MiCOM Px3x Series REB

Redundant Ethernet Board

REB/EN M/B22

Supplement to the Technical Manual

Changes after going to press

Table of Contents

1 Introduction

Protection devices in the MiCOM 30 series are described in detail in the respective operating manuals as regards technical properties, functional characteristics, and proper handling during installation, connection, commissioning, and operation. However, the operating manuals do not provide any information regarding the philosophy behind each specific product or the way in which the functional possibilities of a particular protection device can be used to handle special applications.

The present application guide for the Redundant Ethernet Board is intended to close such gap. The purpose is to give the reader a better understanding of the design of the individual function blocks and then to provide related instructions for settings and application.

The Redundant Ethernet Board assures redundancy at IED level. For safety information please see the Safety Section of the relevant Px3x IED Technical Manual.

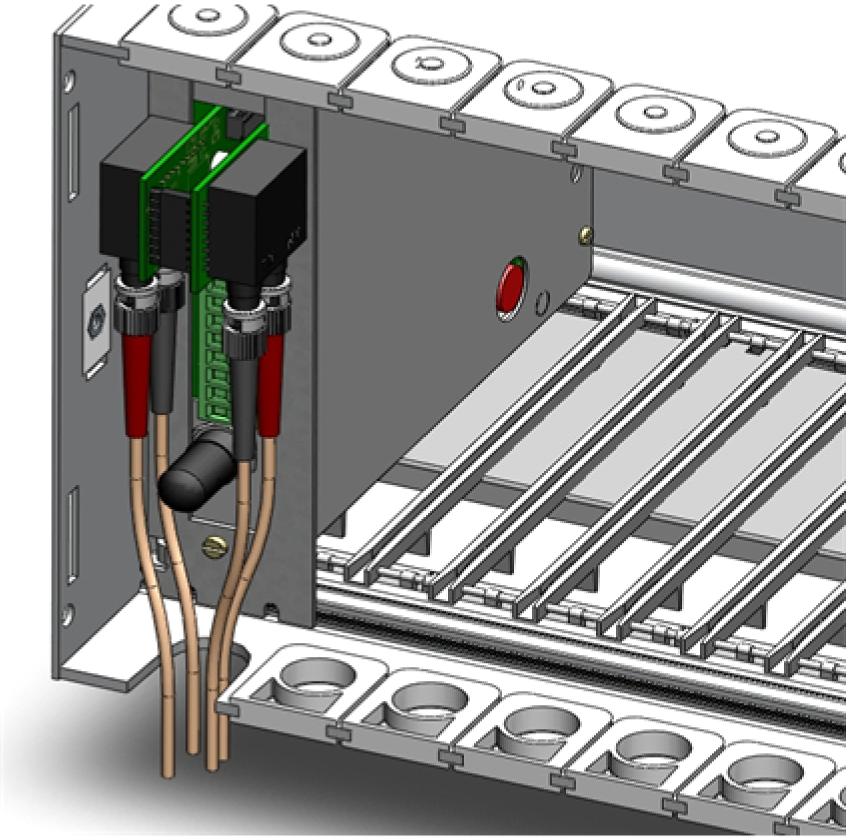


Fig. 1-1: MiCOM Px3x Redundant Ethernet Board, project view.

2 Hardware Description

Two boards are available for using IEC 61850, the single Ethernet board and the Redundant Ethernet Board. Both are required for communications but the Redundant Ethernet Board allows an alternative path to be always available, providing bumpless redundancy.

Industrial network failure can be disastrous. Redundancy provides increased safety and reliability, but also devices can be added to or removed from the network without network downtime.

2.1 Px3x Redundancy Protocols

The following list shows Schneider Electric's implementation of Ethernet redundancy, which has four variants with embedded IEC 61850, plus SHP, RSTP, DHP and PRP redundancy protocols.

SHP

- Self Healing Protocol (SHP) 1300 nm multi mode 100BaseFx fiber optic Ethernet ports (ST® connector) and modulated IRIG-B input.

This board offers compatibility with C264-SWR202 and MiCOM H35x multi-mode switches. Self Healing Protocol is a Schneider Electric proprietary solution providing extremely fast recovery time.

RSTP

- Rapid Spanning Tree Protocol (RSTP IEEE 802.1w) 1300 nm multi mode 100BaseFx fiber optic Ethernet ports (ST® connector) and modulated IRIG-B input.

This board offers compatibility with any RSTP device.

DHP

- Dual Homing Protocol (DHP) 1300 nm multi mode 100BaseFx fiber optic Ethernet ports (ST® connector) and modulated IRIG-B input.

This board offers compatibility with C264-SWD202 and MiCOM H36x multi-mode switches. Dual Homing Protocol is a Schneider Electric proprietary solution providing bumpless redundancy to the IED.

PRP

- Parallel Redundancy Protocol (PRP IEC 62439-3 (2012)) 1300 nm multi mode 100BaseFx fiber-optic Ethernet ports (ST® connector) and modulated IRIG-B input.

All of these boards have connections for a watchdog relay and an RS 485 link.

The Redundant Ethernet Board is fitted into Slot 2 of the IED. Each Ethernet board has two MAC addresses, one for the managed embedded switch and one for the IED.

2.2 Modules

The MiCOM Px3x devices are constructed from standard hardware modules. The following table lists the item numbers of the four variants of the Redundant Ethernet board:

Type	Item number	Description	Width
A	9651 531	KE Dual Ethernet SHP + RS 485 + IRIG-B	4 TE
A	9651 532	KE Dual Ethernet RSTP + RS 485 + IRIG-B	4 TE
A	9651 533	KE Dual Ethernet DualHoming + RS 485 + IRIG-B	4 TE
A	9652 036	KE Dual Ethernet PRP + RS 485 + IRIG-B	4 TE

Tab. 2-1: Redundant Ethernet board variants.

2.3 Redundant Ethernet Board Connection

The diagram and the related tables below show the global Interface arrangement of all board connectors, as they are the fiber optic connectors, the serial interface and the watchdog relay contacts. The available IRIG-B connector is designed as a modulated input.

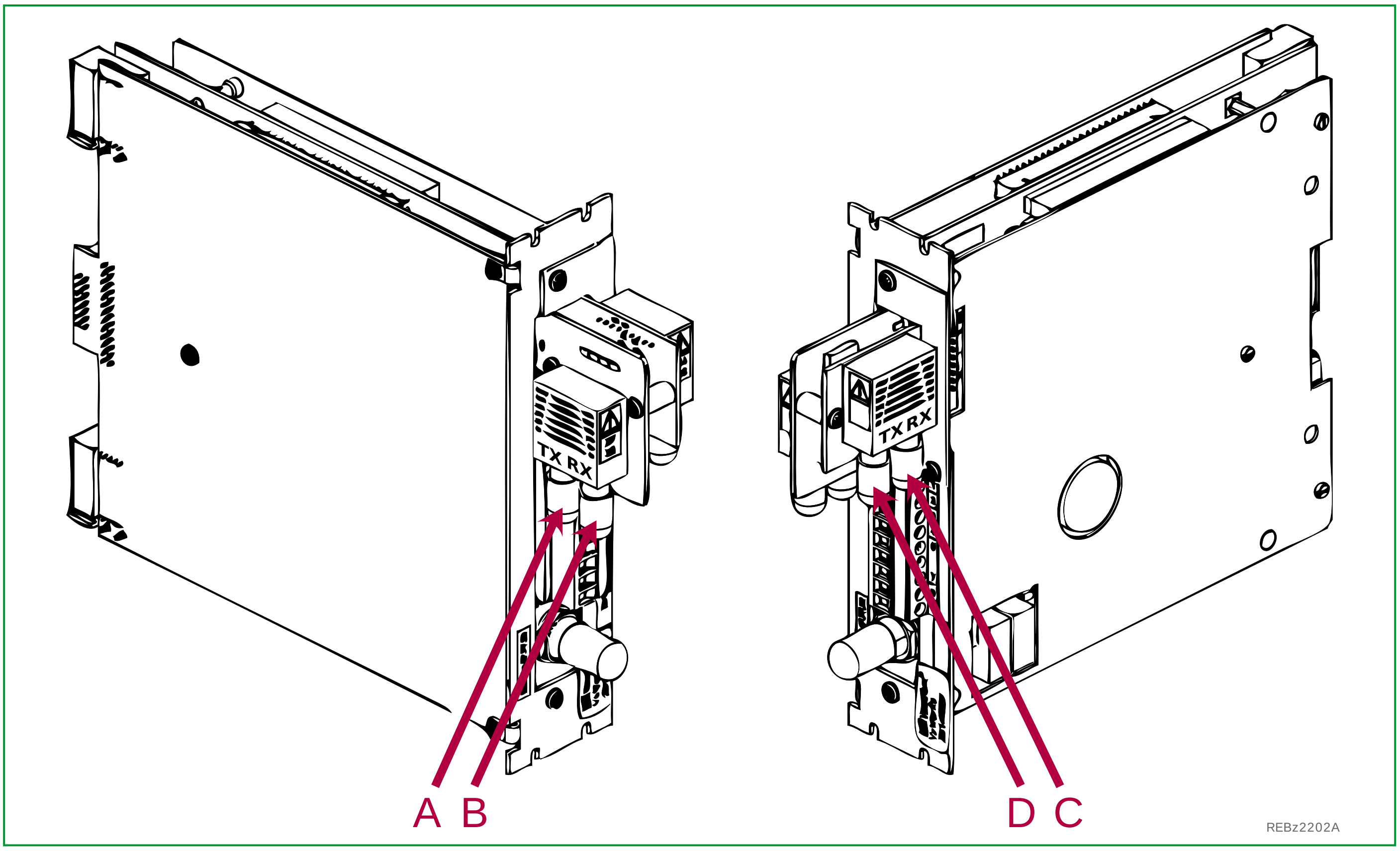


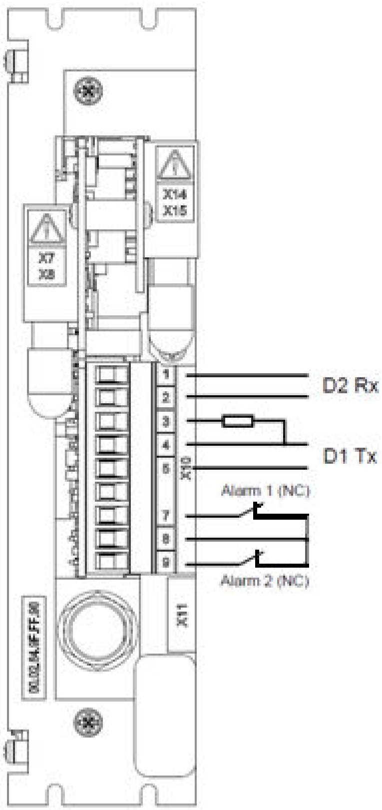
Fig. 2-1: Redundant Ethernet Board connectors.

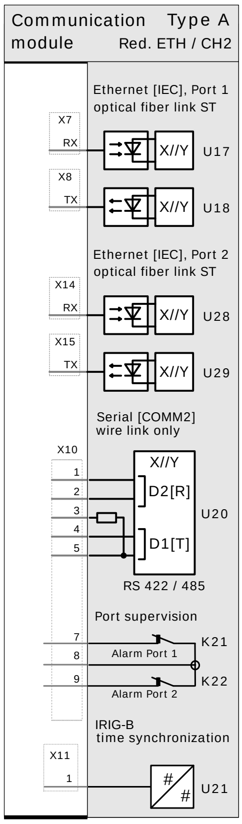
Connector	SHP	RSTP	DHP	PRP
A (-X8)	E_S	T_{X1}	T_{XA}	T_{XA}
B (-X7)	R_P	R_{X1}	R_{XA}	R_{XA}
C (-X14)	R_S	R_{X2}	R_{XB}	R_{XB}
D (-X15)	E_P	T_{X2}	T_{XB}	T_{XB}

Tab. 2-2: Optical fiber connector functionality.

LED	Function	On	Off	Flashing
Green	Link	Link o.k.	Link broken	
Yellow	Activity	SHP running		PRP / RSTP or DHP traffic

Tab. 2-3: LED functionality





Tab. 2-4: Redundant Ethernet Board connection.

Pin	Connections
1–2	D2 Rx
3	220 Ω terminator resistor
4–5	D1 Tx

Tab. 2-5: RS 422 / 485 configuration and default values.

Pin	Open	Closed
7–8	Link o.k. Channel 1 (A)	Link fail Channel 1 (A)
8–9	Link o.k. Channel 2 (B)	Link fail Channel 2 (B)

Tab. 2-6: Fiber defect connector (watchdog relay) configuration and default values.

3 Redundancy Protocols

There are four redundancy protocols available:

- PRP (Parallel Redundancy Protocol)
- RSTP (Rapid Spanning Tree Protocol)
- SHP (Self Healing Protocol)
- DHP (Dual Homing Protocol)

3.1 Parallel Redundancy Protocol (PRP)

The Parallel Redundancy Protocol used in the MiCOM Px3x devices is defined in Clause 4 of the IEC 62439-3 (2012) standard.

The PRP is a “redundancy in the devices” method that provides bumpless switchover in case of failure or reintegration. Furthermore, it provides the shortest Ethernet network reconfiguration time as network reconfiguration is seamless.

The PRP uses two independent Ethernet networks that operate in parallel. Each message is replicated and sent over both networks. The first network node that receives a message will processes, all later copies of the received message will be discarded. It is important to note that these details of replicating and discarding messages are controlled by the low-level PRP layer of the network architecture, and that the two networks are hidden from the higher-level layers. Thus, PRP-based networks provide a high degree of robustness and resilience.

Essentially, a PRP network consists of a pair of similar Local Area Networks (LANs) which can be any topology (tree, ring or mesh). An example of a PRP network is shown in the following figure.

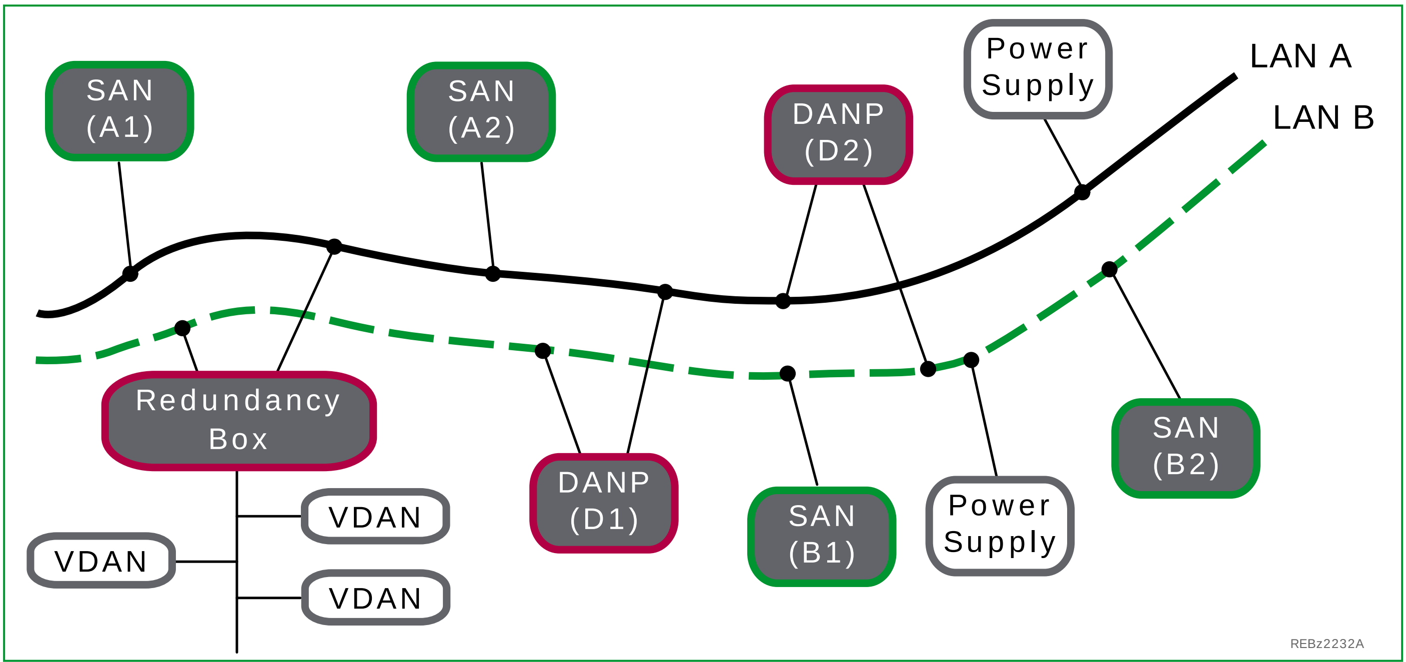


Fig. 3-1: PRP Redundancy Network.

The key features of a PRP redundancy network include:

- Two Ethernet networks (LANs), completely separated, operating in parallel.

  With the exception of a Redundancy Box (RedBox, see below), no direct cable connections can be made between the two LANs.

  LAN A and LAN B must be powered from different power supply sources.

  LAN A and LAN B can differ in terms of performance and topology, transmission delays can also be different between related nodes of the two LANs.
- Each of the two LANs can have one or more “Single Attached Nodes” (SANs). These are normally non-critical devices that are attached only to a single network. SANs can communicate with each other, but only if they are attached to the same LAN.
- Matched pairs of devices which are critical to the operation of the overall scheme have an interface to each LAN, hence they are called “Dual Attached Nodes” (DANs). DANs having the PRP implemented are called “DANs with PRP implemented” (DANP).
- To be sure that network messages (also known as “frames”) are transferred correctly to each device at the DAN, each device must have the same Media Access Control (MAC) code and Internet Protocol (IP) address. As a result, TCP/IP traffic will automatically communicate with both of the paired devices, so it will be unaware of any two-layer redundancy or frame duplication issues.
- A Redundancy Box (RedBox) is used when a single interface node has to be connected to both LANs. The RedBox can communicate with all other nodes. So far as other nodes are concerned, the RedBox behaves like a DAN, so a RedBox is also called a “Virtual DAN” (VDAN). The RedBox must have its own unique IP address.

3.2 Rapid Spanning Tree Protocol (RSTP)

RSTP is a standard used to quickly reconnect a network fault by finding an alternative path, allowing loop-free network topology. Although RSTP can recover network faults quickly, the fault recovery time depends on the number of devices and the topology. The recovery time also depends on the time taken by the devices to determine the root bridge and compute the port roles (discarding, learning, forwarding). The devices do this by exchanging Bridge Protocol Data Units (BPDUs) containing information about bridge IDs and root path costs. See the IEEE 802.1w standard for further information.

The Px3x Redundant Ethernet Board uses the RSTP protocol, so a Px3x can attach onto a network as shown in the following figure.

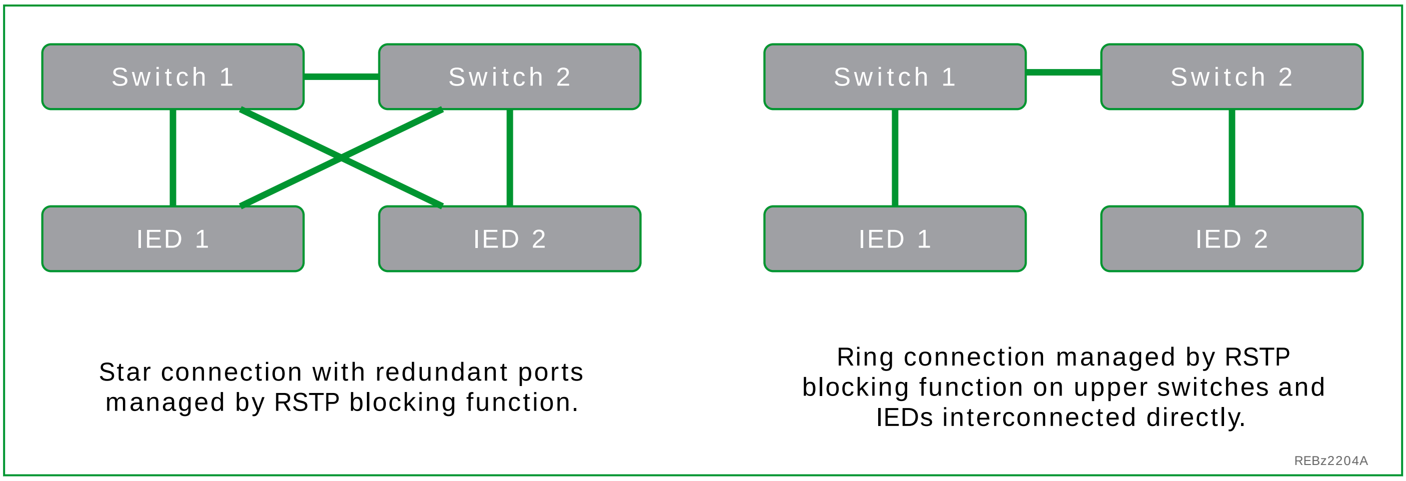


Fig. 3-2: IED attached to a redundant Ethernet star or ring circuit.

The RSTP solution is based on open standards. It is therefore compatible with other manufacturers' IEDs that use the RSTP protocol. The RSTP recovery time is typically 300 ms but it increases with network size. However, the Schneider Electric dual homing protocol (DHP) solution and Schneider Electric self healing protocol (SHP) solution respond to the constraints of critical time applications such as GOOSE.

3.3 Self Healing Protocol (SHP)

SHP is applied to double ring network topologies. When a fiber is broken, both end stations detect the break. Using both the primary and redundant networks the ring is automatically reclosed.

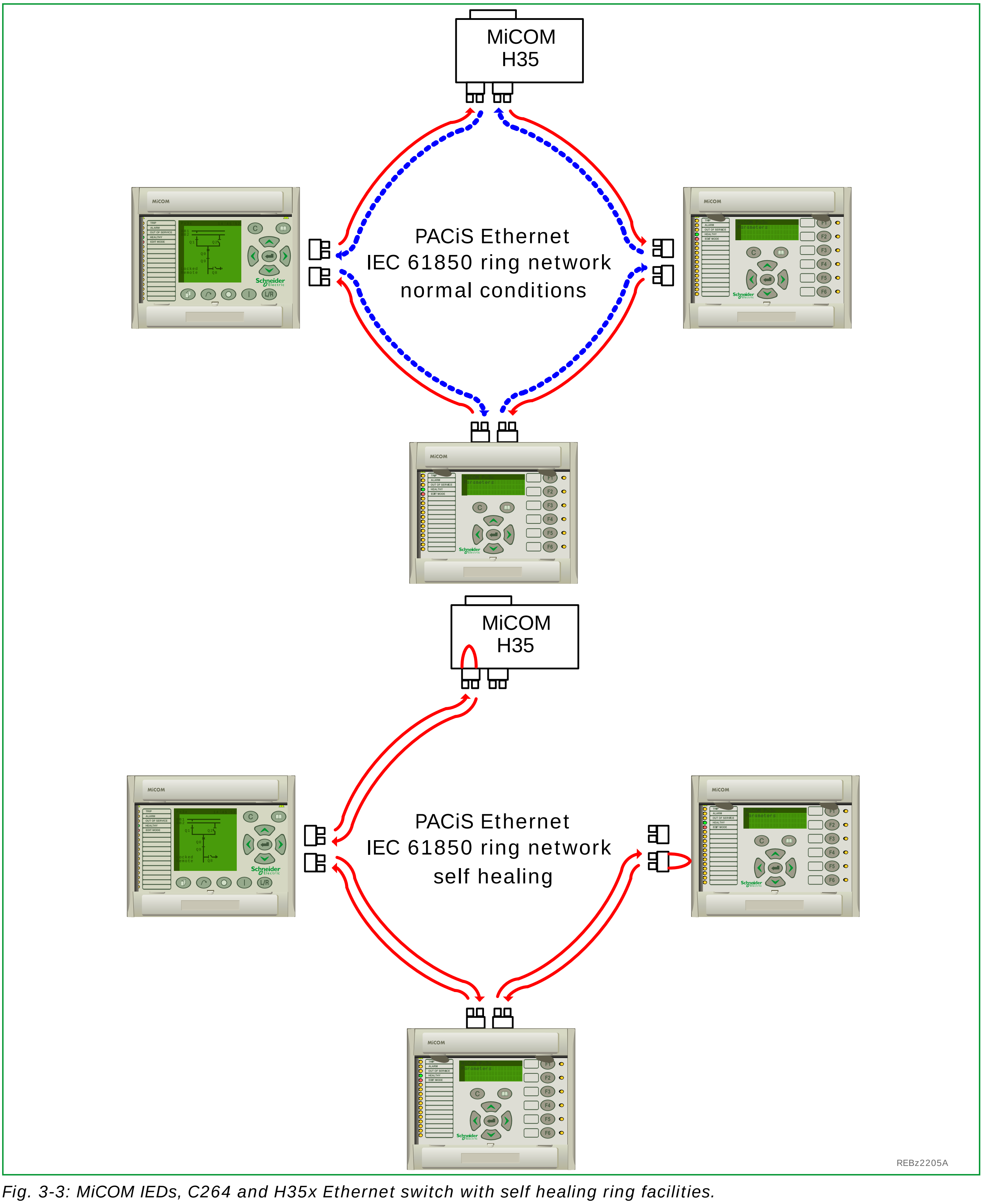


Fig. 3-3: MiCOM IEDs, C264 and H35x Ethernet switch with self healing ring facilities.

The MiCOM Px3x, C264 and H35x are repeaters with a standard 802.3 Ethernet switch plus the self healing manager (SHM). The figure below shows the internal architecture of such a device.

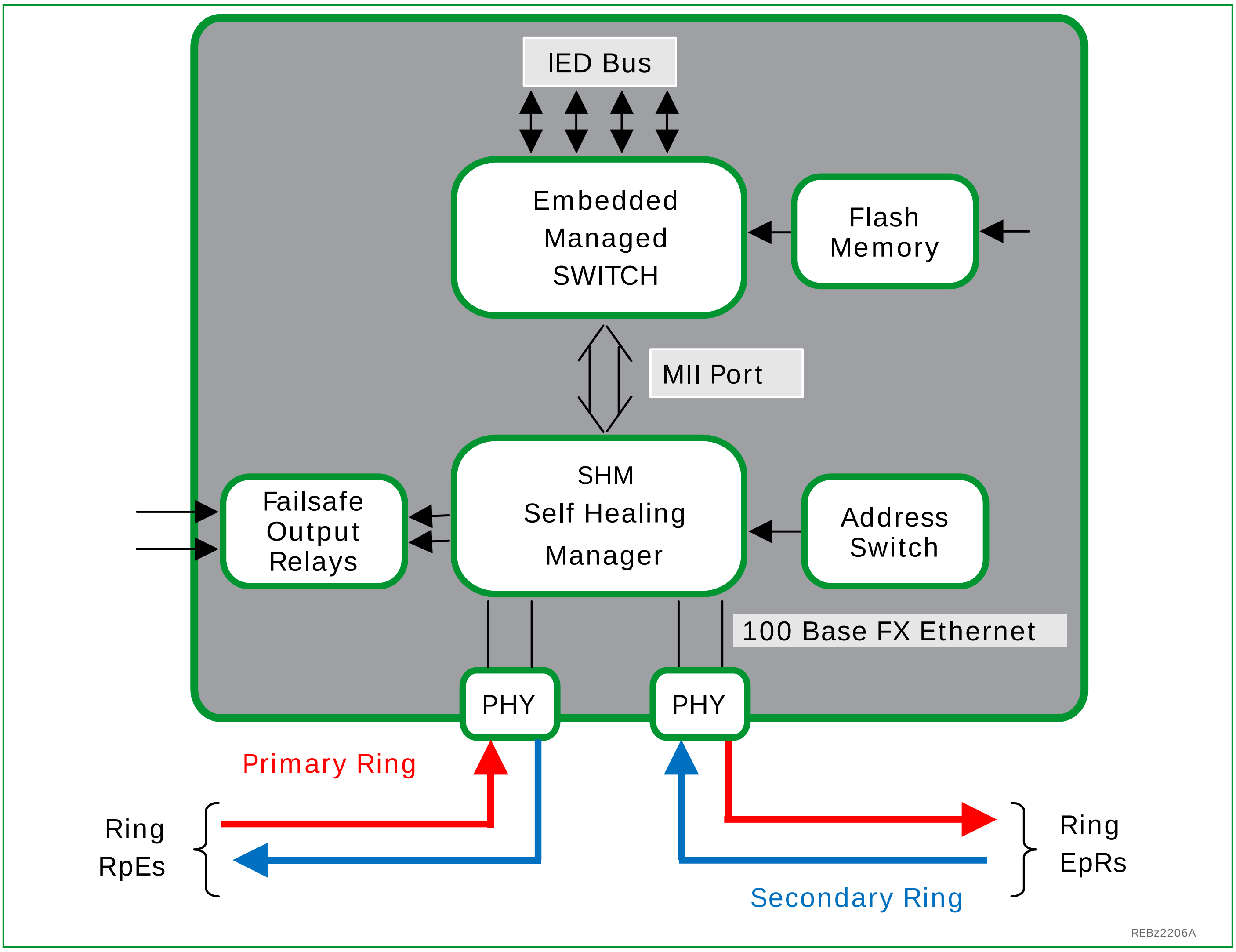


Fig. 3-4: Internal architecture of MiCOM IEDs, and C264 and H35x switches.

The SHM functions manage the ring. If the fiber optic connection between two devices is broken, the network continues to run correctly.

Normally the Ethernet packets travel on the primary fiber in the same direction, and only a checking frame (4 octets) is sent every 5 µs on the secondary fiber in the opposite direction.

If the link goes down, both SHM's immediately start the network self-healing. At one side of the break, received messages are no longer sent to the primary fiber but are sent to the secondary fiber. On the other side of the break, messages received on the secondary fiber are sent to the primary fiber and the new topological loop is closed in less than 1 ms.

It is therefore possible to extend the number of devices, or the size of a sub-station network, without stopping the network. The loop is opened and it self heals, then new equipment is connected and it self heals again, closing the loop.

To increase the reliability some specific mechanisms are used:

- The quality of transmission is monitored. Each frame (Ethernet packet or checking frame) is controlled by the SHM.
- Even if there is no traffic in the primary link, the secondary link is still supervised by sending out checking frames every 5 µs.

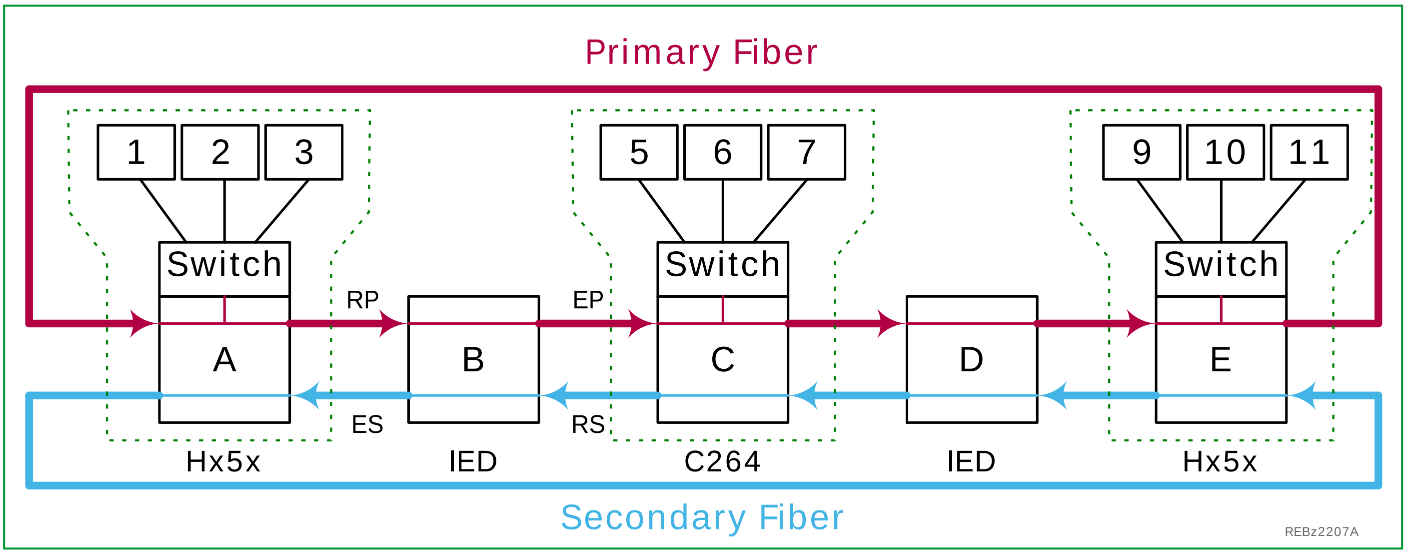


Fig. 3-5: SHP ring architecture with Px3x, C264 and Hx5x switches.

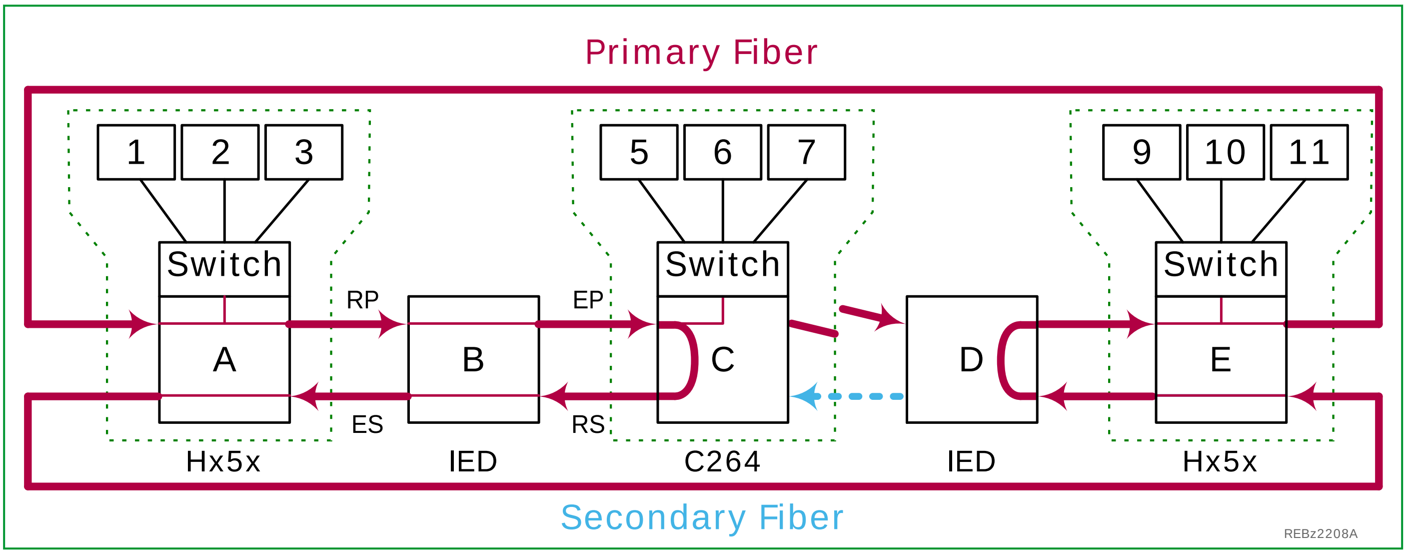


Fig. 3-6: SHP ring architecture with Px3x, C264 and Hx5x switches with failure.

3.4 Dual Homing Protocol (DHP)

The dual homing mechanism functions manage the double star. If the optical fiber connection between two devices is broken, the network continues to operate correctly.

The dual homing mechanism handles topologies where a device is connected to two independent networks. One is the main link, the other is the backup. Both are active at the same time.

In sending mode, packets from the device are sent by the DHM to the two networks. In receive mode, the duplicate discard principle is used. This means that when both links are up, the MiCOM H36x receives the same Ethernet frame twice. The Dual Homing Manager transmits the first frame received to upper layers for processing, and the second frame is discarded. If one link is down, the frame is sent through the link, received by the device, and passed to upper layers for processing.

Schneider Electric's dual homing mechanism fulfills automation requirements by delivering a very fast recovery time for the entire network (less than 1 ms).

To increase reliability some specific mechanisms are used:

- Each frame carries a sequence number which is incremented and inserted into both frames.
- Specific frames are used to synchronize the discard mechanism.

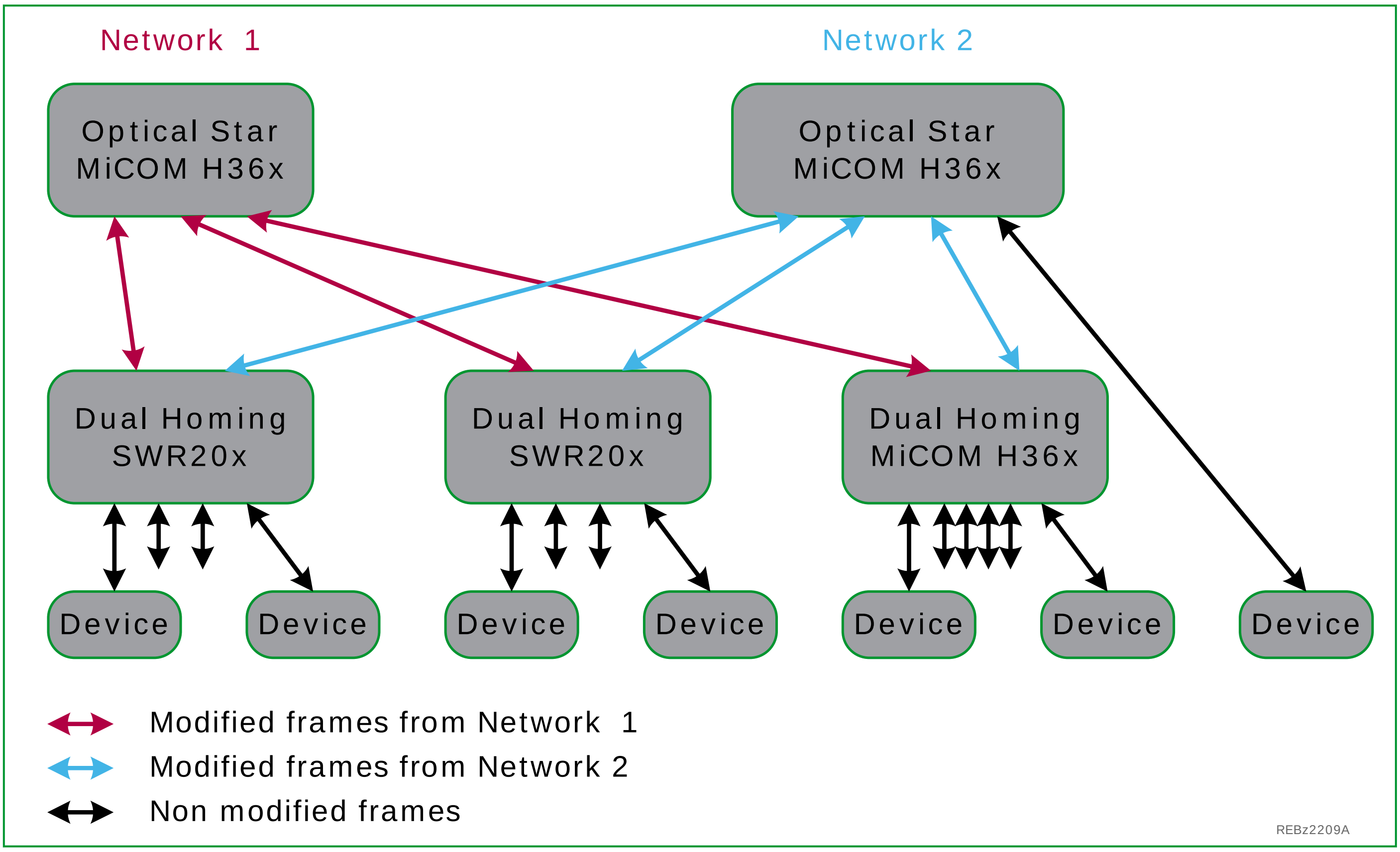


Fig. 3-7: Dual homing mechanism.

The MiCOM H36x is a repeater with a standard 802.3 Ethernet switch, plus the dual homing manager. The following figure shows the internal architecture of such a device.

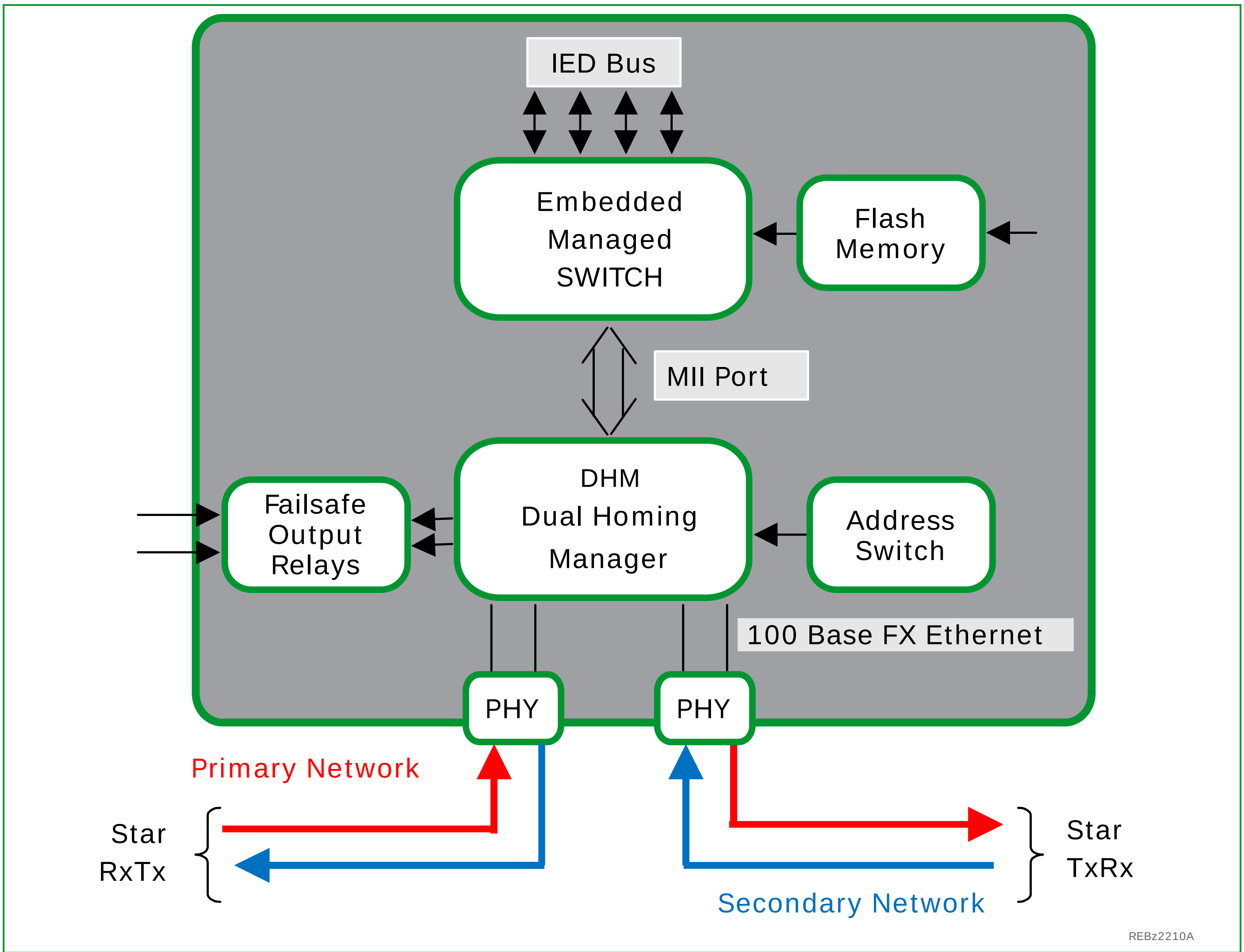


Fig. 3-8: Internal architecture of MiCOM IEDs, and C264 and H36x switches.

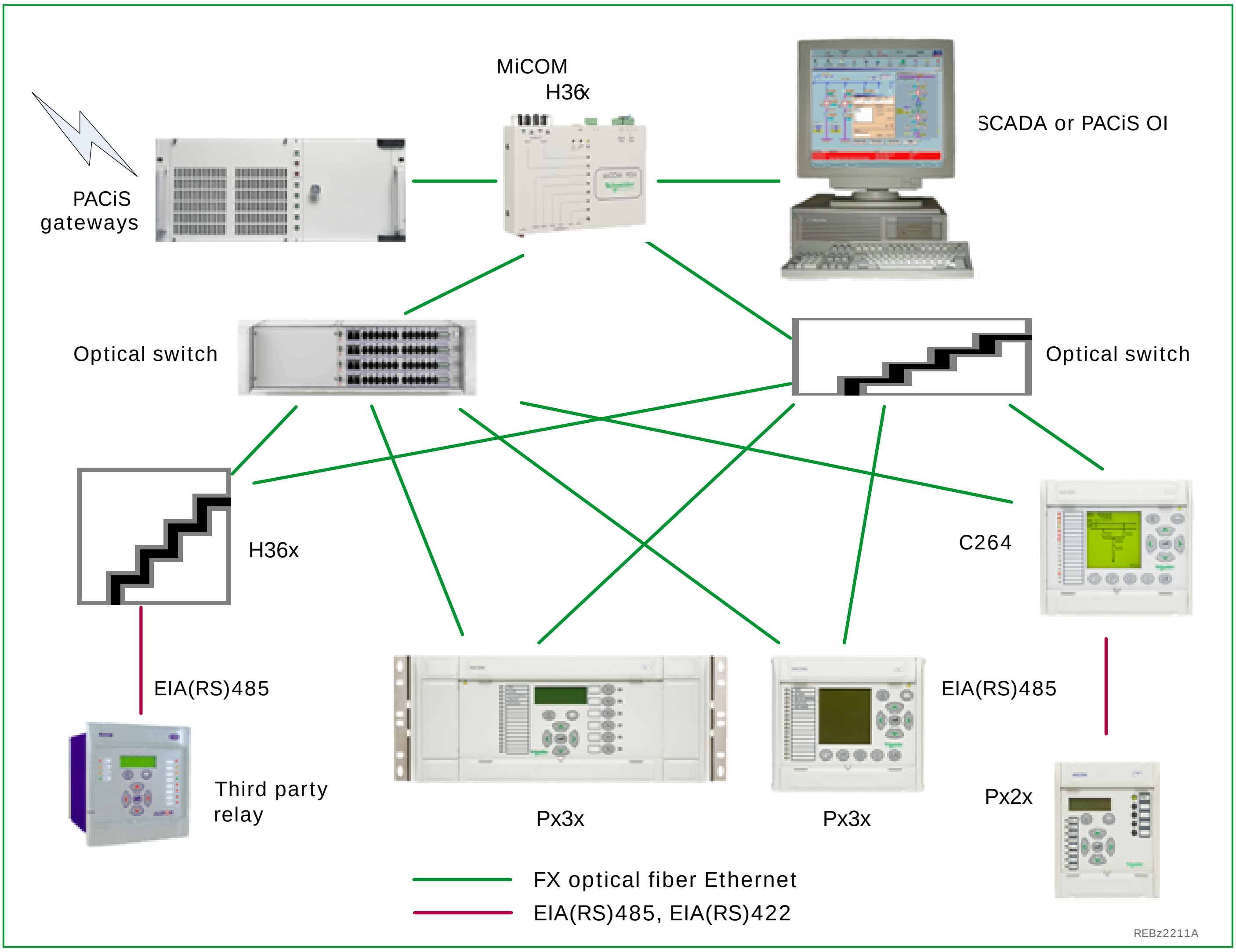


Fig. 3-9: Application of dual homing star at substation level.

3.5 Generic Functions for All Redundant Ethernet Boards

The following apply to all four redundant Ethernet protocols (SHP, RSTP, DHP and PRP).

3.5.1 Ethernet 100Base Fx

The fiber optic ports are full duplex 100 Mbps ST connectors.

3.5.2 Forwarding

The MiCOM P30, P40 series, C264 and MiCOM H switches support store and forward mode. The MiCOM switch forwards messages with known addresses to the appropriate port. The messages with unknown addresses, the broadcast messages and the multicast messages are forwarded out to all ports except the source port. MiCOM switches do not forward error packets, 802.3x pause frames or local packets.

3.5.3 Priority Tagging

802.1p priority is enabled on all ports.

3.5.4 Simple Network Management Protocol – SNMP

Simple Network Management Protocol (SNMP) is the network protocol developed to manage devices in an IP network. SNMP relies on a Management Information Base (MIB) that contains information about parameters to supervise. The MIB format is a tree structure, with each node in the tree identified by a numerical Object IDentifier (OID). Each OID identifies a variable that can be read or set using SNMP with the appropriate software. The information in the MIBs is standardized.

3.5.5 Redundant Ethernet Board MIB Structure

The SNMP MIB consists of distinct OIDs, each of which refers to a defined collection of specific information used to manage devices on the Schneider Electric network. The Schneider Electric MIB uses three types of OID (sysDescr, sysUpTime and sysName).

Address												Name
0												CCITT
	1											ISO
		3										Org
			6									DOD
				1								Internet
					2							mgmt
						1						Mib-2
							1					sys
								1				sysDescr
								3				sysUpTime
								4				sysName

Tab. 3-1: Redundant Ethernet Board MIB Structure.

3.5.6 Remote monitoring (RMON)

Address												Name
							16					RMON
								1				statistics
									1			etherstat
										1		etherStatsEntry
											9	etherStatsUndersizePkts
											10	etherStatsOversizePkts
											12	etherStatsJabbers
											13	etherStatsCollisions
											14	etherStatsPkts64Octets
											15	etherStatsPkts65to127Octets
											16	etherStatsPkts128to255Octets
											17	etherStatsPkts256to511Octets
											18	etherStatsPkts512to1023Octets

Tab. 3-2: Remote monitoring (RMON) Structure.

Various SNMP client software tools can be used with the MiCOM P30, P40, C264 and Hx5x range. Schneider Electric recommends using an SNMP MIB browser which can perform the basic SNMP operations such as GET, GETNEXT, RESPONSE.

To access the network using SNMP, use the IP address of the embedded switch in the Redundant Ethernet Board. See Section 4.2, (p. 4-3).

3.5.7 Simple Network Time Protocol – SNTP

Simple Network Time Protocol is supported by both the IED and the Redundant Ethernet switch. SNTP is used to synchronize the clocks of computer systems over packet-switched, variable-latency data networks. A jitter buffer is used to reduce the effects of variable latency introduced by queuing in packet switched networks, ensuring a continuous data stream over the network.

The IED receives the synchronization from the SNTP server. This is done using the IP address of the SNTP server entered into the IED from the *IED Configurator* software.

4 Configuration

An Internet Protocol (IP) address is a logical address assigned to devices in a computer network that uses the Internet Protocol for communication between nodes. IP addresses are stored as binary numbers but they are usually displayed in the following format.

`10.86.254.85`

Both the IED and the Redundant Ethernet Board have their own IP address. The figure below shows the IED as IP1 and the Redundant Ethernet Board (REB) as IP2. Note that IP1 and IP2 must be different and in the same subnet mask.

The switch IP address must be configured through the network.

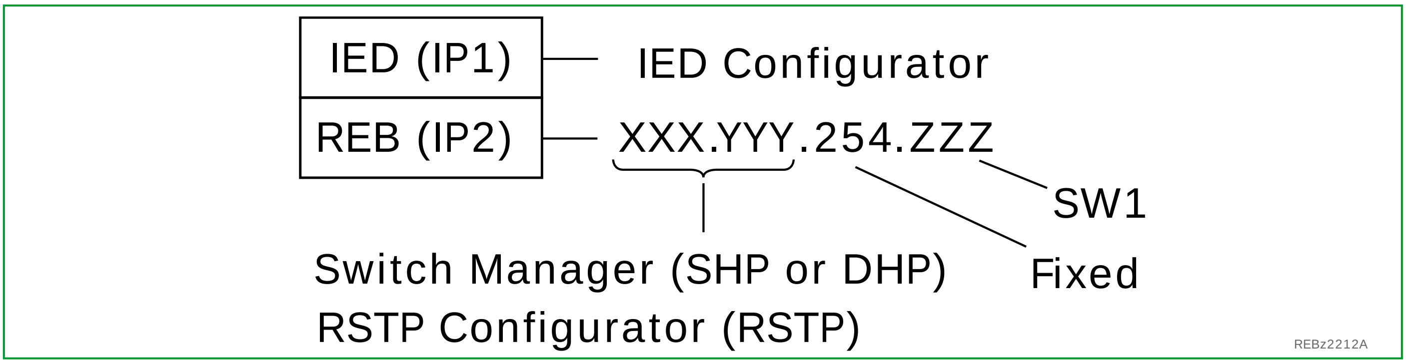


Fig. 4-1: IED and Redundant Ethernet Board IP address configuration.

4.1 Configuring the IED IP Address

The IP address of the IED is configured using the IED Configurator software in MiCOM S1 Studio. If using IEC 61850 the IED IP address is set using the IED Configurator. The available range is 1 to 254 in the last octet of the IED IP address. It is recommended to select an octet from the range 128 to 254 to avoid a potential equality with the board IP address.

In the IED Configurator, set the port type to Copper, not Fiber.

4.2 Configuring the Board IP Address

The IP address of the Redundant Ethernet Board is configured in both software and hardware, as shown in Fig. 4-1, (p. 4-1). Therefore this must be configured before connecting the IED to the network to avoid an IP address conflict.

Configuring the First Two Octets of the Board IP Address

If using Self Healing Protocol or Dual Homing Protocol, the first two octets are configured using Switch Manager or an SNMP MIB browser (see Section 3.5, (p. 3-12)). An H35 (SHP) or H36 (DHP) network device is needed in the network to configure the Redundant Ethernet Board IP address using SNMP.

If using Rapid Spanning Tree Protocol, the first two octets are configured using the RSTP Configurator software tool or using an SNMP MIB browser.

The Third Octet of the Board IP Address

The third octet is fixed at 254, regardless of the protocol.

Configuring the Last Octet of the Board IP Address

The last octet is configured using address switches on the board. There can either a “vertical switch” or a “horizontal switch” be fitted on the board. The available address range is 1 to 127. See the figure below.

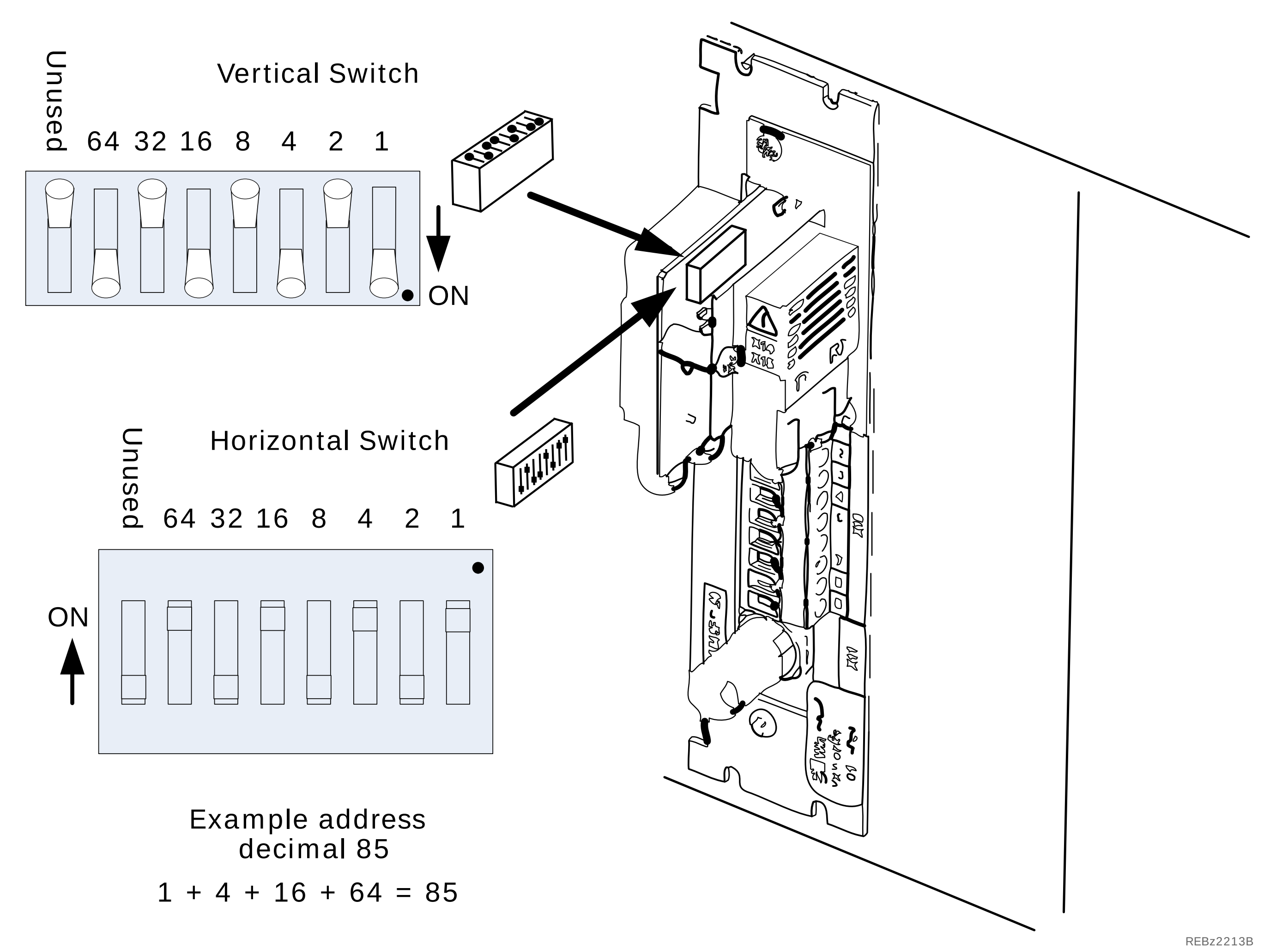


Fig. 4-2: Redundant Ethernet board address switches.

4.3 Switch Manager Software

For further information see the *Switch Manager Operation Guide*.

4.4 RSTP Configurator software

A global software description is provided in Chapter A1, (p. A1-1).

5 Commissioning

5.1 SHP Ring Connection

Connect Es to Rs and Ep to Rp until it makes a ring, as shown in the following figure.

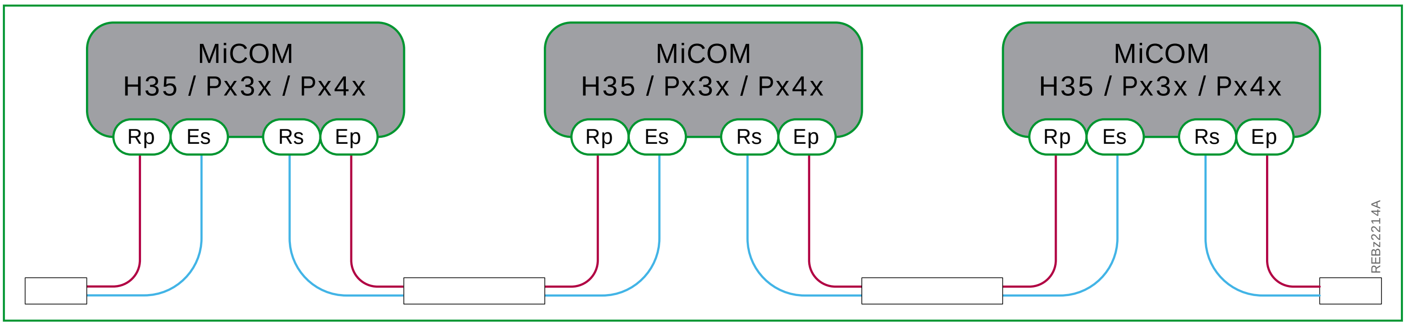


Fig. 5-1: Dual Ethernet ring connections.

5.2 DHP Star Connection

Connect Tx to Rx and Rx to Tx on each device as shown in the following figure.

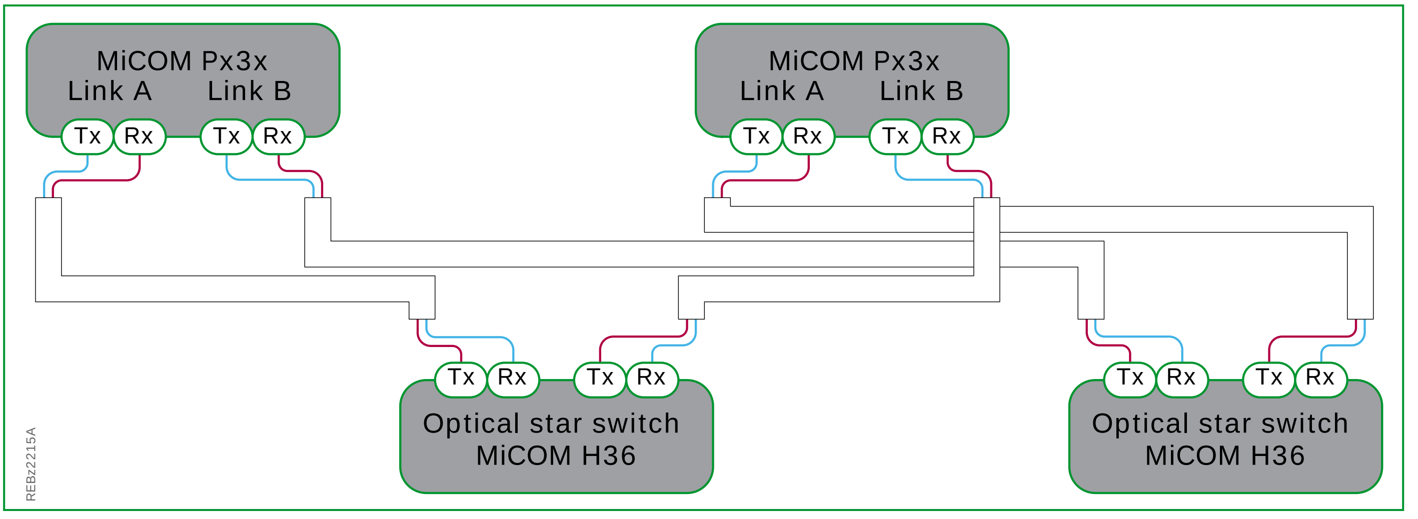


Fig. 5-2: Dual Ethernet star connections.

5.3 RSTP Ring Connection

The figure below shows IED 1 to IED n with the RSTP variant of Redundant Ethernet Boards connected in a ring topology. The ring topology can have one or more high-end RSTP-enabled Ethernet switches to interface with another network or control center. The Ethernet switch is an RSTP enabled switch with a higher number of ports.

The Ethernet switch, which is connected to the controlling PC, should be configured as the root bridge. The bridge priority of the Ethernet switch should be configured to the minimum value in the network.

The maximum number of IEDs that can be connected in the ring network depends on the Max Age parameter configured in the root bridge.

The Max Age parameter can be varied from 6 to 40 seconds.

If Max Age = 6 seconds, the maximum number of IEDs in the ring is 6 – 1 = 5.

If Max Age = 40 seconds, the maximum number of IEDs in the ring is 40 – 1 = 39.

Therefore the number of IEDs that can be connected in the ring can vary from 5 to 39.

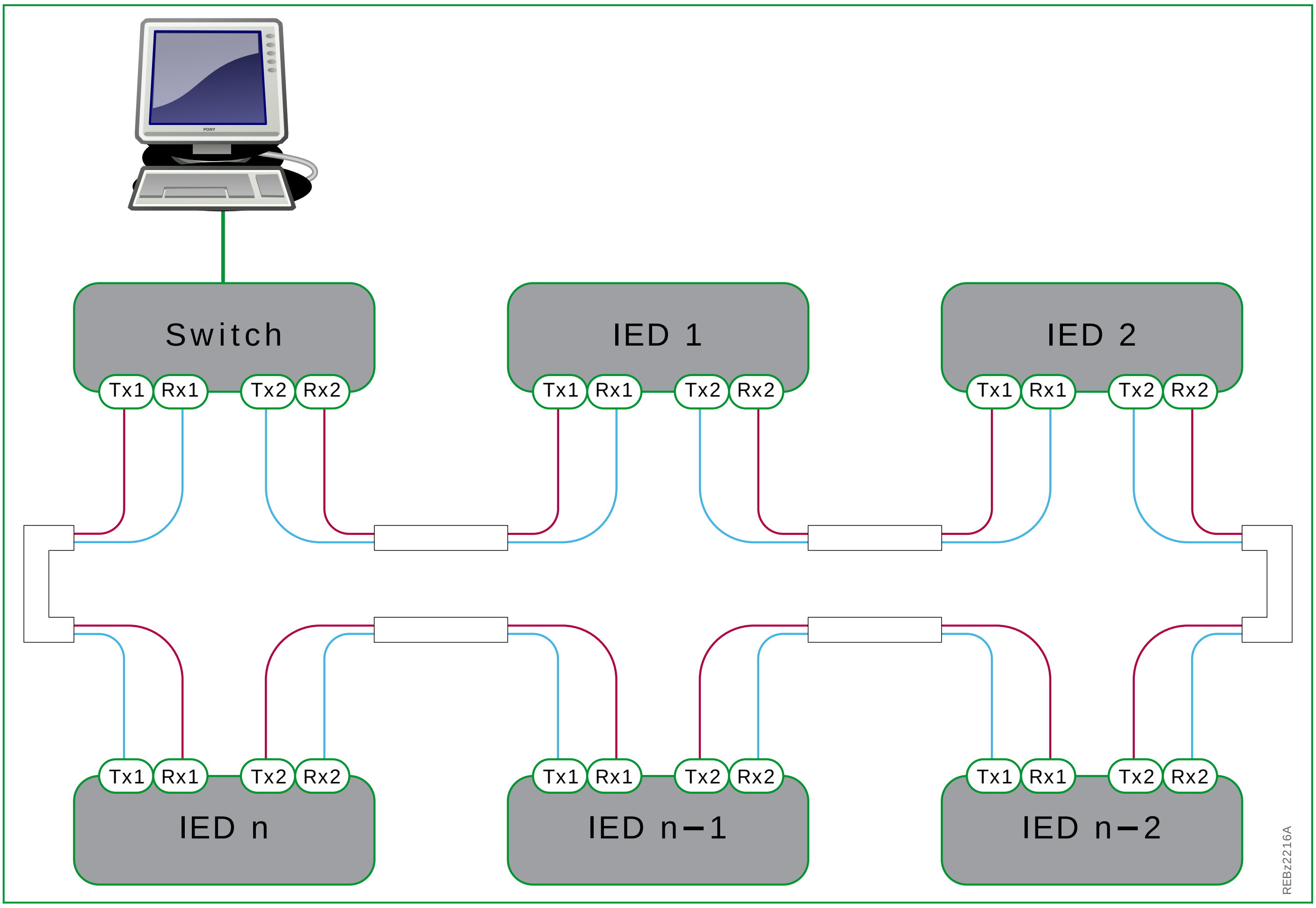


Fig. 5-3: Dual Ethernet ring topology.

5.4 RSTP Star Connection

The figure below shows IED 1 to IED n with the RSTP variant of Redundant Ethernet Boards connected in a star topology. The star topology can have one or more high-end RSTP-enabled Ethernet switches to interface with other networks, control centers, or IEDs. The Ethernet switch is an RSTP enabled switch with a greater number of ports. The Ethernet switch, which is connected to the controlling PC, should be configured as the root bridge. The bridge priority of the Ethernet switch should be configured to the minimum value in the network.

The IEDs are placed at two hop distance from the root bridge, therefore the Max Age parameter has no impact on star topology.

The maximum number of IEDs that can be connected in the star network depends on the number of ports available in the Ethernet switch, provided that the hop count from the root bridge is less than the Max Age parameter.

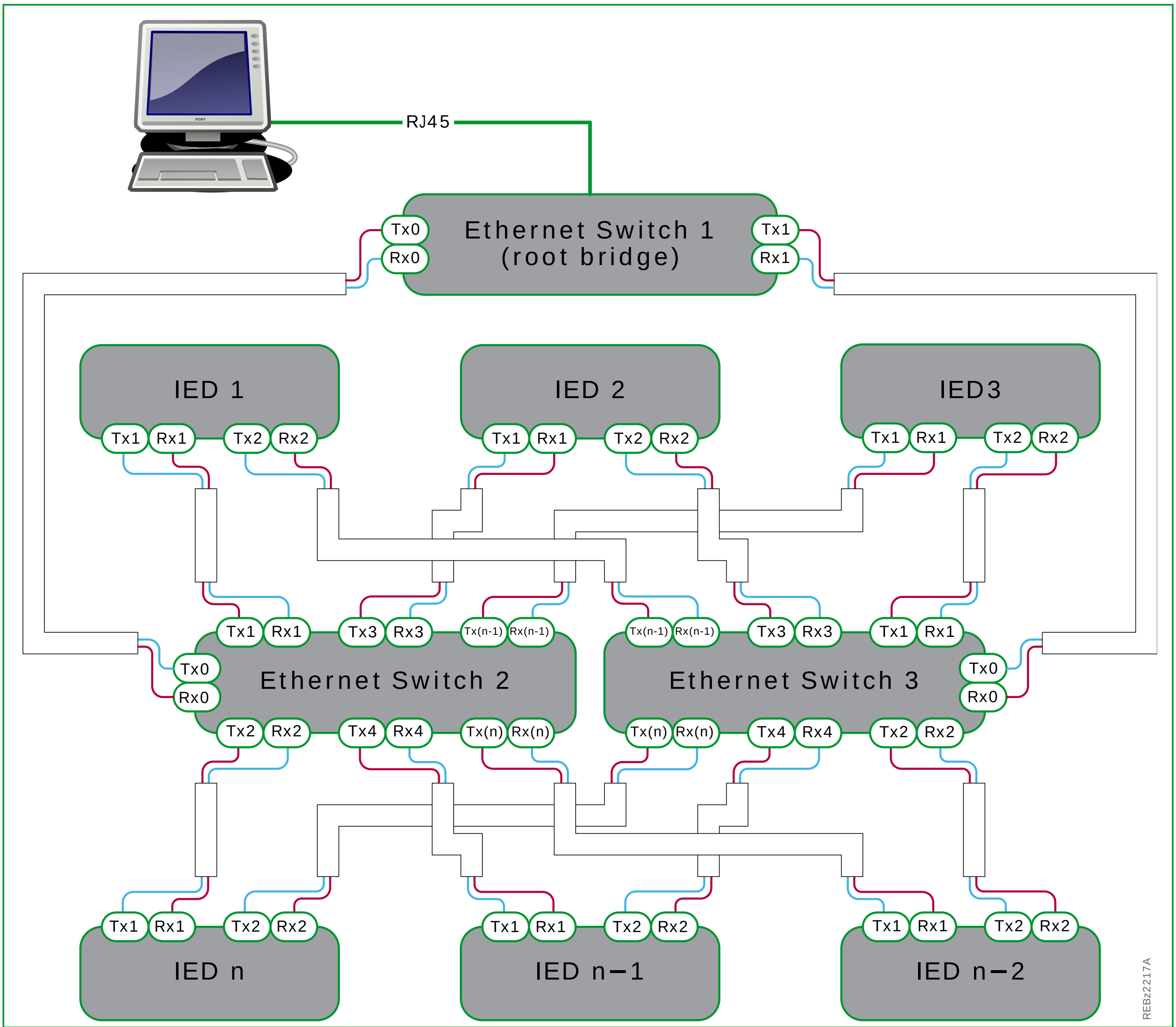


Fig. 5-4: Dual Ethernet star and ring topology.

5.5 Large RSTP Networks Combining Star and Ring

Fig. 5-5, (p. 5-6) shows a star of four rings. Each ring is connected to the root bridge. The root bridge is a high-end RSTP enabled bridge with the maximum number of ports as required. The devices A_1, A_2 ... $A_{n,max}$, B_1, B_2 ... $B_{n,max}$, C_1, C_2 ... $C_{n,max}$, D_1, D_2 ... $D_{n,max}$, represent the RSTP variant of Redundant Ethernet Boards.

The maximum number of boards that can be connected in single ring in an RSTP-enabled network depends on the Max Age parameter. The hop count from the root bridge can not be greater than the Max Age parameter.

The maximum number of RSTP bridges in a ring is given by:

Nmax = (Max Age − 1)

Where:

Nmax = maximum number of devices in a ring

Max Age = Max Age value configured in the root bridge.

Assuming the default value of Max Age as 20 seconds in the topology, the maximum number of devices that can be connected in ring A is 19.

If Max Age is configured as 40 seconds, the maximum number of IEDs that can be connected in the network is (40−1) = 39. According to the IEEE 802.1w standard, the maximum value for the Max Age parameter is limited to 40. To use the maximum number of IEDs in the ring, the following configuration should be used.

Max Age	40 seconds
Forward Delay	30 seconds
Hello Time	2 seconds
Bridge Priority	As required by the end user.

The IEEE 802.1w standard defines the relation between Max Age and Forward Delay as:

2·(Forward Delay − 1.0 seconds) ≥ Max Age

To have the maximum number of nodes in the RSTP network, the number of rings can be increased, depending on the number of ports available in the root bridge.

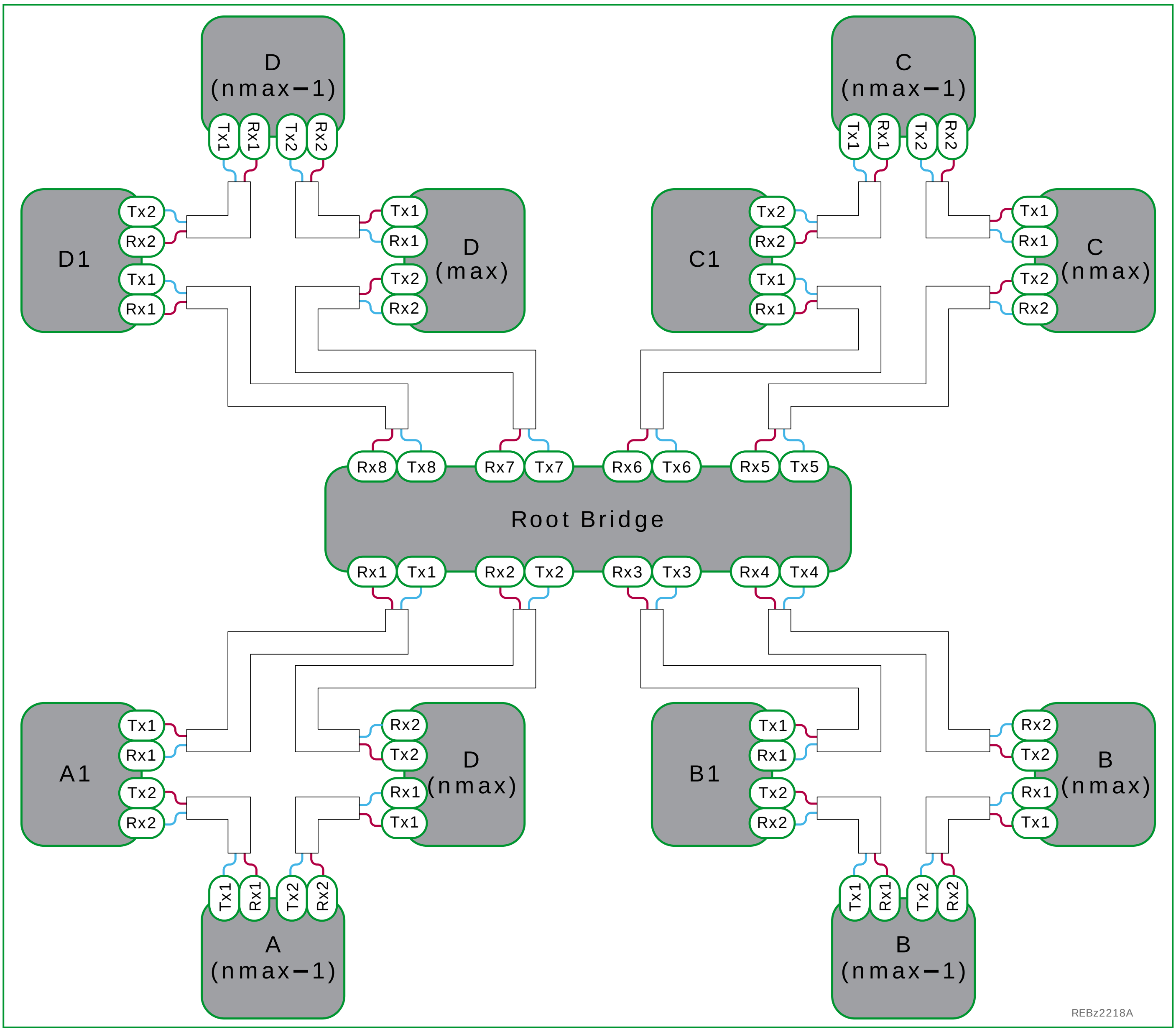


Fig. 5-5: Combined RSTP star and ring topology.

6 Technical Data

The technical data applies to a Redundant Ethernet Board fitted into any of the supported IEDs.

6.1 100 Base FX Interface (in Accordance with IEEE 802.3 and IEC 61850)

Optical fibers (-X7, -X8, -X14, -X15):

- BFOC-(ST®)-interface 2.5 per IEC 60874-10-1 per glass fiber

Glass fiber connection G 50/125

- Optical wavelength: typ. 1308 nm
- Optical output: min. −23.5 dBm
- Optical sensitivity: min. −31 dBm
- Optical input: max. −14 dBm

Glass fiber connection G 62.6/125

- Optical wavelength: typ. 1308 nm
- Optical output: min. −20 dBm
- Optical sensitivity: min. −31 dBm
- Optical input: max. −14 dBm

6.2 Serial Interface COMM2

Leads (X10)

- Threaded terminal ends M2 for wire cross sections up to 1.5 mm^2

Protocol per IEC 60870-5-103

Transmission rate: 300 ... 57600 bit/s (settable)

6.3 IRIG-B Interface

- Format B122,
- Amplitude modulated, 1 kHz carrier signal,
- BCD time-of-year code

6.4 Fiber Defect Connector (Watchdog Relay)

- Rated voltage: 250 VDC, 250 VAC
- Continuous current: 5 A
- Short-duration current: 30 A and carry for 3 s
- Breaking capacity AC:
  - 1500 VA resistive (cos φ = 1.0)
  - 1500 VA inductive (cos φ = 0.5)

- Breaking capacity DC:
  - 50 W, 250 VDC resistive
  - 25 W inductive (L/R = 40 ms)

7 Cortec

Below cortec (partial example) covers all Px3x IEDs using the Redundant Ethernet Board. Using Redundant Ethernet Board for Px30 requires the new power supply unit PSU2 with order identifiers as listed below.

Px3x English

18 character cortec	1 2 3 4	5	6	7	8	9	10	11	12, 13	14	15	16	17	18
AFS Generic Standard Cortec Px3x	P x 3 x -			9 0					-3xx -4xx -5xx -6xx -7xx	-47x	-46x	-9x x	-9x x	-8xx
[illegible]														
[illegible]							E							
[illegible]							F							
[illegible]							G							
VA,nom = 60 ... 250 VDC / 100 ... 230 VAC and 6 output relays							H							
[illegible]							J							
[illegible]							K							
[illegible]														
VA,nom = 24 ... 60 VDC and 4 high break contacts							L							
VA,nom = 60 ... 250 VDC / 100 ... 230 VAC and 4 high break contacts							M							
Protocol IEC 61850 redundant connection [21)]												-98		
For connection to 100 Mbit/s Ethernet, glass fiber ST, SHP and IRIG-B input for clock synchronization and 2nd interface (RS485, IEC 60870-5-103)												1		
For connection to 100 Mbit/s Ethernet, glass fiber ST, RSTP and IRIG-B input for clock synchronization and 2nd interface (RS485, IEC 60870-5-103)												2		
For connection to 100 Mbit/s Ethernet, glass fiber ST, dual homing and IRIG-B input for clock synchronization and 2nd interface (RS485, IEC 60870-5-103)												3		
For connection to 100 Mbit/s Ethernet, glass fiber ST, PRP and IRIG-B input for clock synchronization and 2nd interface (RS485, IEC 60870-5-103)												4		

21) IEC61850 redundant connection with power supply options E to M only

Fig. 7-1: Cortec for Px3x IEDs using the Redundant Ethernet Board.

A1 RSTP Configurator

When running the RSTP protocol, the RSTP Configurator software is used to identify a device, configure the IP address, configure the SNTP IP address and configure RSTP settings.

A1.1 Connecting the IED to a PC

Connect the IED to the PC on which RSTP Configurator will run. This connection is done through an Ethernet switch or through a media converter. See the figure below.

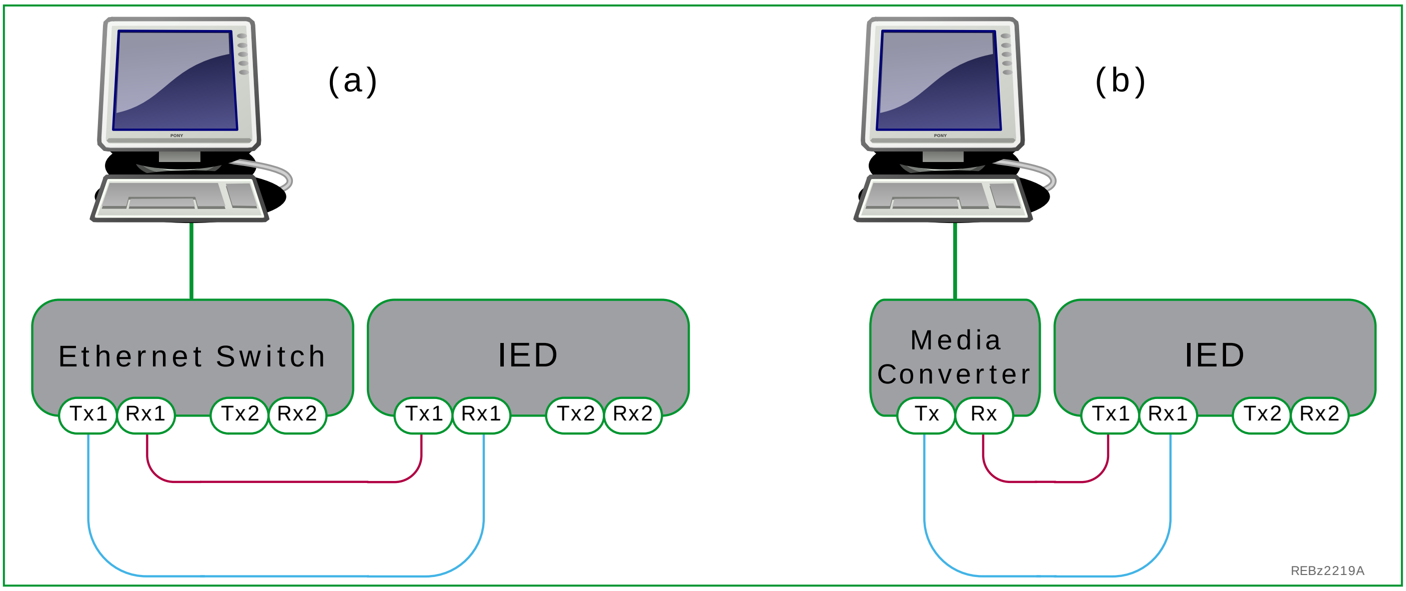


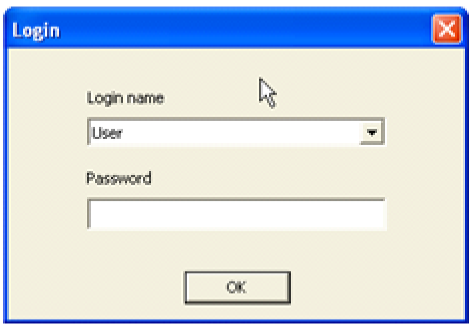
Fig. A1-1: Connection using (a) an Ethernet switch and (b) a media converter.

A1.2 Installing RSTP Configurator

Double click WinPcap_4_0.exe to install WinPcap.

Double click Schneider Electric RSTP Configurator.msi to install the RSTP Configurator. The setup wizard appears. Click Next and follow the on-screen instructions to run the installation.

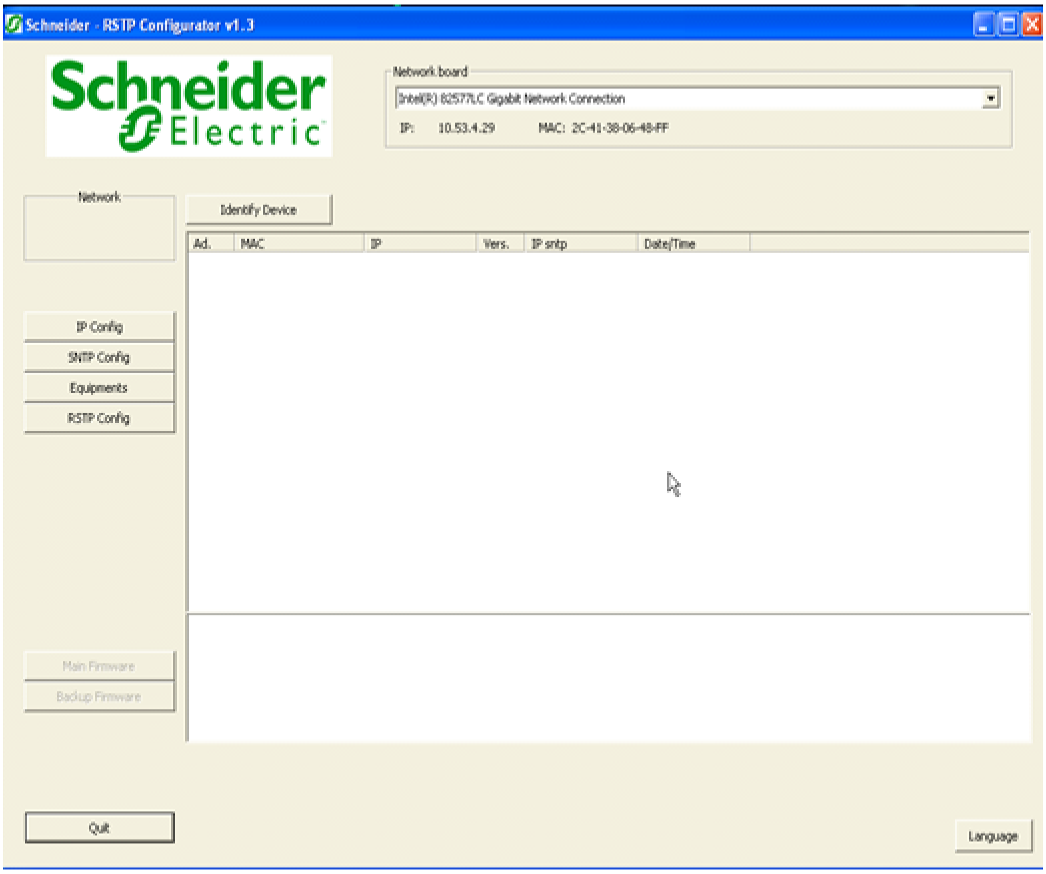
A1.3 Starting the RSTP Configurator



To start the RSTP Configurator, select Programs > RSTP Configurator > RSTP Configurator. The Login screen appears.

For user mode login, enter the Login name as User and click OK with no password. If the login screen does not appear, check all network connections.

The main window of the RSTP Configurator appears. The Network Board drop-down list shows the Network Board, IP Address and MAC Address of the PC in which the RSTP Configurator is running.



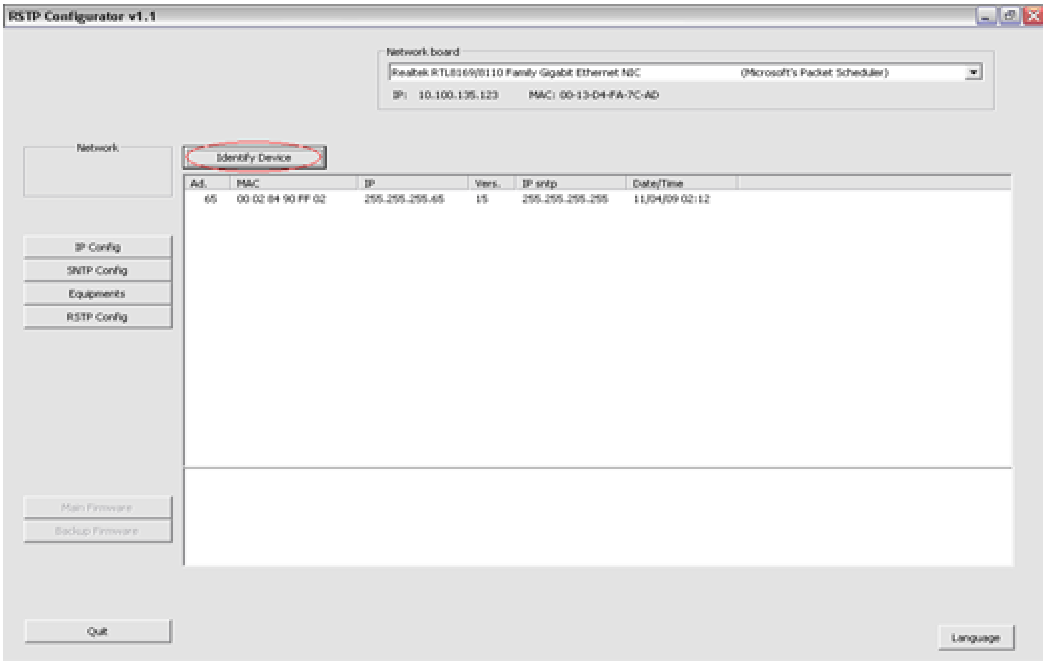
A1.4 Device Identification

To configure the Redundant Ethernet Board, go to the main window and click Identify Device.

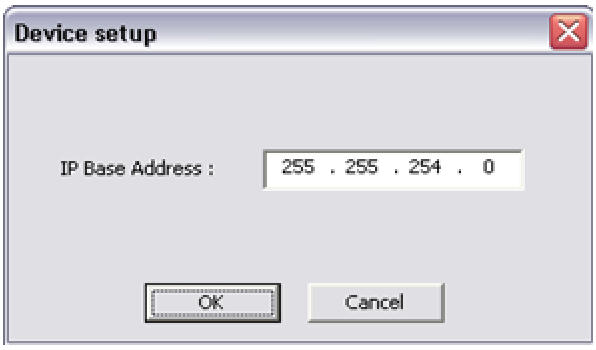
Due to the time needed to establish the RSTP protocol, it is necessary to wait 25 seconds between connecting the PC to the IED and clicking the Identify Device button.

The Redundant Ethernet Board connected to the PC is identified and its details are listed.

- Device address
- MAC address
- Version number of the firmware
- SNTP IP address
- Date and time of the real-time clock, from the board



A1.5 IP Address Configuration

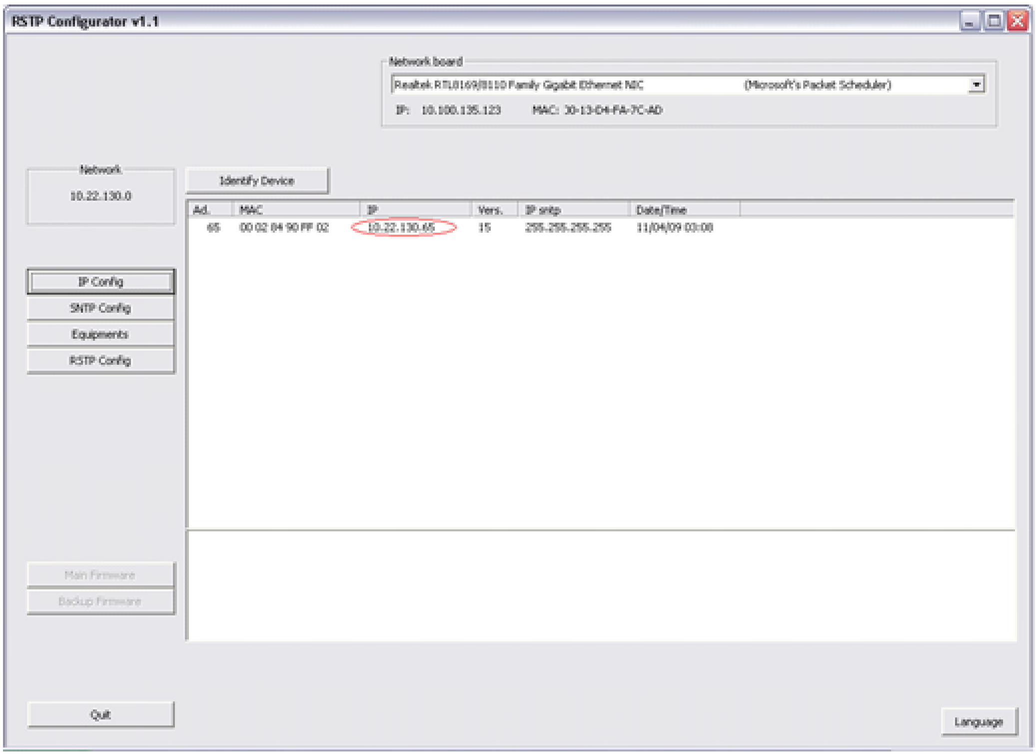


To change the network address component of the IP address, go to the main window and click the IP Config button.

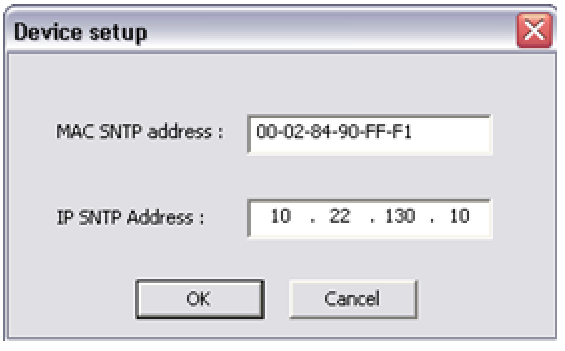
The Device setup screen appears. The first three octets of the board IP address can be configured. The last octet is set using the switches.

Enter the required board IP address and click OK.

The board network address is updated and displayed in the main window.



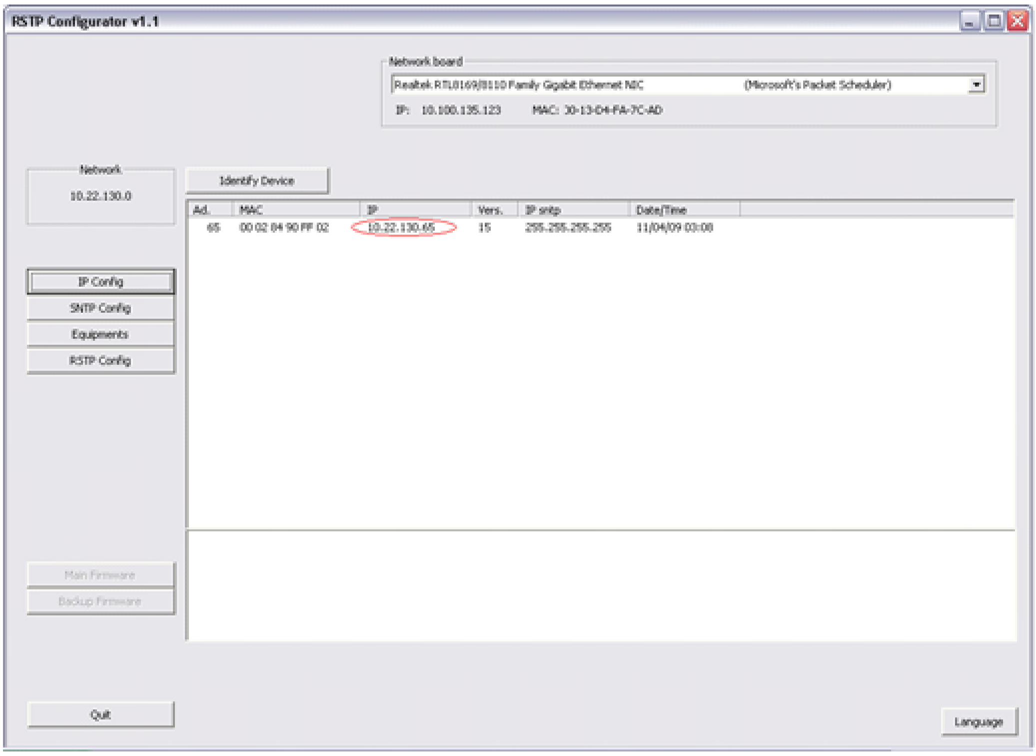
A1.6 SNTP IP Address Configuration



To configure SNTP server IP address, go to the main window and click the SNTP Config button. The Device setup screen appears.

Enter the required SNTP MAC and server IP address. Then click OK.

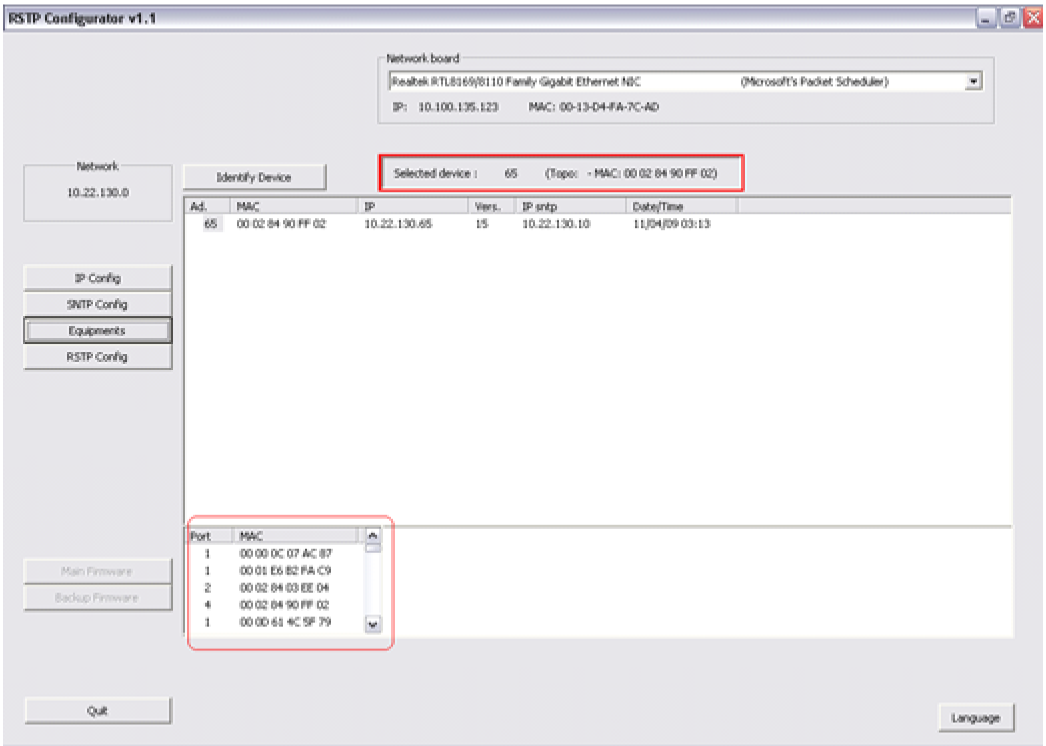
The updated SNTP server IP address appears in the main screen.



A1.7 Equipment

To view the MAC addresses learned by the switch, go to the main window and click the Identify Device button. The selected device MAC address then appears highlighted.

Click the Equipment button. The list of MAC addresses learned by the switch and the corresponding port number are displayed.



A1.8 RSTP Configuration

To view or configure the RSTP Bridge Parameters, go to the main window and click the device address to select the device. The selected device MAC address appears highlighted.

Click the RSTP Config button. The RSTP Config screen appears.

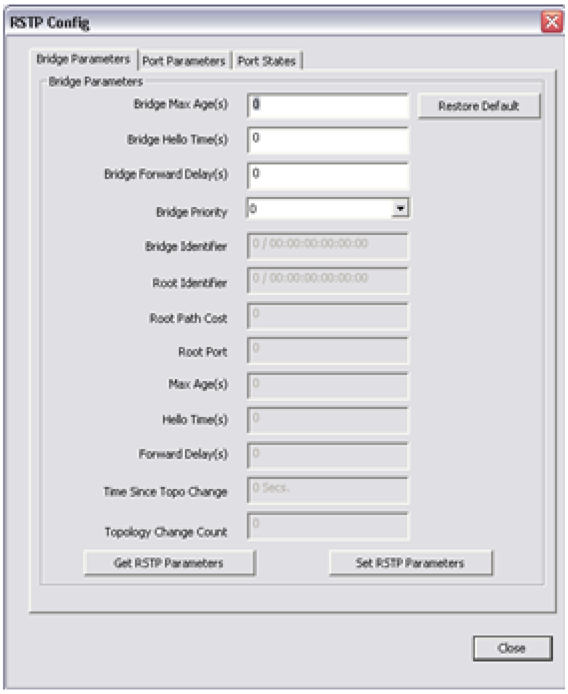
To view the available parameters in the board that is connected, click the Get RSTP Parameters button.

To set the configurable parameters such as Bridge Max Age, Bridge Hello Time, Bridge Forward Delay, and Bridge Priority, modify the parameter values according to the following table and click Set RSTP Parameters.

S.No	Parameter	Default value (seconds)	Minimum value (seconds)	Maximum value (seconds)
1	Bridge Max Age	20	6	40
2	Bridge Hello Time	2	1	10
3	Bridge Forward Delay	15	4	30
4	Bridge Priority	32768	0	61440

Tab. A1-1: RSTP configuration parameters ranges and default values.

Bridge Parameters



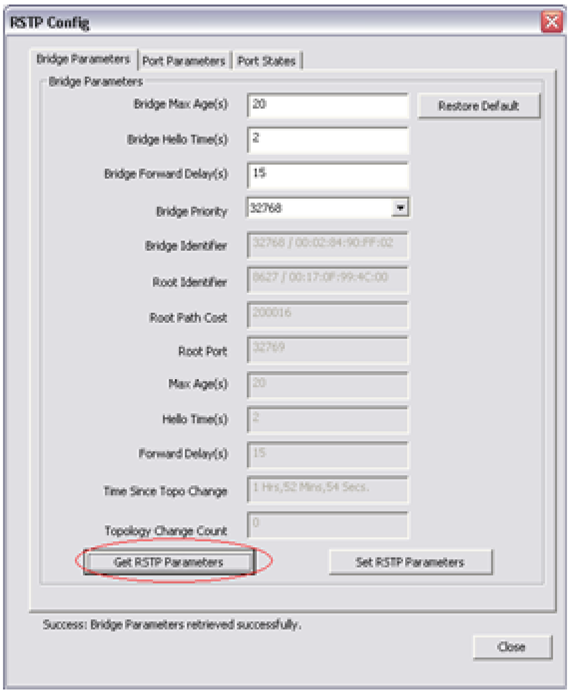
To read the RSTP bridge parameters from the board, go to the main window and click the device address to select the device. The RSTP Config window appears and the default tab is Bridge Parameters.

Click the Get RSTP Parameters button. This displays all the RSTP bridge parameters from the Ethernet board.

To modify the RSTP parameters, enter the values and click Set RSTP Parameters.

To restore the default values, click Restore Default and click Set RSTP Parameters. The grey parameters are read-only and cannot be modified.

Port Parameters

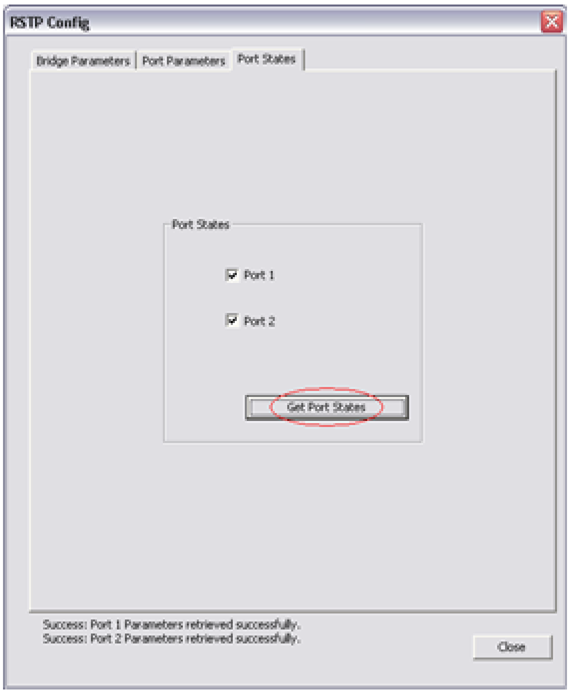


This function is useful if you need to view the parameters of each port.

From the main window, click the device address to select the device and the RSTP Config window appears.

Select the Port Parameters tab, and then click Get Parameters to read the port parameters. Alternatively, select the port numbers to read the parameters.

Port States



This is used to see which ports of the board are enabled or disabled.

From the main window, click the device address to select the device. The RSTP Config window appears.

Select the Port States tab then click the Get Port States button. This lists the ports of the Ethernet board. A tick shows they are enabled.

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