can be changed by pressing the arrow buttons (◀ or ▶) to scroll round them. The bottom bar shows the selected function as a text message.







Diagnostics Menus



Field Unit Menus

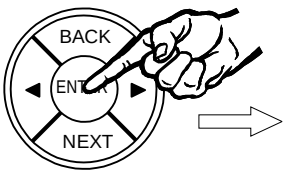


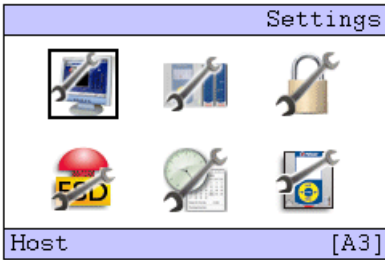
Settings Menus



ESD control - only visible when "Keypad ESD" is enabled

Highlight the Spanner icon for 'Settings'; then press **ENTER**. The menu location changes to A3 and the 'Settings' menu screen appears with the 'Host' icon selected.



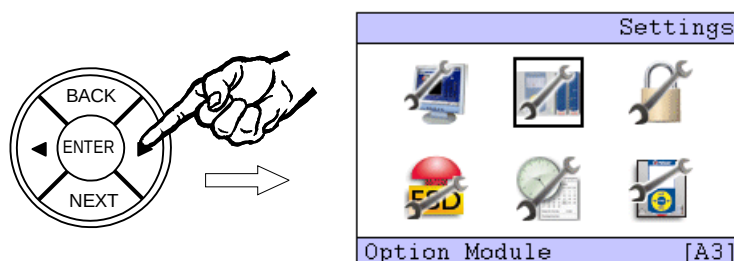


This screen also contains the icons used for access to all the other setting menus.

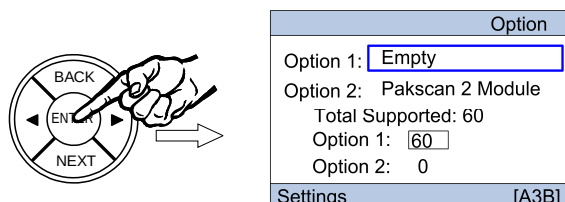
	Host		Option Module		Security
	ESD		Date/Time		M/S

6.3 Setting the Current Loop Option Module Parameters

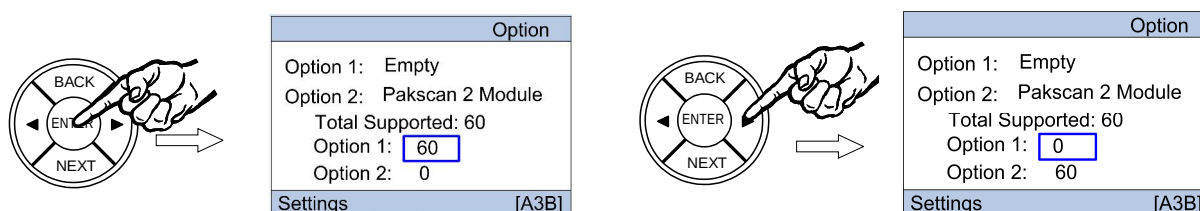
On the 'Settings' menu, select the Option Module Icon by pressing the right arrow key (►) followed by the **ENTER** key.



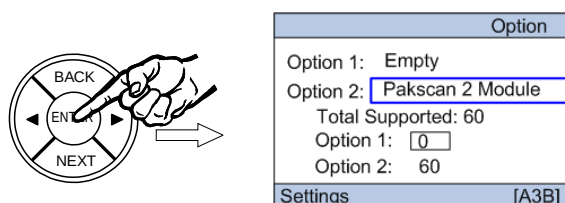
The Option choice screen appears where the module to be set can be selected. Firstly we need to ensure that the field units are correctly assigned to the field network chosen. The selection box by the 'Option 1' text should be highlighted by pressing the right arrow key twice (►►).



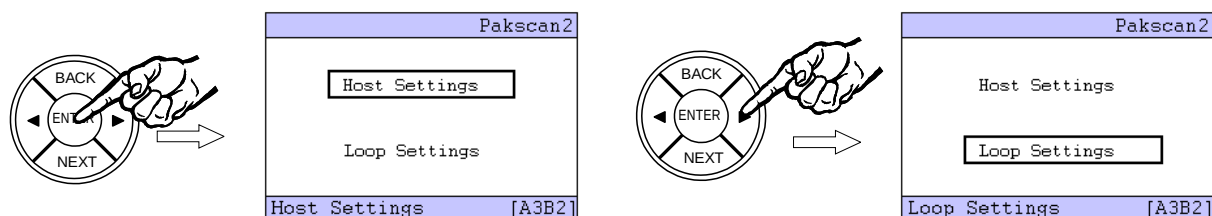
Pressing **ENTER** enables changes to be made using the left (◄) or right (►) arrow key, press the **ENTER** key to make a change to the value. This box will increment in steps of 60. In a wired only network all available field units should be allocated to the Pakscan 2 module. Once the number is correct, press **ENTER** once more



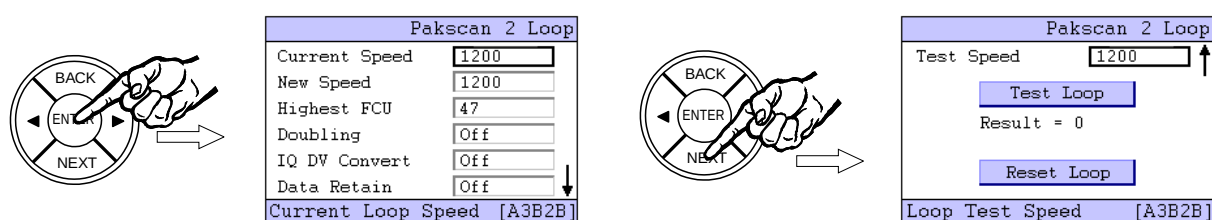
To make changes to the Pakscan 2 Current Loop module settings, highlight Option 2 by using the left (◄) or right (►) arrow key.



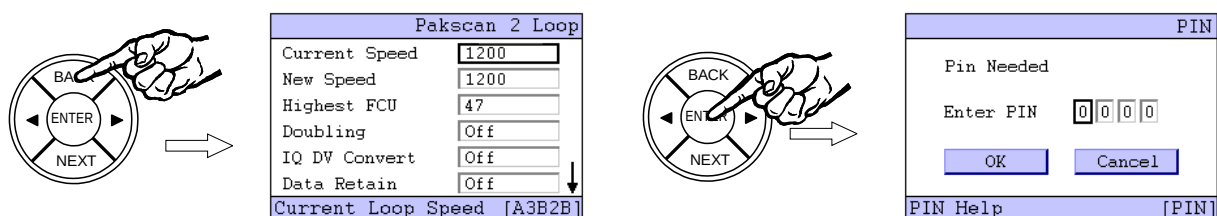
Pressing **ENTER** brings the next choice for the setting. This time select 'Loop Settings' by once more using the right arrow key (►).



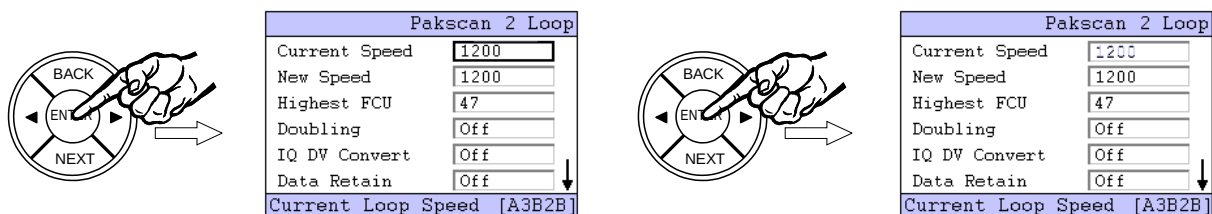
The Loop Settings screen is split over two pages, as indicated by the small arrow (↓) on the right side of the screen, so the **NEXT** and **BACK** buttons are used to jump between the two.



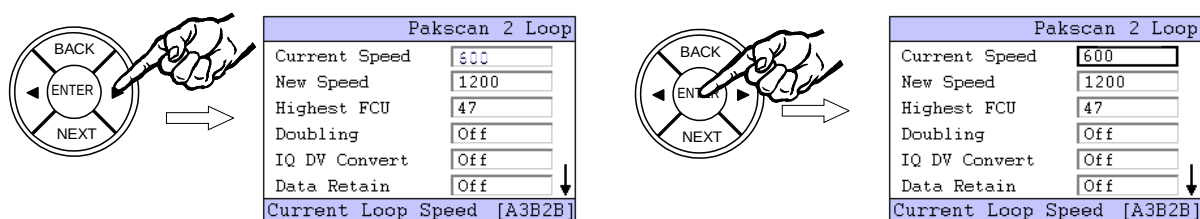
Once a setting box is highlighted, by using the left (◀) or right (▶) arrow key, press the **ENTER** key to make a change to the value. This will make the security screen appear for the PIN number entry. The default value for the system security requires a PIN to be entered before any settings can be changed. This setting can be altered from the Security Setting menu.



The default PIN number is 0000. To enter a PIN, or accept the number, press **ENTER** and the first digit will flash. The value can be changed by using the left or right arrow keys (◀ or ▶). Once the number is correct, press **ENTER** once more. When all 4 digits of the PIN are entered correctly, select the OK button with the arrow keys (◀ or ▶).



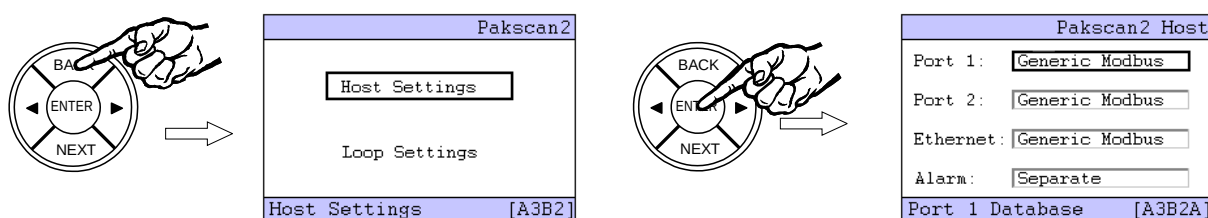
Press **ENTER** and the screen will return to the settings screen and the Current Speed will be highlighted. Press **ENTER** once more to select this parameter and the current value begins to flash.



Use the arrow keys (◀ or ▶) to change the value shown until the desired figure appears, then press **ENTER** and the new value will be set. The arrow keys can be used to navigate to other settings, and the **NEXT** button goes to the Loop Test screen and Loop Reset function.

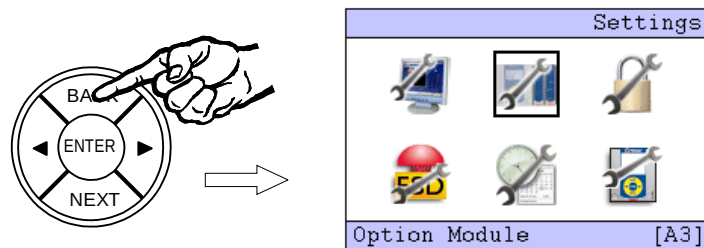
- ☐ Set the loop performance parameters in accordance with the data recorded earlier. Make sure the loop speed is compatible with the setting for the loop capacitance.
- ☐ Set the highest field unit address parameter equal to the actual highest address.
- ☐ Doubling can be set to 'On' if the loop performance is not fast enough. It has the effect of halving the time to collect data from the field units. This feature will only operate if the loop is functioning correctly with "loopbacks off".
- ☐ IQ DV Convert should be set to 'On' if analogue position control is being used on the IQ / IQT actuators on the network.
- ☐ Data Retain set to 'Off' clears all the field unit data if communication is lost. Some host systems want the data to be retained, in which case set the parameter to 'On'.

Once the parameters are all set, leave this part of the setting menu to ensure the new values are loaded. Use the **BACK** button to return to the Host Settings page, and then **ENTER** to select the Host Settings menu.



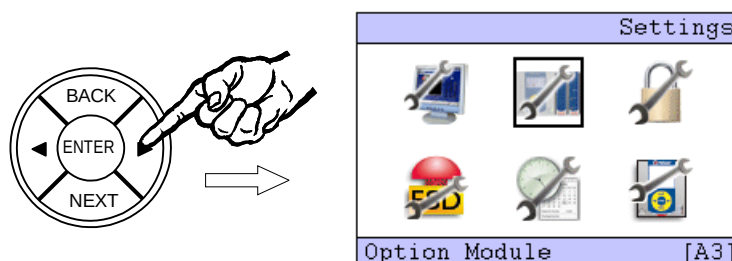
Make alterations to the host protocol settings and Alarm linkage, if required, in a similar manner to altering the loop performance parameters described earlier. The PIN will need to be entered if no keys are operated for approximately 5 minutes from the last PIN entry. Where the two serial ports are being used by the same host system it is advisable to 'Link' the alarms so that both ports always report exactly the same alarm data.

When the settings are as required, use the **BACK** key to return to the top Settings menu.

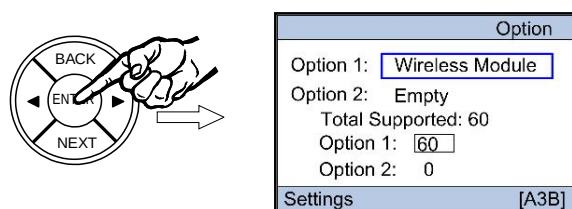


6.4 Setting the Wireless Option Module Parameters

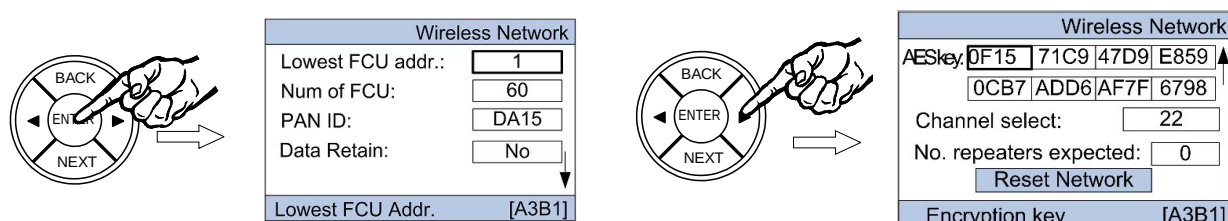
On the 'Settings' menu, select the Option Module Icon by pressing the right arrow key (►) followed by the **ENTER** key.



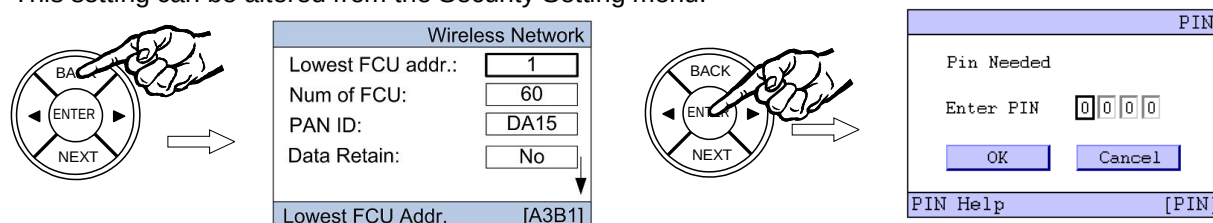
The Option choice screen appears where the module to be set can be selected. The Pakscan Wireless is always in the Option 1 slot and this is highlighted as the page is entered.



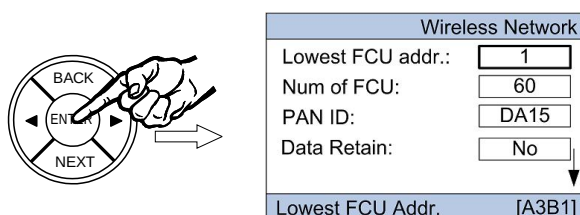
The Wireless network Settings screen is split over two pages, as indicated by the small arrow (↓) on the right side of the screen, so the **NEXT** and **BACK** buttons are used to jump between the two.



Once a setting box is highlighted, by using the left (◀) or right (▶) arrow key, press the **ENTER** key to make a change to the value. This will make the security screen appear for the PIN number entry. The default value for the system security requires a PIN to be entered before any settings can be changed. This setting can be altered from the Security Setting menu.



The default PIN number is 0000. To enter a PIN, or accept the number, press **ENTER** and the first digit will flash. The value can be changed by using the left or right arrow keys (◀ or ▶). Once the number is correct, press **ENTER** once more. When all 4 digits of the PIN are entered correctly, select the OK button with the arrow keys (◀ or ▶).

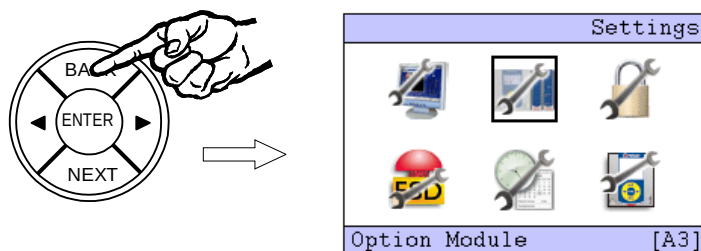


Press **ENTER** and the screen will return to the settings screen and the Lowest FCU addr. will be highlighted. Press **ENTER** once more to select this parameter and the current value begins to flash. Use the arrow keys (◀ or ▶) to change the value shown until the desired figure appears, then press **ENTER** and the new value will be set. The arrow keys can be used to navigate to other settings, and the **NEXT** button goes to the second setting page and the Network Reset function.

- ☐ Set Lowest FCU addr. to the lowest address used for a Wireless field device. This will be where the addressing starts from.
- ☐ Set the Num of FCU to the actual number of Field units in the network. The field units will be numbered from the lowest FCU address contiguously for the Number for field units fitted.
- ☐ Set the PAN ID to a value different from the default. This should be noted as this needs to be set in all the individual field units.
- ☐ Data Retain set to 'Off' clears all the field unit data if communication is lost. Some host systems want the data to be retained, in which case set the parameter to 'On'.
- ☐ Set the AES key to something different from the default. This should be noted as this needs to be set in all the individual field units.
- ☐ The most suitable channel for the system will have been selected during the site survey. This setting should be set to that value.
- ☐ Set the number of repeaters used in the system - repeaters may be required in the system to ensure redundancy or for improved communications.

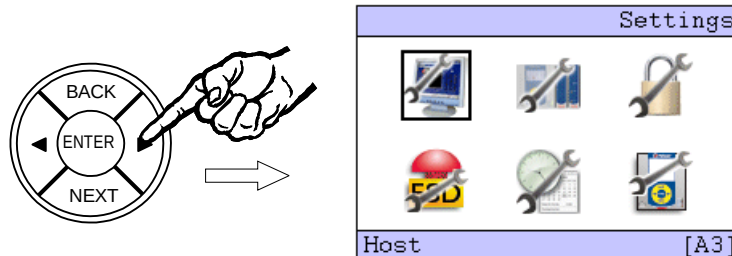
The network can be reset from the second page. This will need to be done if network changes have been made and these are required to be uploaded to all field units. Note that changes to network parameters will only be loaded to those devices currently communicating on the network.

When the settings are as required, use the **BACK** key to return to the top Settings menu.

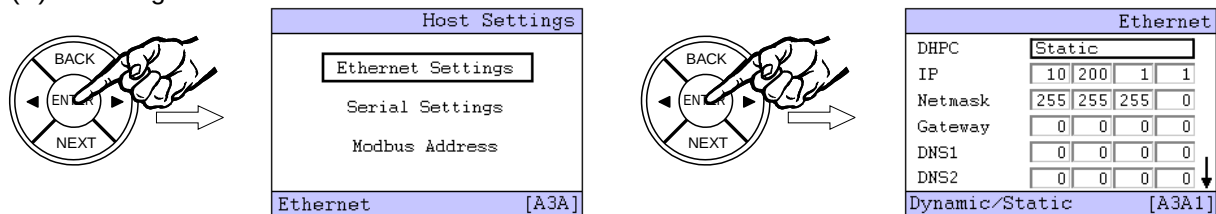


6.5 Setting the Master Host Communications Parameters

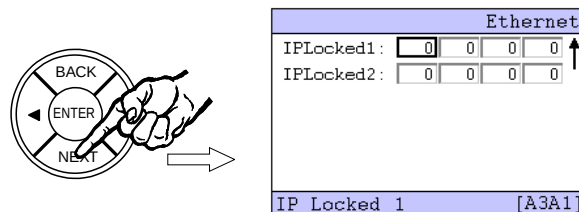
Select the Host icon using the arrow keys (◀ or ▶) and press **ENTER**. The Host Settings menu choices screen appears.



Select 'Ethernet Settings' using the arrow keys (◀ or ▶) and press **Enter** once more. The Ethernet settings screen appears, note that there are two pages to the menu as indicated by the small arrow (↓) on the right side of the screen.

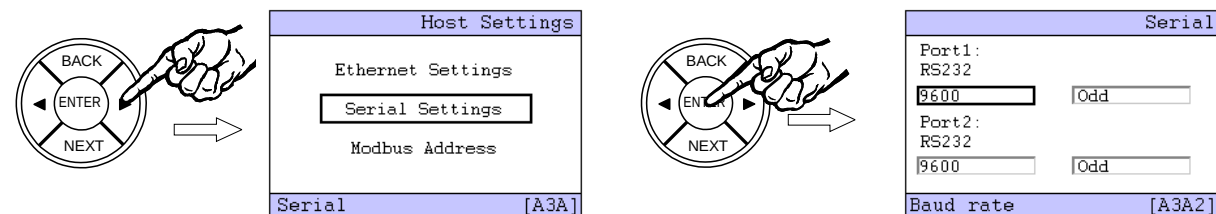


Use the **NEXT** button to move to the second page, the **BACK** button returns to the first page.



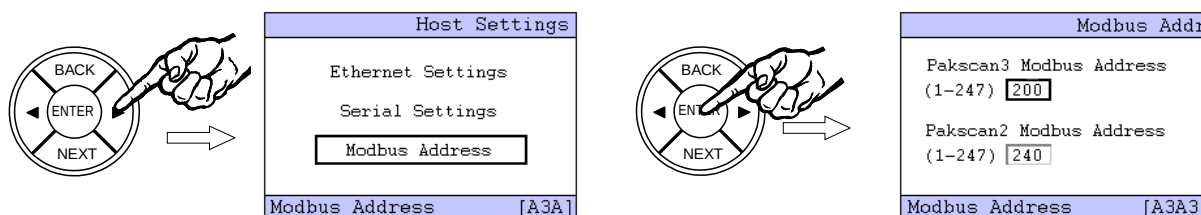
It is usually only necessary to change the IP address and Netmask to match the requirements of the network connected to the master station. When making any change it will be necessary to enter the PIN number for the master station as shown in the previous section.

To return to the previous Host Settings screen, press **BACK** and then select the Serial Settings using the arrow keys (◀ or ▶) and press **ENTER**. The communications port speed (default 9600), and parity are changed here.



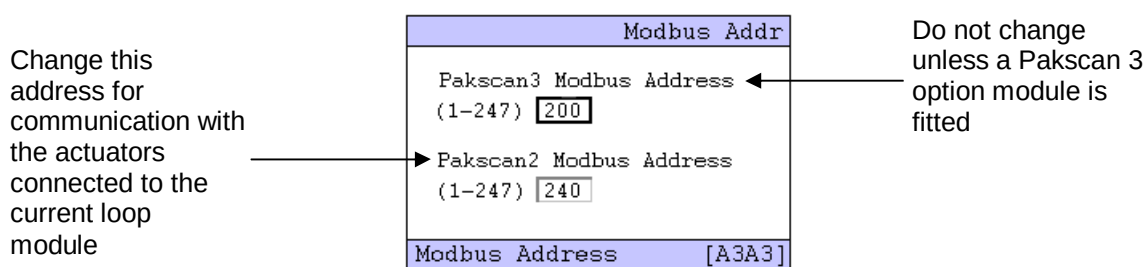
The port type is determined by the DIP switch settings on the main chassis behind the PS710 CPU module and the setting is reflected in the message on the screen. If the port is set to RS-485 and cross connected, the description changes to show these settings. This is particularly useful when determining the settings already in place. Select the option to be changed by using the arrow keys (◀ or ▶), then **ENTER** (the PIN screen may appear before a change can be made). Once the PIN is entered, the value of the parameter can be altered by the arrow keys (◀ or ▶). The speed can be varied from 2400 to 115,200 and the parity may be Odd, Even, Zero or None. Once the value is as required, press **ENTER** to set the value.

When the parameters are all as required, press **BACK** to return to the Host Settings screen, then select the Modbus Address using the arrow keys (◀ or ▶) and press **ENTER**.



- ☐ The **Pakscan 3 Modbus address** is for accessing the **Wireless** database.
- ☐ The **Pakscan 2 Modbus address** is for accessing the **Wired** (current loop) database.
- ☐ **The Pakscan 2 and Pakscan 3 Modbus addresses MUST NOT be the same value.**

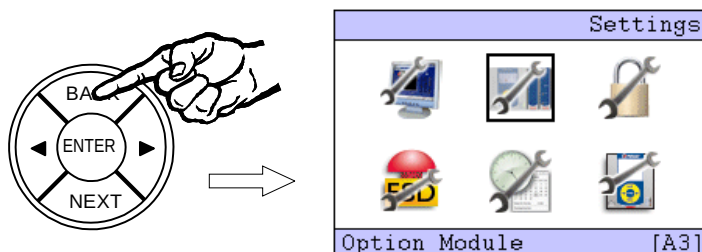
The Modbus address for the communication to the actuators on the Pakscan 2 current loop (via the module in option 2 slot) is altered in the lower window. It is recommended that this is altered to a value other than the generic Modbus default address of 247 and the master Station defaults to ensure that any new stations introduced do not conflict with this address.



The address is changed by first selecting it with the arrow keys, then pressing **ENTER** (if the PIN requires entry the prompt page then appears). Use the arrow keys to change the number to the new value, and then press **ENTER** once more. The new address becomes active once the screen has been changed to a new one.

The Pakscan 3 wireless Modbus address is modified in the same way.

Once the settings are as required, use the **BACK** key to return to the top Settings menu.



6.6 The Other Settings

There are menus for setting all the parameters of the system. These are more fully explained in the system manual and, in general, the default settings will allow most systems to operate with reasonable success.

6.6.1 Security



Security is used for setting the PIN number to be used, plus the actions permitted from the keypad and the serial ports via the Interlocks. The Security setting default requires a PIN for adjusting the settings for system performance, but not for issuing actuator commands.

Interlocking controls the serial communications that are permitted to operate the actuators. The default grants permission to all the serial ports and the Ethernet ports, but prevents the web page facility from moving the valves.

- ☐ The default PIN = 0000.

6.6.2 ESD



The default condition is to disable all the possible Emergency Shut Down routes. ESD can be enabled from the serial ports, Ethernet ports, Web page, hard-wired input or keypad on an individual actuator selection basis. If this ESD function is not required, ensure that a shorting link is fitted across pins 4 and 5 of the PS710 CPU module connector.

6.6.3 Date and Time



The date and time, plus the use of an NTP server are set from this menu. The time stamp is used for the logging facility.

6.6.4 Master Station Parameters



The master station parameters include the Tag for the master station and the setting for data transferred between the two CPU modules on a hot standby system along with several other parameters. Most of the default settings are suitable on most systems, though there is one particular set of parameters that must be correctly set in the case of hot standby systems.

M/S Settings	
Changeover Master	↑
Serial Port1:	Passive
Serial Port2:	Active
Ethernet	Active
Port1 Standby	↓
	[A3F]

The Serial Ports should appear as Passive if the Cross Connect DIP switch is set to 'cross connect'. If the port is set to RS-485 highway and is being used on a multi-drop highway it must be set to passive. If it is not shown correctly it probably means the DIP switch is incorrectly set.

Remember, the default setting is Standby Active.

7. INTERNAL WEB PAGES

The master station includes a set of web pages that may be remotely accessed via Ethernet. They can be used for setting up the system, examining the system for any faults or alarms and also for controlling the actuators on the network (provided the Interlock permission is set to allow this feature).

If the master station is connected to an Ethernet Network it will act as a web server and any computer within that network can connect to the master station. The master station can also be configured and the field network set up by using these web pages. The host system or computer connected via the Ethernet Network or directly will need a web browser such as Internet Explorer to access the master station web pages.

7.1 Making an Internet / Intranet Connection

Connect the master station to an Ethernet host as described in section 5, or connect via a suitable router to the internet / intranet. A computer can be connected directly to the master station using the configuration port.

Start the browser and enter the IP address of the master station. The default address is 10.200.1.1, so the address is **http://10.200.1.1**. The browser will then access the master station and bring up the opening page of the master station. In order to log in as a verified user, enter a user name of **admin** and a password of **admin**. (The default password should be altered as soon as convenient to prevent unauthorised access to the system.)

Default IP address	10 . 200 . 1 . 1
Default User	admin
Default Password	admin

Once entry to the web pages has been made, if no changes to the display or information is made for a few minutes, the system will automatically log out and the user/password must be re-entered.

7.2 Connecting a Computer Directly to the Master Station

The simplest direct connection to the master station is by using the Ethernet port on the front of the CPU module. A standard Ethernet patch cable or crossover cable can be used to link the two directly. A permanent connection can also be made directly to one of the underside connectors (port 3 or 4). In order to establish a connection it is probably necessary to adjust the settings of the computer's Internet connection.

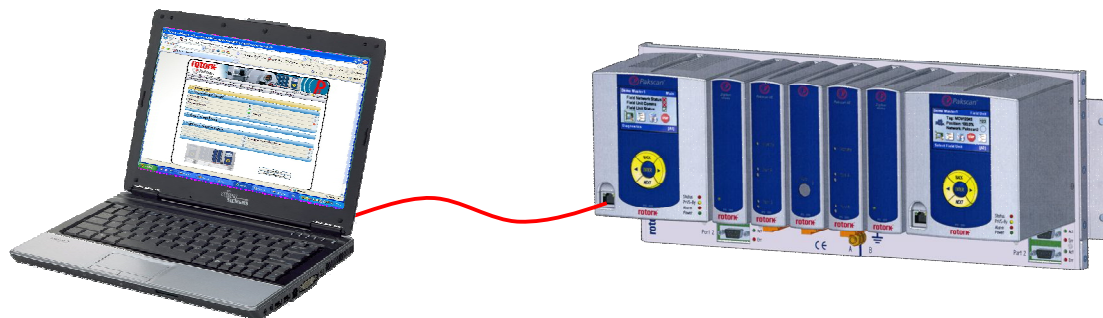


Fig 32: Connecting a Laptop to the Pakscan P3 Main Module

7.3 Adjusting the Network Settings of the Computer

- ☐ Ensure that nothing is connected to the Ethernet port of the computer.
- ☐ Open the Control Panel and select Network Connections (XP) or Network and Sharing Centre (Windows 7).
- ☐ Select Change Adaptor settings (Windows 7 only).
- ☐ In the 'Network Connections' window, double-click on the appropriate 'LAN or High Speed Internet' icon and the 'Local Area Connection Status' window will open.
- ☐ Click on the 'Properties' button, and a second window will open. Select 'Internet Protocol TCP/IP' ('Internet Protocol Version 4 (TCP/IPv4)' for Windows 7) and click on the 'Properties' button in this window.
- ☐ The 'Internet Protocol TCP/IP Properties' window will open. Next, change the setting to force the computer to adopt a fixed IP address and enter an address of 10.200.1.3 and a subnet mask of 255.255.255.0. Click on the 'OK' button and the window will close.

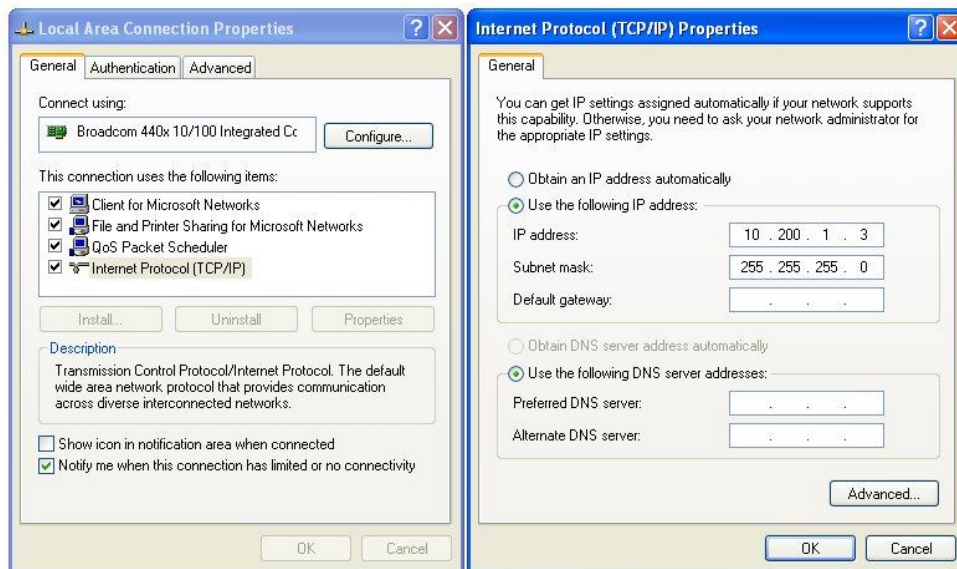


Fig 33: Changing the Network Connections TCP/IP Properties – Windows XP

- ☐ Click OK on the 'Local Area Connection Properties' window and then close the status window.
- ☐ Finally, close the 'Network Connections' window and the Control Panel.
- ☐ It may be necessary to reboot the computer to be sure that the new settings take effect correctly.
- ☐ Connect the cable between the computer and the Pakscan master station.
- ☐ Start the browser and enter the IP address of the master station. The default address is 10.200.1.1, so set the address to **http://10.200.1.1**. The browser will then access the master station and bring up the opening page of the master station. In order to log in as a verified user, enter the username of **admin** and the password **admin**.

Note: If the IP address of the master station has been changed from the defaults, then the settings above will not work and will have to be modified to suit the actual settings.

7.4 Web Page Structure

The web pages have three access levels, each requiring a password with the correct level set. A user enters the web server with a particular degree of access to the functions of the server and the master station.

7.4.1 User Levels

Access Level		Function
Lowest level	Read	Allows access to read master station status and settings, plus the option module status and settings, plus the actuator and field unit status on the option module network. No commands or alterations to the system are permitted.
	Write	As for read access with the addition of the ability to issue network commands, swap masters and command actuators on the option module network to change position.
Highest Level	Administrator	As for the two lower levels plus the ability to configure the master station, option modules and all system settings. Set and remove user names and passwords; set alarm reporting parameters, change system addresses and test system communications.

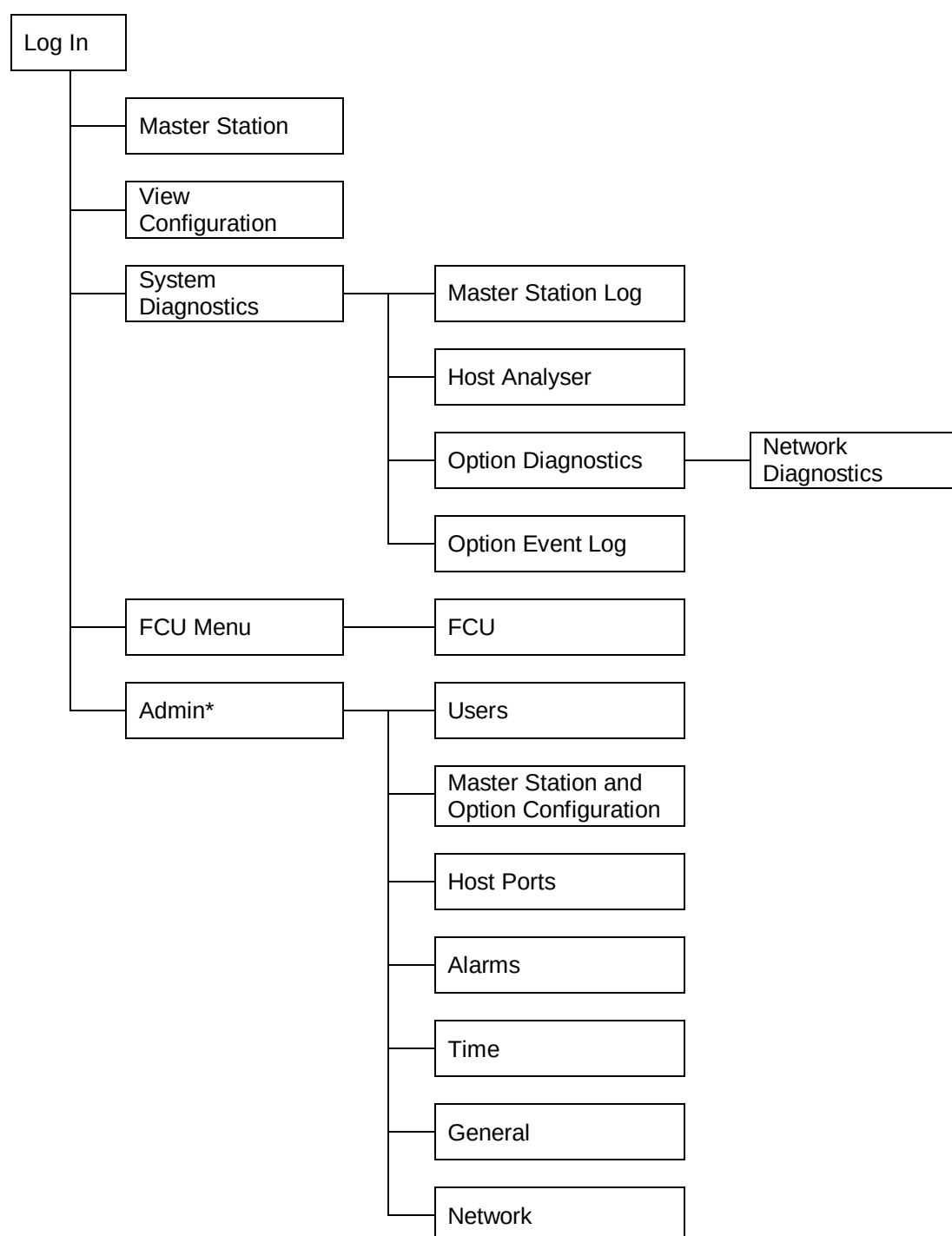
The Administrator level sets all other user names and passwords. As soon as the system is set up the default password should be changed. Make sure all changes made to log in details are recorded.

7.4.2 Overview of Web Page Layout

The web pages are organised using a menu structure with the primary menu on the top of each page. Within a page there are other controls for parameter alteration or to reveal extended information on the topic of the particular page.

Navigation between the pages is by selecting another topic on the main menu.

If there is no activity with the mouse to change the display or update the information or selection for a few minutes, the system automatically logs out the user. The username and password must be re-entered to continue using the pages.



* requires Admin level log in

Fig 34: Web Page Menu Layout

7.5 The Web Pages in Detail

7.5.1 Log In Screen



Fig 35: Web page Log In Screen

The first screen is the Log In screen on which the user must enter a **Username** and **Password**.

- ☐ **Username** - a case sensitive identification for an individual or group used to give access to the system. User names are listed for administrators to see on the 'Add User' page.
- ☐ **Password** - the case sensitive confirmation required before a username is accepted by the system. Passwords are not listed on any page in the system and cannot be retrieved, even at the administrator level.

Select the box with the mouse and enter the appropriate name or password, then click on the **login** button. The system will move to the next page if the login is accepted. If it fails, the data is cleared from the boxes and must be re-entered correctly in both boxes before access is granted.

The default user name is **admin** and default password is **admin**. The password should be altered as soon as convenient to prevent unauthorised access to the system.

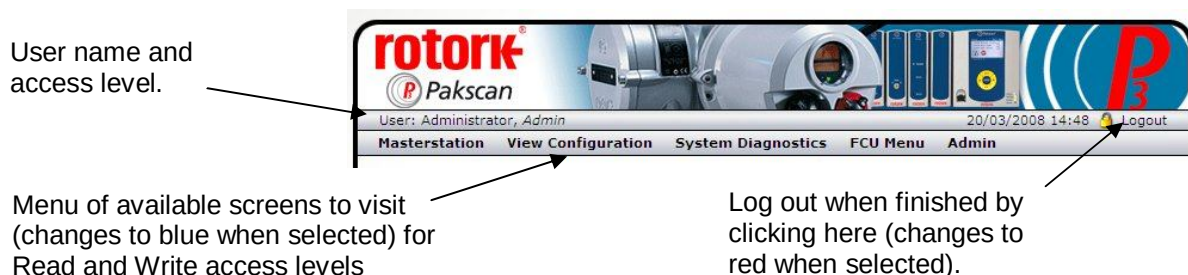


Fig 36: Web page Header Navigation

7.5.2 Master Station

rotork® Pakscan

User: Administrator, Admin 13/02/2009 12:15 Logout

Masterstation View Configuration System Diagnostics FCU Menu Admin

Information: Bath Demonstration Room

Masterstation Status: Master 1

Location (A/B)	A	Redundancy Option	●
Primary / Standby		Other Masterstation Health	●
Module Health		Alarm	●
ESD Presence			●

Option 1: Not Fitted

Option 2: Pakscan 2 Loop

Loopback in Progress	●	Common Field Unit Alarm	●
Loopback in Use	●	Common Actuator Alarm	●
Auto-loopback occurred	●	ESD Active	●

version: 1.02.02 based on Pakscan III technology

Option 1: Pakscan 3 Wireless

Configuration in Progress	●	Field Unit Alarm	●
Network Healthy	●	Field Unit Comms Fail	●
		ESD Active	●

Network ESD
Changeover Master

Site Name
Tag Name
Status
Option Module 1
Option Module 2
Status
Controls

Fig 37: Master Station Overview web page and Option 1 data, if a Wireless module is fitted

This screen is accessible to Read, Write and Administrator user levels.

This screen reports the current status of the master station and the option modules fitted. The picture shows the master station, single or hot standby version. The green, orange and red lights show the condition of the associated parameter. Greyed out text and lights are not applicable or else in a safe (normal) condition.

Master station CPU Module

- Site name : The name of the site where the system is located, as entered during configuration.
- Tag name : The master station tag, as entered during configuration.

Status

- Location A/B : Indicates the CPU module currently in communication over the Ethernet.

Primary/Standby	: Shows the condition of the CPU with regard to controlling the option modules. The Primary CPU is in control. A Standby CPU is prepared to become the Primary and take control if the partner unit fails.
Module Health	: Indicates the absence (green light) or presence (red light) of a fault on the CPU.
ESD Presence	: Shows a yellow light if an Emergency Shut Down signal is active.
Redundancy Option	: Shows a green light if there is a partner module fitted.
Other Master Station health	: Indicates the absence (green light) or presence (red light) of a fault on the partner CPU.
Alarm	: Indicates the presence of an alarm (red light) somewhere on the system.

Option 1 and Option 2 - Show the type of Option module fitted, either:

Pakscan 2 Loop Option Module

Loopback in Progress	: A blue light shows whilst the master station is reconfiguring the loop.
Loopback in Use	: A yellow light shows when the master station has detected a loopback fault on the system.
Auto Loopback occurred	: If a fault occurs on the network and an automatic reconfiguration of the loop occurs, then a yellow light is shown here.
Common Field Unit Alarm	: A red light shows if any field unit on the network has an alarm bit present.
Common Actuator Alarm	: A red light shows if any actuator on the network is unavailable due to its monitor relay having tripped.
ESD Active	: If there is an Emergency Shut Down signal present on the system a red light shows.

Pakscan 3 Wireless Option Module

Configuration in Progress	: A blue light shows whilst the master station is reconfiguring the network.
Network Healthy	: A Green light shows when the master station has detected NO faults in the network and it is healthy.
Field Unit Alarm	: A Red light shows when the master station has detected an alarm on any of the field units.
Field unit Comms fail	: A Red light shows when the master station has detected a communications failure to a field unit.
ESD Active	: If there is any Emergency Shut Down signal present for that network on the system a red light shows.

Controls - Not Available for Read level users

Network ESD	: Click here to issue an ESD to all actuators connected to both option modules. The resulting action will depend on the individual actuator settings. A confirmation screen appears to verify or cancel the instruction before the action occurs.
Changeover Master	: Only applicable to hot standby systems. Click this button to make the master station CPU in control; change from A to B or B to A.

7.5.3 View Configuration

rotork® Pakscan

User: Administrator, Admin 13/02/2009 12:22 Logout

Masterstation View Configuration System Diagnostics FCU Menu Admin

View Configuration

Site name	Bath Demonstration Room			
Tag name	Master 1			
Modbus address	200			
Hot Standby module	Enabled			
ESD Settings	Ethernet ESD	Disabled	Webpage ESD	Disabled
	Hardwired ESD	Disabled	Serial ESD	Disabled
			Keypad ESD	Disabled
Command Settings	Ethernet	Enabled	Webpage	Enabled
	Serial Port 1	Enabled	Serial Port 2	Enabled
			Keypad	Enabled
Copy Options	Settings	Enabled	Tag	Enabled
	Address	Enabled	IP	Disabled
Display Language	English			
Security Level	None			
Number of channels	60			
Software version	1.02.02			

Option 1: Not Fitted

Option 2: Pakscan 2 Loop

Software version Option 2	1.0.6
P2 Modbus Address	1
Highest FCU address	25
Loop speed	1200
New loop speed	N/A
Loop speed doubling	OFF
Retain data on loss of communications	OFF
DV convert	ON
Host Port 1 Database Selection	Generic Modbus
Host Port 2 Database Selection	Yokogawa Modbus
Ethernet Database Selection	Generic Modbus
Port alarms	Separate

version: 1.02.02 based on Pakscan III technology

Fig 38: System Configuration Overview web page

This screen is accessible to Read, Write and Administrator user levels.

The screen shows the settings for the control of the option module networks and the CPU control capability, software fitted and various options selected. All of these settings can be modified elsewhere, but only by users with Administrator level access. There are no controls on this page.

The settings are explained in the Master Station Configuration page section.

7.5.4 System Diagnostics

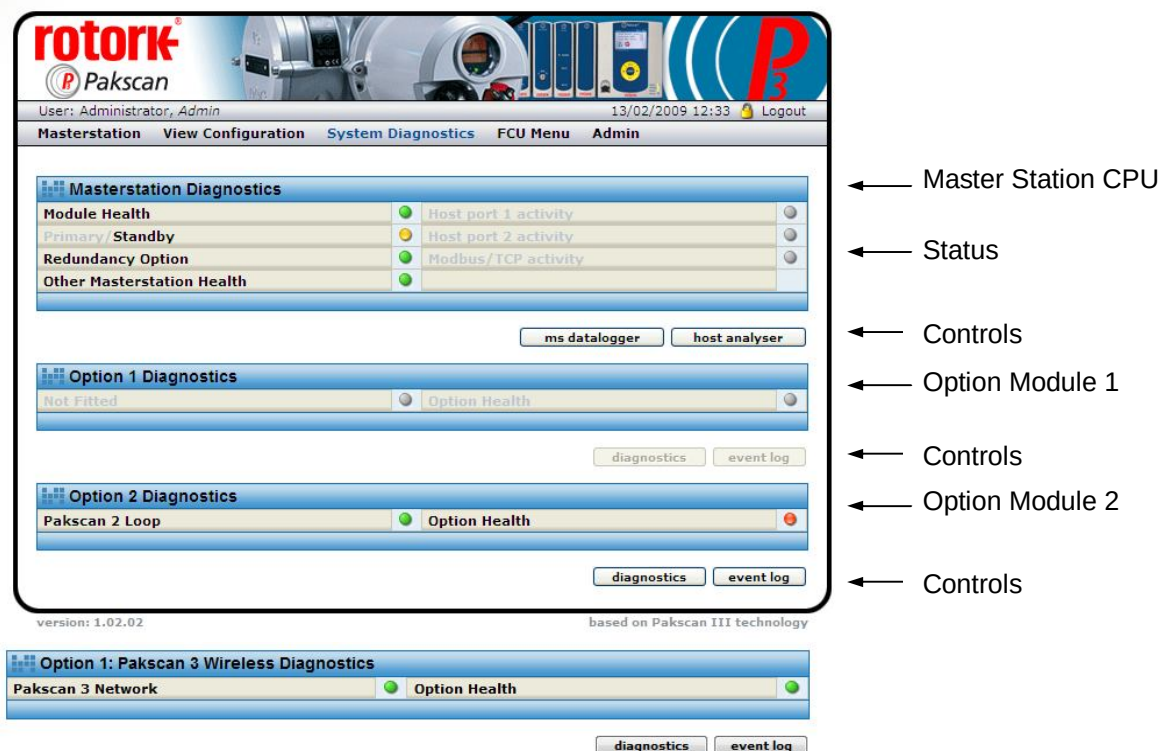


Fig 39: System Diagnostics web page wired only and option 1 data, if wireless fitted

This screen is accessible to Read, Write and Administrator user levels.

The System Diagnostics screen shows an overview of the status of the fitted modules and also provides access to further information.

Master Station Diagnostics

- Module Health** : A green light shows if the module is operating correctly, changes to red if there is a fault.
- Primary/Standby** : Indicates which module is being accessed. A green light indicates Primary, a yellow light indicates Standby and a red light indicates a fault.
- Redundancy Option** : Shows a green light if there is a partner module fitted.
- Other Master Station Health** : Indicates the absence (green light) or presence (red light) of a fault on the partner CPU.
- Host port 1 activity** : Indicates when there is serial communication taking place on communications port 1.
- Host port 2 activity** : Indicates when there is serial communication taking place on communications port 2.
- Modbus/TCP activity** : Indicates when Ethernet control using Modbus/TCP is present on either Ethernet port.

Controls - Available to all user levels

- ms datalogger : Reveals a pop-up showing a log of the activity on the master station and the source of requests or commands received. See section 7.5.5 for details.
- host analyser : Reveals a pop-up with the data logger data and the additional controls required for using the inbuilt data analyser for commands and data sent to the host system. See section 7.5.6.

Option 1 Diagnostics

- Pakscan : Shows module type and status, or 'Not Fitted' when there is nothing in the slot.
- wireless network : Shows a green light when healthy and a red light if there is a fault on the module.

Option 2 Diagnostics

- Pakscan 2 Loop : Shows module type and status, or 'Not Fitted' when there is nothing in the slot.
- Option Health : Shows a green light when healthy and a red light if there is a fault on the module.

Controls - Available (when module fitted) to all user levels

- diagnostics : Reveals the diagnostic page for the option module fitted. See section 7.5.7 Pakscan 2 Loop and section 7.5.8 Pakscan Wireless.
- event log : Shows the option module event recorder. See section 7.5.9 Pakscan 2 Loop and section 7.5.10 Pakscan Wireless.

7.5.5 Master Station Data Logger [ms datalogger]

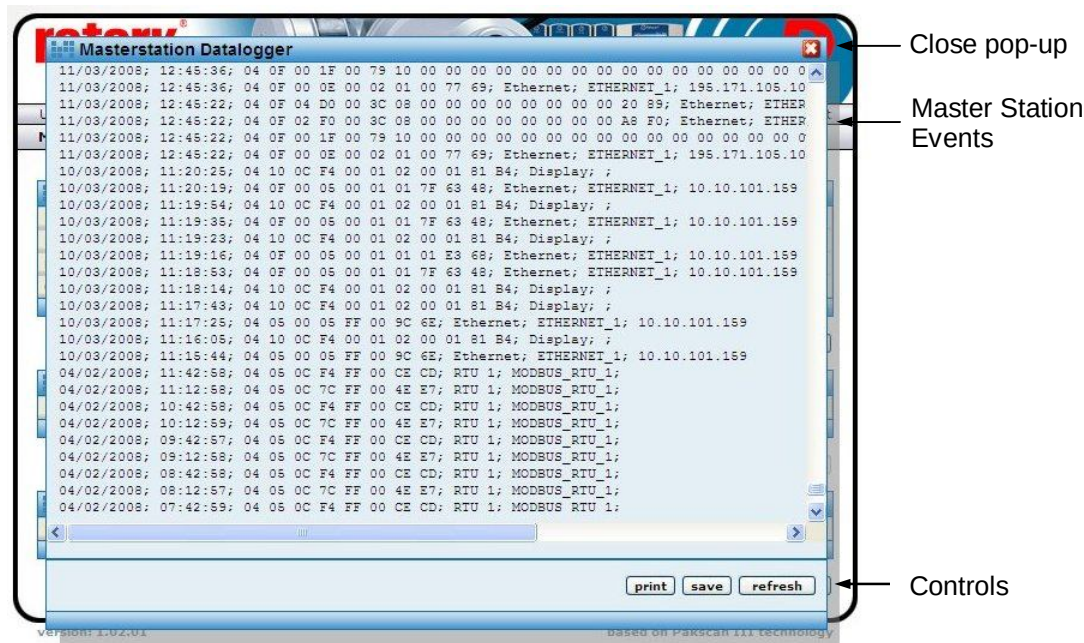


Fig 40: Master Station Data Logger pop-up

This screen is accessible to Read, Write and Administrator user levels.

The data logger displays Modbus instructions received by the master station to carry out commands such Alarm Accept or commands to move a valve. Each event is prefixed by a date and time and they are listed in time order. They are followed by the source from which the command originated. Once full the log rolls over and rewrites over the oldest events, the log is 1Mbyte in size.

Date and Time	Modbus Message	Message Source / Address
10/03/2008; 11:16:05; 04 10 0C F4 00 01 02 00 01 81 B4; Display; ;		
10/03/2008; 11:15:44; 04 05 00 05 FF 00 9C 6E; Ethernet; ETHERNET_1; 10.10.101.159		
04/02/2008; 11:42:58; 04 05 0C F4 FF 00 CE CD; RTU 1; MODBUS_RTU_1;		

Fig 41: Close up of Master Station Data Logger Information

Date and Time

Formatted Day/Month/Year or Month / Day / Year.

Modbus Message

Standard Modbus RTU format for all 'write' messages.

Message Source and Address

Display : Keypad on the master station CPU.
 Ethernet : Ethernet input and IP address of the source.
 RTU : Serial port 1 (RTU 1) or serial port 2 (RTU 2).
 Webpages : Web page Log In name and IP address.

Controls - Available to all user levels

- Print** : Prints the logger data to a printer attached to the computer.
- Save** : Saves the logger data to a file on the computer.
The saved file is of the type cmdlog.log and can be opened in the Notepad on the computer. It can also be imported into a spreadsheet, such as Excel, for analysis as required.
- Refresh** : Updates the screen with any new data.

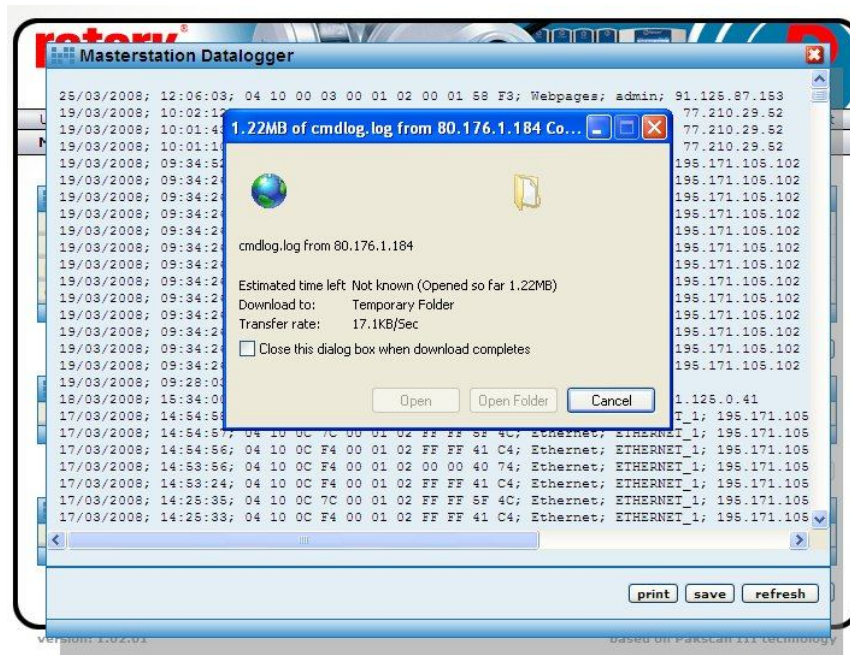


Fig 42: Saving the master station log file

7.5.6 Master Station Host Analyser [host analyser]

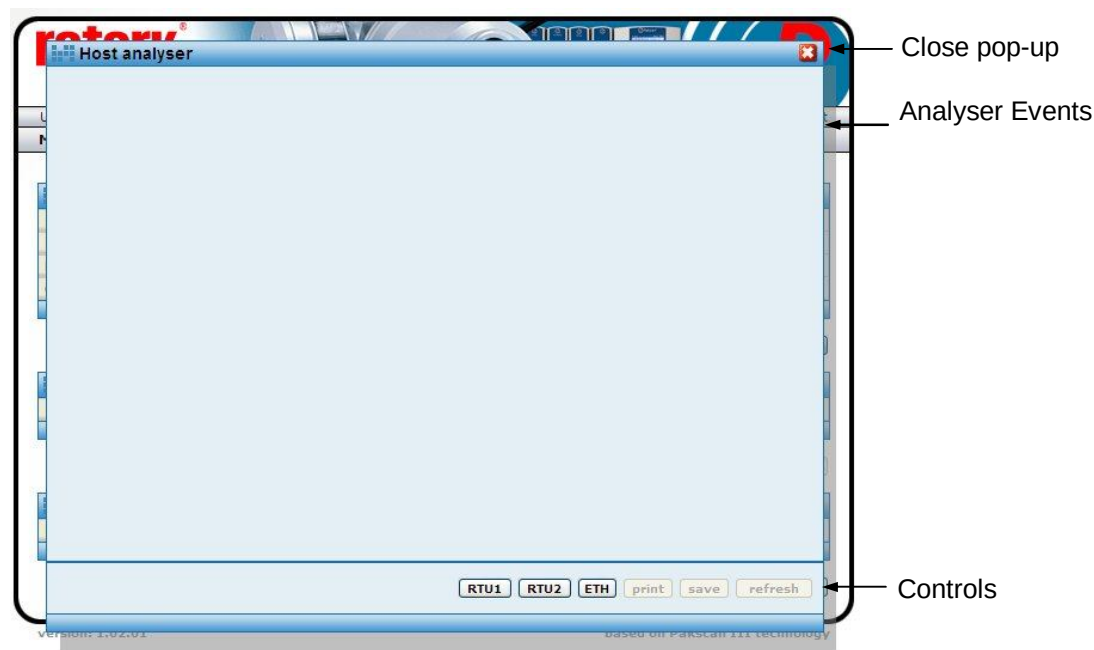


Fig 43: Host Analyser pop-up

This screen may be used by Administrator user level only.

The Host Analyser is a real time system analyser that can be used with either a Modbus RTU serial data control source, acting through one of the serial data ports (Port 1 or 2), or a Modbus TCP Ethernet control source, acting through the Ethernet ports.

The analyser will record up to 100 messages (requests and responses) on the data line between the two points. It is especially useful for debugging a host control system to ensure that messages are correctly formatted and that the required control or data points are being accessed. In particular, the use of correct offsets in the Modbus protocol can be checked.

Controls - Available to Administrator user level

- RTU1 : Selects Serial Port 1 host input.
- RTU2 : Selects Serial Port 2 host input.
- ETH : Selects the Ethernet port host input (all Ethernet ports are monitored).
- Print : Prints the analyser data to a printer attached to the computer.
- Save : Saves the analyser data to a file on the computer.
- Refresh : Updates the screen with any new data.

7.5.7 Pakscan 2 Loop Diagnostics [diagnostics]

rotork® Pakscan

User: Administrator, Admin 13/02/2009 12:36 Logout

Masterstation View Configuration System Diagnostics FCU Menu Admin

Network Diagnostics

No Of Devices On Network	25
No Of FCU's Found	25
Configuration Status	
Last Network Reset Initialised By	Loop fault on outward wire (loop complete)
Network Fault Type	No faults
Loop Baud Rate	1200
No Of FCU's On Side A	25
No Of FCU's On Side B	0

reset network

Network Map

Position	Address	Failures	Type	Tag Name
1	25	0	Integral	ROMPAK
2	3	0	Integral	-
3	24	0	GPFCU - GP	-
4	23	0	GPFCU - GP	-
5	22	0	GPFCU - GP	-
6	21	0	Integral	-
7	20	0	Integral	-
8	19	0	Integral	-
9	18	0	Integral	-
10	17	0	Integral	-
11	16	0	Integral	-
12	15	0	GPFCU - GP	-
13	6	0	GPFCU - GP	-
14	7	0	GPFCU - GP	DAN TEST
15	8	0	GPFCU - GP	-
16	9	0	GPFCU - GP	-
17	10	0	GPFCU - GP	-
18	11	0	GPFCU - GP	-
19	12	0	GPFCU - GP	-
20	2	0	Integral	-
21	5	0	Integral	-
22	14	0	Flowpak	-
23	4	0	IQ	-
24	13	0	Integral	-
25	1	0	IQ	-

version: 1.02.02 based on Pakscan III technology

Fig 44: Pakscan 2 Loop Diagnostics web page

This screen is accessible to Read, Write and Administrator user levels.

The Pakscan 2 Loop Diagnostics screen gives diagnostic information on the 2-wire loop option module and the network connected to it. The top part of the screen shows the information about the option module itself, whilst the lower part shows the loop map. This is the order in which the field units on the 2-wire loop are connected. It also shows the device type and tag name for each address and position.

Network Diagnostics

- No. Of Devices On Network : This is the number of field units that are expected to be located on the network. It is the highest address that the network will scan up to when locating field units. All field units need to be consecutively addressed, and there should be no gaps in the addresses.
- No. Of FCUs Found : This is the total number of field units located on the network. If all the field units are powered on and connected, then the number will equal the No. Of Devices On The Network above.
- Configuration Status : This field shows any fault that exists on the network cabling and the stages passed through as network configuration takes place.

During configuration the following sequence can be displayed -

1. Wait for Loopbacks 1 (first wait for loopbacks to come on)
2. Find FCUs on Port A (finding FCUs on port A)
3. Test Loop (testing for complete loop)
4. Find FCUs on Port B (finding FCUs on port B)
5. Wait for Loopbacks 2 (second wait for loopbacks to come on)
6. Loopbacks off on A (removing loopbacks from port A)
7. Loopbacks off on B (removing loopbacks from port B)

(The normal sequence for a fault-free loop would be 1, 2 and 3. A sequence for a break in the loop, anywhere except at port A or port B, would be 1 to 7. Some of the phases may be very quick, particularly at higher baud rates, and so may not be seen on the browser display.

Whilst the configuration is taking place, the master station web page shows 'Loopback in Progress' and a blue light on the Option module.

If the configuration process detects a fault on the loop and switches on the loopback circuits of two field units, the master station web page shows 'Loopback in Use' and illuminates the yellow light.

- Last Network Reset Initiated By : The loop can be reconfigured for a number of reasons and this field will show the cause of the last reset/reconfigure that occurred.
- The possible reasons are:
- | | |
|-------------------|--|
| Power on Reset | - loop configured because the master station powered up. |
| Fault Found | - fault detected on the loop whilst it was running without loopbacks present. |
| Fault Found A | - fault detected on the A side of broken loop whilst running with loopbacks on. |
| Fault Found B | - fault detected on the B side of broken loop whilst running with loopbacks on. |
| Reset Command | - loop Reconfigure command entered from keypad or serial port. |
| Return wire fault | - fault detected in the return current path whilst the loop was running at double speed. |
| Doubling failed | - fault detected after loop assumed double speed. |

Network Fault Type : This field shows the type of fault detected that caused the loopback to occur, or an addressing fault on the field units. The types are:

Zero Address	- a field unit has been found with an address of zero.
Address too High xx	- a field unit has been found with an address higher than that set up within the master station; xx is the address.
Same Address xx	- two field units found with the same address; xx is the address.
Loop Open Circuit	- an open-circuit fault found on the loop.
Loop Short Circuit	- a short-circuit fault found on the loop.

If two field units are found with the same address, or there is an address outside the range of addresses expected (as set by No. of Devices on Network), the network will continue to operate and miss out the faulty field units.

Loop Baud Rate : Shows the current speed selected. The speed can be 110, 300, 600, 1200, or 2400 baud.

No. Of FCUs On Side A : This is the total number of field units connected to the option module Port A and communicating via Port A.

No. Of FCUs On Side B : This is the total number of field units connected to the option module Port B and communicating via Port B. Port B is only used if there is a loopback present on the network.

Controls - Available to all user levels

Reset network : Causes the option module to reconfigure the 2-wire network. This should be used after a loop fault has been corrected.

Network Map

The map shows the order in which the field units have been identified and found by the option module during the last loop reconfiguration process (reset). Each time the loop is reconfigured the map is regenerated and repopulated. Any field unit that is not powered-up at the time of reconfiguration will be absent from the map.

Position : The position in the loop. Number 1 is nearest to Port A.

Address : The address of the field unit.

Failures : Shows a count of communication errors with the field unit. The count has a range of 0 to 255, after which it rolls around to zero and it increments for every communication error. The system will only announce a 'Comms failure' when 3 successive tries have failed to locate the field unit. This counter therefore reflects the communications condition and can be used as an indicator of the health of the field unit to assess the probability of failure in the future.

Type	: The type of field unit depends on the actuator and function required. Current types are -														
	<table> <tr> <td>IQ</td><td>- IQ or IQT actuator</td></tr> <tr> <td>Integral</td><td>- Non IQ actuator</td></tr> <tr> <td>Flowpak</td><td>- Flowpak actuator</td></tr> <tr> <td>GPFCU - GP</td><td>- General Purpose Field Unit</td></tr> <tr> <td>GPFCU - Act</td><td>- General Purpose in Actuator mode</td></tr> <tr> <td>IQA</td><td>- IQ Analogue card</td></tr> <tr> <td>ROMpak</td><td>- ROMpak actuator</td></tr> </table>	IQ	- IQ or IQT actuator	Integral	- Non IQ actuator	Flowpak	- Flowpak actuator	GPFCU - GP	- General Purpose Field Unit	GPFCU - Act	- General Purpose in Actuator mode	IQA	- IQ Analogue card	ROMpak	- ROMpak actuator
IQ	- IQ or IQT actuator														
Integral	- Non IQ actuator														
Flowpak	- Flowpak actuator														
GPFCU - GP	- General Purpose Field Unit														
GPFCU - Act	- General Purpose in Actuator mode														
IQA	- IQ Analogue card														
ROMpak	- ROMpak actuator														
Tag Name	: The associated identification Tag assigned to this field unit.														

7.5.8 Pakscan Wireless Diagnostics [diagnostics]

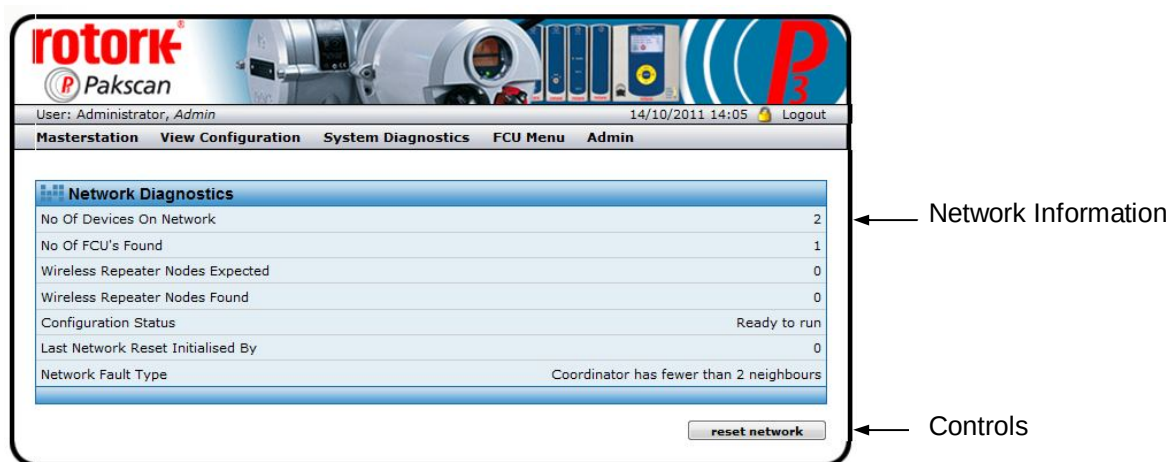


Fig 45: Pakscan Wireless Diagnostics web page

This screen is accessible to Read, Write and Administrator user levels.

The Pakscan Wireless Diagnostics screen gives diagnostic information on the wireless option module and the network connected to it.

No of Devices On Network	: This is the number of wireless field units that are expected to be located on the network. This is set up in the master station configuration web page.
No of FCUs found	: This is the total number of field units found on the network. If all the field units are powered on and able to communicate, the number will equal the number expected on the network.
Wireless repeater nodes expected	: This is the number of wireless repeater modules that are expected to be located on the network. This is set up in the master station configuration web page.
Wireless repeater nodes found	: This is the total number of wireless repeater nodes found on the network. If all the repeater nodes are powered on and able to communicate, the number will equal the number expected on the

Configuration Status	: network. During configuration of the wireless network the network goes through various stages as indicated below. Some of the stages can be quite quick and therefore may not be seen: • Uninitialised. • Initialised / starting up. • Detecting field units. • Building map of field units. • Detecting field units complete. • Obtaining initial field unit data. • Field unit data collection complete. • Network Ready to run. • Master station updating RF parameters. After a reset network command is sent from the web page, the normal sequence seen would be: Initialised / starting up, Detecting Complete, Obtaining initial Data, Data collection complete, Ready to run. 'Ready to run' is the normal state of a good network.
Last Network Reset Initialised By	: This field indicates the cause of the last reset, this can either be due to a power cycle (value will be 00), as a result of receiving a reset network command, due to a parameter change causing the Coordinator to reset or due to a Radio communications parameter change.
Network Fault Type	: This field indicates any faults on the network. Faults reported can be: • Wireless coordinator fault. • Insufficient wireless neighbours for the coordinator or the field units, the intention is always to have at least 2 neighbours. • RF parameter change failed. • Duplicate field unit address detected.

7.5.9 Pakscan 2 Loop Option Module Event Logger [Event Log]

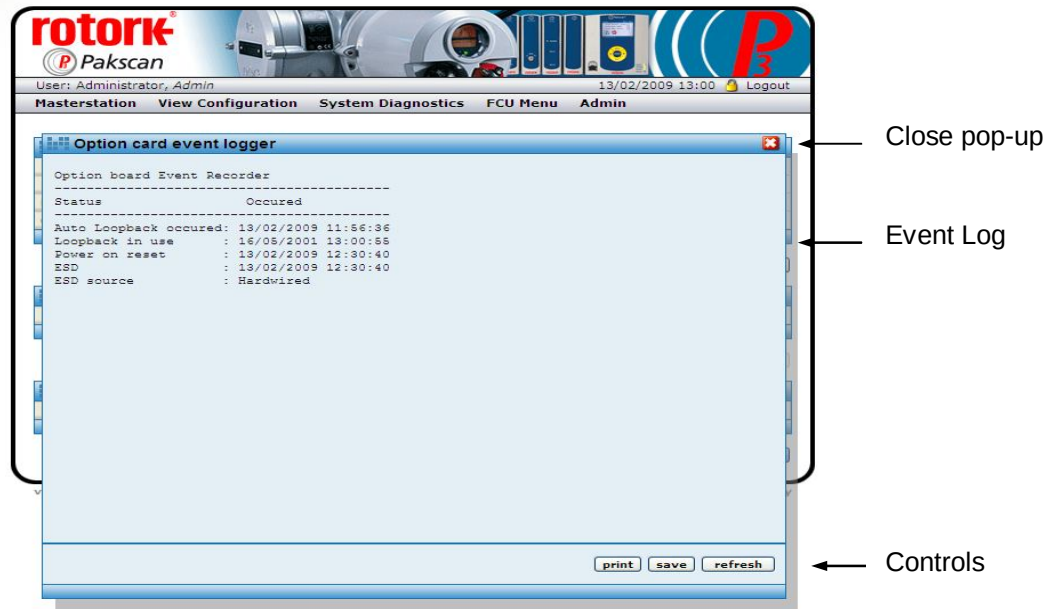


Fig 46: Wired Option Module Event Logger pop-up

This screen is accessible to Read, Write and Administrator user levels.

The event logger shows the last occurrence of the listed events and, in the case of an ESD, where the signal originated.

Controls - Available to all user levels

- Print : Prints the logger data to a printer attached to the computer.
- Save : Saves the logger data to a file on the computer.
- Refresh : Updates the screen with any new data.

7.5.10 Pakscan Wireless Option Module Event Logger [Event Log]

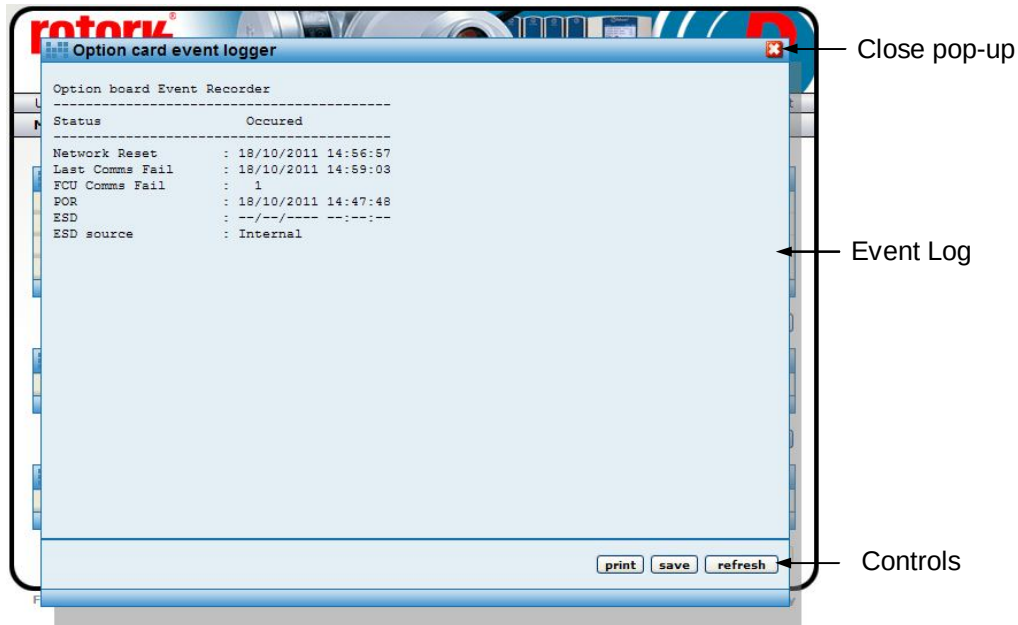


Fig 47: Wireless Option Module Event Logger pop-up

This screen is accessible to Read, Write and Administrator user levels.

The event logger shows the last occurrence of the listed events. In the case of an ESD, where the ESD signal originated is reported. In the case of the last field unit comms fail, it also indicates which field unit lost communications.

Controls - Available to all user levels

- Print : Prints the logger data to a printer attached to the computer.
- Save : Saves the logger data to a file on the computer.
- Refresh : Updates the screen with any new data.

7.5.11 FCU Menu

rotork Pakscan

User: Administrator, Admin 13/02/2009 13:01 Logout

Masterstation View Configuration System Diagnostics FCU Menu Admin

Address	Tag Name	Type	Network	Alarm	Comms Fail	Navigation
1	-	IQ	Pakscan2	●	●	FCU Control
2	-	Integral	Pakscan2	●	●	FCU Control
3	-	Integral	Pakscan2	●	●	FCU Control
4	-	IQ	Pakscan2	●	●	FCU Control
5	-	Integral	Pakscan2	●	●	FCU Control
6	-	GPFCU - GP	Pakscan2	●	●	FCU Control
7	DAN TEST	GPFCU - GP	Pakscan2	●	●	FCU Control
8	-	GPFCU - GP	Pakscan2	●	●	FCU Control
9	-	GPFCU - GP	Pakscan2	●	●	FCU Control
10	-	GPFCU - GP	Pakscan2	●	●	FCU Control
11	-	GPFCU - GP	Pakscan2	●	●	FCU Control
12	-	GPFCU - GP	Pakscan2	●	●	FCU Control
13	-	Integral	Pakscan2	●	●	FCU Control
14	-	Flowpak	Pakscan2	●	●	FCU Control
15	-	GPFCU - GP	Pakscan2	●	●	FCU Control
16	-	Integral	Pakscan2	●	●	FCU Control
17	-	Integral	Pakscan2	●	●	FCU Control
18	-	Integral	Pakscan2	●	●	FCU Control
19	-	Integral	Pakscan2	●	●	FCU Control
20	-	Integral	Pakscan2	●	●	FCU Control
21	-	Integral	Pakscan2	●	●	FCU Control
22	-	GPFCU - GP	Pakscan2	●	●	FCU Control
23	-	GPFCU - GP	Pakscan2	●	●	FCU Control
24	-	GPFCU - GP	Pakscan2	●	●	FCU Control
25	ROMPAK	Integral	Pakscan2	●	●	FCU Control

version: 1.02.02 based on Pakscan III technology

Fig 48: FCU Menu web page

This screen is accessible to Read, Write and Administrator user levels.

The FCU Menu lists all the field units in address order (which may not be the same as the order in which they are connected together on the wired loop).

For each address, the Tag name and Type of field unit is listed. Field unit types are described in section 7.5.7. The Network column shows which option module network each actuator is connected to; this will be Pakscan 2 for the 2-wire loop option module and Wireless for the wireless option.

The next two columns show critical alarm conditions that will prevent remote control of the actuator. An Alarm present will generally prevent operation, whilst Comms Fail indicates that the actuator is no longer in communication with the field network.

The final column has Navigation controls to the individual FCU screens.

Controls - Available to all user levels

FCU Control : Click here to show the selected FCU individual control panel web page. The different types of devices each have different screens and only the relevant data and controls for each type are included on the screen, together with a picture identifying the type of device.

When not in communication the screen may still be visited, but the actuator picture will have a large red cross over it to show that a problem exists.