

# RES2404-PTP-PoE

Doc. Rev. 1.1

Doc-ID: 1061-3693

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 RES2404-PTP-POE - USER GUIDE

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**⚠ CAUTION**

Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled. Please follow the "General Safety Instructions for IT Equipment" supplied with the system.

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## Revision History

Revision	Brief Description of Changes	Date of Issue	Author
1.0	Initial issue	2017-May-08	hjs
1.1	Layout modifications, Storage Temperature in chapter 1.4	2020-August-18	hjs

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## Symbols

The following symbols may be used in this manual

### DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### NOTICE

NOTICE indicates a property damage message.

### CAUTION

CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.



#### Electric Shock!

This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of them. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material. Please refer also to the "High-Voltage Safety Instructions" portion below in this section.



#### ESD Sensitive Device!

This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.



#### HOT Surface!

Do NOT touch! Allow to cool before servicing.



#### Laser!

This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.



This symbol indicates general information about the product and the user manual.

This symbol also indicates detail information about the specific product configuration.



This symbol precedes helpful hints and tips for daily use.

## For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

## High Voltage Safety Instructions

As a precaution, in case of danger, the power connector is the product's main disconnect device and must be easily accessible.

### **⚠ CAUTION**

Warning!

All operations on this device must be carried out by sufficiently skilled personnel only.



Caution, Electric Shock!

Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Earth ground connection to vehicle's chassis or a central grounding point shall remain connected.

The earth ground cable shall be the last disconnected or the first connected during operations of cabling.

## Special Handling and Unpacking Instructions



ESD Sensitive Device!

Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

## General Instructions On Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction.

All RES2404-PTP-PoE products are supposed to be opened by qualified integrators for customization, following Kontron recommendations described this User Guide. Then, any modifications performed on the unit render the guarantee void. Each shield end of power cable shall be connected to external ground (same as chassis ground). The length of the power cable must not exceed 3 meters.

## Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

## WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- ▶ Reduce waste arising from electrical and electronic equipment (EEE)
- ▶ Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste
- ▶ Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- ▶ Improve the environmental performance of all those involved during the lifecycle of EEE




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### WEEE

Environmental protection is a high priority with Kontron.

Kontron follows the WEEE directive.

You are encouraged to return our products for proper disposal.

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## 1/ Introduction

The RES2404-PTP-PoE is a standalone rugged Ethernet switch family, supporting 24 Gigabit Ethernet Ports and four 10 Gigabit Ethernet Ports. It is specifically designed for working reliably under harsh environmental conditions.

There are two different RES2404-PTP-PoE product options (see table below), each using the Ethernet Switch Core Module ESC2404-PTP.

**Table 1: Product Variants**

Product Name	Description
RES2404-AC-PTP-PoE	24x GbE ports, 4x 10GbE ports, PTP module, PoE+, 300 W power supply
RES2404-AC-PTP	24x GbE ports, 4x 10GbE ports, PTP module, no PoE+, 100 W power supply

Each switch interface is able to run at full wire speed regardless of the status of other interfaces. The switching fabric does not limit the throughput of the interfaces. The product is defined as non-blocking switch fabric with line rate switching. The number of interfaces and the corresponding speed define the maximum bandwidth. For 24x GbE ports + 4x 10 GbE ports operating at full duplex rate, the resulting bandwidth is 64 Gbit/sec (24 Gbit/sec + 40 Gbit/sec).

The key features of the Rugged Ethernet Switch are:

- ▶ 1U System
- ▶ 24 Ports 10/100/1000Base-T RJ45
- ▶ four 10 Gigabit Ethernet Ports
- ▶ Power Supply AC 110/230 with 100 W without PoE or 300 W PoE version
- ▶ 10/100/1000Base-T and RS232 for switch management
- ▶ Rotary Dip Switch for configuration of 8 bit Carrier ID (CID)
- ▶ Designed to meet military and transportation norms
- ▶ Temperature range from -20°C to +50°C (RES2404-AC-PTP)
- ▶ Temperature range from -20°C to +55°C (RES2404-AC-PTP-PoE)

## 1.1. RES2404-PTP-PoE Operational View

Figure 1: RES2404-PTP-PoE Operational Front View

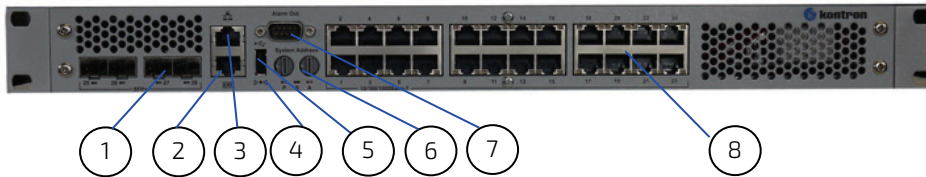
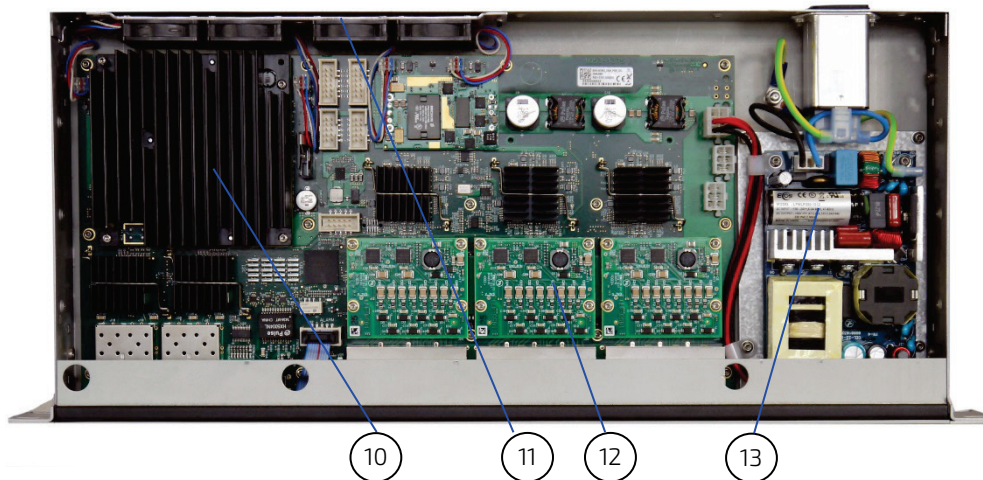


Figure 2: RES2404-PTP-PoE Operational Back View



Figure 3: RES2404-PTP-PoE Inside View



The picture above shows the RES2404-AC-PTP-PoE product from the RES2404-PTP-PoE family.

1. 4x 10GBase-X SFP+ for direct attach copper or fiber
2. serial admin RJ45 interfaces
3. Out of band admin interface
4. Reset button
5. USB reserved for future enhancements
6. DIP switches
7. Alarm out
8. 24x 10/100/1000Base-T Ethernet Ports with PoE+ PSE support (RES2404-AC-PTP-PoE only)
9. Power-plug with two fuses
10. ESC2404-PTP Ethernet Switch Core Module
11. 4x fans
12. 3x octal PoE+ PSE Controller Modules (RES2404-AC-PTP-PoE only)
13. Power Supply

## 1.2. Hardware Components

The RES2404-PTP-PoE family includes the following hardware sub-assemblies and optional modules:

- ▶ **Ethernet Switch Core Module:** The ESC2404-PTP provides 24GbE ports and four 10GbE ports with Precision Time Protocol (PTP).
- ▶ **Chassis Enclosure with Front Panel and power supply:** The front panel consists of an aluminum plate. There are two 1U mounting holes on each side. The case could be opened with six screws on the rear side.
- ▶ **RES Carrier:**
- ▶ **PoE+ modules (for RES2404-AC-PTP-PoE):** Three Power over Ethernet-(PoE+)-modules deliver up to 56 V to the connected devices, depending on the used power supply.

## 1.3. Software Components

Table 2: Software Specification

RES2404-PTP-PoE	Specification
General	Reliable field upgrades for all software components
	Dual boot images
	Management via SNMP and Command Line Interface
	System access via TELNET, SSH and serial line
Ethernet/Bridging	Link aggregation (IEEE 802.3ad)
	Classic and rapid spanning tree algorithms(IEEE 802.1D, IEEE 802.1w)
	Multiple Spanning Tree (IEEE 802.5)
	Quality Of Service on all ports (IEEE 802.1p)
	Full Duplex operation and flow control on all ports (IEEE 802.3x)
	Static MAC filtering
	Port Authentication (IEEE 802.1X)
	Auto negotiation of speeds and operational mode on all external copper GE interfaces as well as on all base fabric interfaces
	Layer 2 multicast services using GARP/GMRP (IEEE 802.1p)
	VLAN support including VLAN tagging (IEEE 802.3ac), dynamic VLAN registration with GARP/GVRP (IEEE 802.1Q) and Protocol based VLANs (IEEE 802.1v)
	Double VLAN tagging
Port Mirroring	
IP Routing	IPv4 Forwarding on all base channels and connected uplink ports
	Quality of service according to the DiffServ standards
	ARP for all routable interfaces
	ICMP for all routable interfaces
	OSPF routing protocol version 2
	RIP routing protocol version 2
	VRRP (virtual router redundancy protocol) for transparent fail over of default
	IPv4 Forwarding on all base channels and connected uplink ports routers
IGMP snooping	
QoS	CoS (Class of Service )
	DiffServ (Differentiated Services)
	ACL (Access Control List)
IP Multicast	DVMRP
	PIM-DM

RES2404-PTP-PoE	Specification
	PIM-SM
	IGMP (Internet Group Message Protocol) v2 and v3
	IGMP Proxy
<b>Applications</b>	SNTP client for retrieving accurate time and date information
	DHCP server
	Onboard event management
	Test and trace facilities
	POST (power on self tests) diagnostics
	Standards based SNMP implementation supporting SNMP v1, v2 and v3 for monitoring and management purposes
	Persistent storage of configuration across restarts
<b>Bootloader</b>	Precision Time Protocol (PTP)
	u-boot Version 2017.01
	POST (power on self tests) diagnostics
	Reliable field upgradable
	H/W protected
<b>Operating System</b>	Serial console support
	Buildroot Linux 2017-02, Kernel 4.10

## 1.4. Technical Data

The table below summarizes the features of the technical features.

**Table 3: Technical Data**

RES2404-PTP-PoE	
<b>Form factor (LxBxD)</b>	445 x 45 x 205 mm, 19 inch 1U rack
<b>Weight, Material</b>	2.5 kg, surface finished with powdered aluminium
External I/O	
<b>LAN</b>	24 GbE/FE, four 10GbE ports (10GBase-X SFP+)
<b>Admin interface</b>	Serial (RS232), out of band via GbE service port and in-band via any network interface
<b>DIP switches</b>	Rotary Dip Switch selectable 8bit Carrier ID
LED Indicators	
<b>GbE ports (24x)</b>	Front side
<b>10GbE ports (4x)</b>	Front side
<b>Alarm</b>	Front side
<b>Status (green/yellow)</b>	Front side
<b>Power (green)</b>	Front side
CPU and Memory	
<b>CPU</b>	Socketless Freescale T1024 CPU, used for switch provisioning and diagnostics. T1024 features two e5500 Cores built on Power Architecture technology and delivers following parameters: <ul style="list-style-type: none"> <li>▶ Core Speed up to 1200MHz</li> <li>▶ DDR Speed up to 1600MTps</li> </ul>
<b>Memory</b>	2 GByte DDR4 SDRAM Memory <ul style="list-style-type: none"> <li>▶ 4bit ECC</li> <li>▶ 800MHZ data rate</li> </ul>
<b>eMMC</b>	The eMMC device is JEDEC/MMC standard version 4.51 compliant (JEDEC Standard No. 84-B451). Following features are supported: <ul style="list-style-type: none"> <li>▶ 2GB in pSLC mode</li> </ul>
<b>Ethernet Controller</b>	The T1024 supports one single 10/100/1000Base-T Ethernet service port.
<b>SPI Flash</b>	4 MB SPI NOR Flash, used as primary Boot source
<b>Sensors</b>	Voltage, temperature
Power	
<b>Power input</b>	110/230 V AC power input on rear side
<b>Power supply</b>	Depending on product <ul style="list-style-type: none"> <li>▶ RES2404-AC-PTP: 45 Watt</li> <li>▶ RES2404-AC-PTP-PoE: 200 Watt</li> </ul>
<b>PoE+ devices</b>	The 24 ports share 150 W in total, 30 W per port max.

Table 4: Environmental Conditions

<b>Operating Temperature</b>	-20 °C to +50 °C (non PoE); -20 °C to +55 °C (PoE version) operating temperature (convection cooling). Up to 93% relative humidity (non-condensing) at 40°C
<b>Storage Temperature</b>	-20°C to +85°C
<b>EMC Emission</b>	EN 55022, Class B
<b>EMC Immunity</b>	Standards: EN 55024, EN61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN61000-4-6 EN61000-4-11, May: EN61000-6-2 Specifications: IEC 61000-4-2 (±8 kV contact, ±15 kV air), IEC 61000-4-3 (80MHz to 2GHz, 80% AM modulated (1kHz), test level 10V/m on four sides Criteria A), IEC 61000-4-4 (0.5 kV and 1.0kV), IEC 61000-4-6 (150kHz to 80MHz, 80% AM modulated, (1kHz), 3V)
<b>Safety Compliance (IEC60950-1)</b>	CB report: All used components shall fulfill UL94V-0 (or better) requirements (nonflammable)
<b>Safety Compliance for Flammability (Telecordia GR-63-CORE)</b>	UL 94V-0/1 with Oxygen index of 28% or greater
<b>Shock</b>	IEC 60068-2-6: Frequency 10 to 300Hz, Acceleration: 1g
<b>Vibration</b>	IEC 60068-2-29: Peak Accel.: 15 g, Shock Dur.: 11ms half sine, Shock Count: 500
<b>Bump</b>	IEC 60068-2-27: Peak Accel. 30 g, Shock Dur. 9ms half sine, Shock Count: 3/direction, total 18
<b>Altitude</b>	-500 to 2000 m (-1640 to 6561 ft)
<b>Theoretical MTBF</b>	RES2404-AC-PTP: 86386h (9 years 10 months), according to MIL-HDBK-217 30°C ground benign RES2404-AC-PTP-POE: 99249 (11 years 4 months), according to MIL-HDBK-217 30°C ground benign
<b>Restriction of Hazardous Substances (RoHS2)</b>	The products comply with the RoHS2 regulations.



## 2/ Getting Started with RES2404-PTP-PoE

### 2.1. Receipt of the Equipment

#### 2.1.1. Checking the Packages

Inspecting the packing cartons and verifying their condition is the responsibility of the customer and should be carried out upon delivery.

- ▶ Inspect the packing and check its condition
- ▶ no broken corners
- ▶ general state of the case (no rips or holes),
- ▶ condition of the bands and the clips.
- ▶ If you wish to report any damage in transit, you should make out a full report, and also note the damage on the packing list that accompanies the equipment. Ensure that the report and the packing list are signed by yourself and also by the transport agent, and send a copy of these documents to:
  - ▶ the transport company
  - ▶ Kontron

#### 2.1.2. Unpacking

Unpacking the equipment must be carried out under the supervision of an authorized technician.

- ▶ Open the package and take out the items one by one.
- ▶ Inspect each item and make a note of any possible defects (scratches, marks or blemishes, damaged cables, etc.). If necessary, make a report of any damage or defects.
- ▶ Check the equipment against the packing list and report any missing items.



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**It is recommended that you keep the package and the anti-shock protection. This will be required if you decide to move your system to a different site.**

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## 2.2. External Connectors

### 2.2.1. Ethernet Connectors (I/O area)

In order to achieve the specified performance of the Ethernet port, Category 5 twisted pair cables must be used with 10/100 Mbit/s and Category 5E, 6 or 6E with 1 Gbit/s LAN networks.

Figure 4: Ethernet Connector, Status LEDs see Table 11: Status LEDs

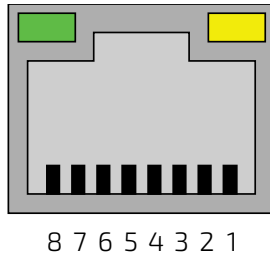


Table 5: Pin Assignment Connector

Pin	Signal	Ethernet 10 BaseT/100BaseT	Gigabit-Ethernet
1	MDI0+	TX+	DA+
2	MDI0-	TX-	DA-
3	MDI1+	RX+	DB+
4	MDI1-		DC+
5	MDI2+		DC-
6	MDI2-	RX-	DB-
7	MDI3+		DD+
8	MDI3-		DD-

Table 6: Signal Description

Signal	Description
MDI[0]+ / MDI[0]-	In MDI mode, this is the first pair in 1000Base-T, i.e. the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX.
MDI[1]+ / MDI[1]-	In MDI mode, this is the second pair in 1000Base-T, i.e. the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX.
MDI[2]+ / MDI[2]-	In MDI mode, this is the third pair in 1000Base-T, i.e. the BI_DC+/- pair. In MDI crossover mode, this pair acts as the BI_DD+/- pair.
MDI[3]+ / MDI[3]-	In MDI mode, this is the fourth pair in 1000Base-T, i.e. the BI_DD+/- pair. In MDI crossover mode, this pair acts as the BI_DC+/- pair.

## 2.2.2. Small Form-Factor Pluggable (SFP+) connector for 10 GbE

The RES2404-PTP-POE supports four SFP+ fabric switch uplinks to the front panel. The SFP+ uplink ports are according the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), Sept. 14th, 2000. The connector fits for GbE/10GbE Copper/Fiber and Direct Attached Copper Cables.

Figure 5: Small Form-Factor Pluggable (SFP+) Standard Connector for GbE/10 GbE

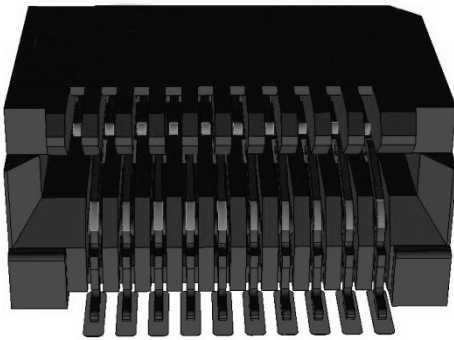


Table 7: SFP+ connector

Pin	Type	Signal
1	VeeT	Transmitter ground
2	TxFault	Transmitter fault indication
3	TxDisable	Optical output disabled when high
4	MOD-DEF(2)	Data for serial ID interface
5	MOD-DEF(1)	Clock for serial ID interface
6	MOD-DEF(0)	Grounded by the module to indicate module presence
7	RateSelect	Low selects reduced bandwidth
8	LOS	When high, indicates received optical power below worst-case receiver sensitivity
9	VeeR	Receiver ground
10	VeeR	Receiver ground
11	VeeR	Receiver ground
12	RD-	Inverted received data
13	RD+	Received data
14	VeeR	Receiver ground
15	VccR	Receiver power (3.3 V, max. 300 mA)
16	VccT	Transmitter power (3.3 V, max. 300 mA)
17	VeeT	Transmitter ground
18	TD+	Transmit data
19	TD-	Inverted transmit data
20	VeeT	Transmitter ground

## 2.2.3. Ethernet Port Mapping

Table 8: Ethernet Port Mapping

Front IO	Type	CLI Port
1	RJ45	0/1
2	RJ45	0/2
3	RJ45	0/3
4	RJ45	0/4
5	RJ45	0/5
6	RJ45	0/6
7	RJ45	0/7
8	RJ45	0/8
9	RJ45	0/9
10	RJ45	0/10
11	RJ45	0/11
12	RJ45	0/12
13	RJ45	0/13
14	RJ45	0/14
15	RJ45	0/15
16	RJ45	0/16
17	RJ45	0/17
18	RJ45	0/18
19	RJ45	0/19
20	RJ45	0/20
21	RJ45	0/21
22	RJ45	0/22
23	RJ45	0/23
24	RJ45	0/24
25	SFP+	0/25
26	SFP+	0/26
27	SFP+	0/27
28	SFP+	0/28

## 2.2.4. Dual RJ45 connector

The RS232 and management port interface are combined in one dual RJ45 connector.

Figure 6: Dual RJ45 Connector (red circle)

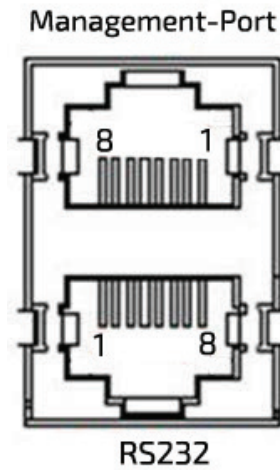
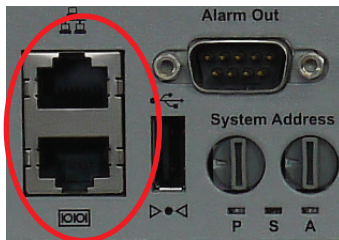


Table 9: Management-Port

Pin	Signal
1	DA+
2	DA-
3	DB+
4	DC+
5	DC-
6	DB-
7	DD+
8	DD-

Table 10: RS232

Pin	Signal
1	RTS
2	DTR
3	TX#
4	GND
5	GND
6	RX#
7	DSR
8	CTS

Please note, for the serial IF on COM, the max allowed Cable length is 3 m.

## 3/ Device Management

### 3.1. Power and Status LEDs

Figure 7: Status LEDs on RES2404-PTP-PoE (red circle)



Table 11: Status LEDs

LED	Status	Meaning
P (Power)	OFF	no power
	ON green	Proper 110/230V Input Voltage detected and healthy voltage monitoring (Power Good Signals) working
S (Status)	OFF	No status function
	ON green/yellow	Status function on
A (Alarm)	OFF	No alarm
	ON red	Alarm

### 3.2. Link Activity PoE Speed LEDs for GbE Ports

The LEDs are integrated in the RJ45 connector. For each port there are two green/yellow LEDs mounted to indicate links or activities and PoE-status.

Figure 8: GbE-ports with LEDs

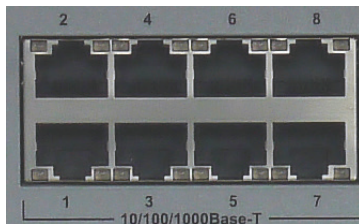


Figure 9: 10GbE-ports with LEDs

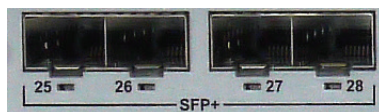


Table 12: LEDs Link, Activity and PoE

LED	Status	Meaning
Ethernet (24x) left LED	OFF	no link, no activity
	ON green	Link established, no activity
	Blinking green	Link established, activity
	ON yellow	Link established, PoE active
	Blinking yellow	Link established, PoE active and activity
Ethernet (24x) right LED	OFF	10Mbps
	ON green	100Mbps
	ON yellow	1000Mbps
10GbE (4x)	OFF	no link, no activity
	ON green	Link established, no activity
	Blinking	Link established, activity

### 3.3. Power over Ethernet (PoE) Distribution

PoE implements the PoE+ specification (IEEE 802.3at) for power sourcing equipment (PSE). IEEE 802.3at allows power to be supplied to Class 4 PD devices that require power greater than 15.4 W up to 34.2 W (max theoretical value delivered by PSE). Powered devices could draw peak 28.3 W and average 25.5 W. This allows the PoE+ enabled network switches and routers to be used for deployment with devices that require more power than the 802.3AF specification allows.

PoE provides power management that supports power reservation, power prioritization and power limiting. The operator can assign a priority to each PoE port. When the power budget of the PoE switch has been exhausted, the higher priority ports are given preference over the lower priority ports. Lower priority ports then are stopped to supply power in order to provide power to higher priority ports.

The static power management feature allows operators to reserve a guaranteed amount of power for a PoE port. This is useful for powering up devices which draw variable amounts of power and provide them an assured power range within which to operate.

In the Dynamic Power management feature, power is not reserved for a given port at any point of time. The power available with the PoE switch is calculated by subtracting the instantaneous power drawn by all the ports from the maximum available power. Thus, more ports can be powered at the same time.

PoE also provides a global usage threshold feature in order to limit the PoE switch from reaching an overload condition.

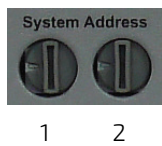
Each of the three 2x4 RJ45 arrays has a companion PoE mezzanine connector with 2x20 pins.

### 3.4. Programming the Carrier ID (CID) with DIP switches

The Carried ID allows to define an unique system address for each RES2404-PTP-POE system. This feature can be used to select predefined switch configurations based on programmed system address.

See corresponding "boot autoinstall file" commands in the RES-PTP-POE CLI Reference Manual.

Figure 10: Rotary DIP switches



The 8 bit address can be programmed by turning the rotary switches.

Table 13: DIP switch 1

Pin	Type	Signal
1	CAR_ID#[4]	Carrier ID 4
2	GND	
3	CAR_ID#[6]	Carrier ID 6
4	CAR_ID#[5]	Carrier ID 5
5	GND	
6	CAR_ID#[7]	Carrier ID 7

Table 14: DIP switch 2

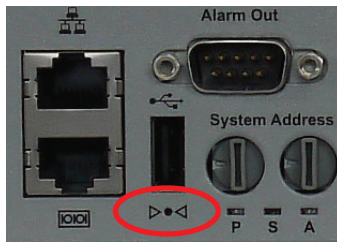
Pin	Type	Signal
1	CAR_ID#[0]	Carrier ID 0
2	GND	
3	CAR_ID#[2]	Carrier ID 2
4	CAR_ID#[1]	Carrier ID 1
5	GND	
6	CAR_ID#[3]	Carrier ID 3



### 3.5. Restart by pressing reset button

If you press the reset button with a needle or a pin, the system will restart and load the default values.

Figure 11: Reset button (in the red circle)




---

After pressing the reset button the bootloader performs some power on self tests (POST).

---

Table 15: POST routines after reset

Test	Description
Serial	Onboard Unit Computer serial controller loopback test
I2C	Check for presence of onboard I2C devices
PCI Express	Check for PCI Express switch device presence
Serviceport	Onboard PPC405EX Ethernet internal loopback test
DDR RAM data line	Data line test. Checks for stucked or shortened data lines
DDR RAM address line	Address line test. Checks for stucked or shortened address lines
DDR RAM memory cells	Checkerboard standard test algorithm
Bootloader environment	Check for valid bootloader environment (CRC correct or both CRCs are 0xFFFFFFFF == not initialized)
VPD area	Check for valid VPD area (CRC is valid)

In the case that a POST fails, a POST error code is written into the postcode register of the onboard CPLD. The boot process is not stopped as there are good chances that the system can finish startup sequence successfully. Post error code is stored inside u-boot environment variable postresult, 0x00h stands for no errors detected during startup.

This variable postresult is passed as kernel argument and reachable from Fastpath CLI with command "show board post-status":

- ▶ 0x00 All POST were successful
- ▶ 0x01 Serial POST failed
- ▶ 0x02 I2C POST failed
- ▶ 0x04 PCIe POST failed
- ▶ 0x08 Ethernet POST failed
- ▶ 0x10 Environment POST failed
- ▶ 0x20 VPD POST failed
- ▶ 0x40 Memory data/address line POST failed

- ▶ 0x80 Memory device cells POST failed

### 3.6. Alarm out

Alarm information will be provided through a header with ten pins on the front. The Alarm connector is used as an interface to connect a sub d connector to the RES2404-PTP-PoE.

Figure 12: Alarm out connector (in the red circle)

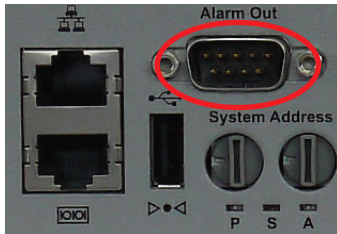


Table 16: Alarm out connector

Pin	Signal	Function
1	ALARM_OUT_CLOSED	NC, normally closed relay contact
7	ALARM_OUT_COMMON	common relay contact
8	ALARM_OUT_OPEN	normally open relay contact

## 4/ Installation

This section gives instructions for accessing the Command Line Interface (CLI) of the RES2404-PTP-PoE using either in-band access via the Ethernet fabric or the out-of-band management interfaces like serial port or Gigabit Ethernet accessible from the front plate connector. The CLI is required for configuring the switch. Furthermore this chapter delivers information and procedures for commissioning of the unit. This includes the following:

- ▶ Safety requirements
- ▶ Cooling
- ▶ Mounting
- ▶ Software Installation

### 4.1. Safety Requirements

The RES240-PTP-PoE is designed for easy installation. However, the following safety precautions must be observed when installing or operating the RES2404-PTP-PoE. Kontron assumes no responsibility for any damage resulting from failure to comply with these requirements.

#### ⚠ CAUTION

##### Electric Shock Hazard!

The RES2404-PTP-PoE require AC mains power in the range from 110 to 240 volts for operation. Therefore, due caution must be exercised in handling or performing operations when power is applied. Failure comply with the above could endanger your life or health.



##### ESD Equipment!

The RES2404-PTP-PoE contains electrostatically sensitive devices. Please observe the necessary precautions to avoid damage to your system:

- ▶ Discharge your clothing before touching the assembly. Tools must be discharged before use.
- ▶ Do not touch any system components, connector pins, or system conductive circuits.
- ▶ If working at an anti-static workbench with professional discharging equipment, ensure compliance with its usage when handling this product.

### 4.2. Cooling

The RES2404-PTP-PoE includes forced-air cooling which is provided by four fans at the back side of the system. Air inlets are located at the front side. Adequate ambient airflow to the fan inlet areas must be ensured and the area behind the system must also provide for adequate outlet airflow. Direct re-cycling of outlet air to the inlet area must be avoided to preclude overheating of the system.

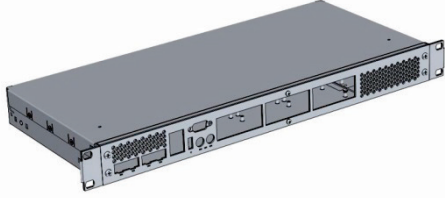
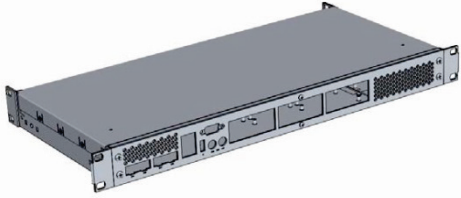
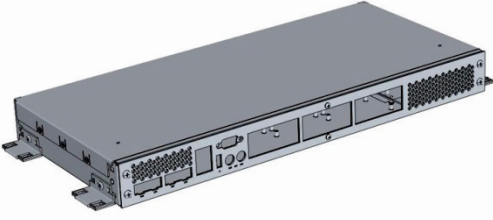
#### ⚠ WARNING

If the RES2404-PTP-PoE is operated at temperatures above 45°C, ensure that an inlet area and an outlet area of 1U (44.45 mm) are provided. Failure to comply with the above may cause improper operation of or damage.

### 4.3. Mounting Variants

The RES2404-PTP-PoE is supplied with mounting brackets for some installation variants, see Figure 13: Mounting Variants.

Figure 13: Mounting Variants

Variant	Description
Front Brackets	 <p>The RES2404-PTP-PoE is supplied with a pair of front mounting brackets for installation in a system cabinet.</p>
Cabinet Mounting	 <p>Rear mounting brackets (incl. screws) are also provided and can be installed when required (use screw lock to secure screws)</p>
Table Mounting	 <p>For operation on a flat surface, desktop or rack shelf, the brackets can also be assembled horizontally</p>

### 4.4. Precision Time Protocol (PTP)

The IEEE 1588v2 Precision Time Protocol is used to synchronize clocks throughout a computer network in the sub-microsecond range, designed for networked measurement and control systems. PTP specifies a precise clock synchronization protocol that relies on time-stamped packets. The PTP protocol is applicable to distributed systems consisting of one or more nodes communicating over some set of communication media.

The distribution of synchronous time information is performed in a hierarchical manner with a grandmaster clock at the root of the hierarchy. The grandmaster provides a common and precise time reference for one or more directly-attached slave devices by periodically exchanging timing information. All slave devices synchronize their clocks with the grandmaster clock. The slave devices can, in-turn, act as master devices for further hierarchical layers of slave devices.

The RES240X-PTP-PoE as a Boundary Clock exceeds IEEE 1588v2 default PTP profile.

- ▶ Boundary Clock configuration with up to 32 ports
- ▶ 1-step clocking
- ▶ Single PTP domain

- ▶ End-2-End delay measurement mechanism
- ▶ L2 multicast Ethernet message encapsulation
- ▶ Single VLAN tagging
- ▶ Phase Profile
- ▶ ITU-T G8262 ECC Option 1 free running and hold-up accuracy
- ▶ Phase accuracy of sub-20 ns

Other PTP profiles are available on request.

- ▶ Unicast/Multicast PTP messages
- ▶ User Datagram Protocol (UDP)/Internet Protocol (IP) message encapsulation
- ▶ IEEE 1588v2 End-2-End Transparent Clock
- ▶ 802.1AS PTP (AVB) package
- ▶ Double vlan-tagging

Refer to the RES-PTP-POE CLI Reference Manual for detailed configuration options.

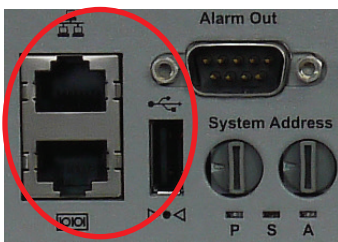
## 4.5. Switch Configuration Access

The Ethernet switch can be configured

- ▶ via the serial Service port
- ▶ or Out-of-Band via the Gigabit Ethernet Service port
- ▶ or In-Band via any Network Interface

The Command Line Interface (CLI) is reachable via the serial interface or via Network. Telnet and ssh sessions are possible, ssh access is disabled as factory default. In addition, the switch can be configured via a Web Interface.

Figure 14: Admin interfaces: Serial Service port (lower) and Ethernet Service port (upper)



### 4.5.1. Serial Port Access

The serial port is ready to use offhand without further configuration.

Port settings are:

- ▶ 115200bps, serial speed might be different for customized system variants
- ▶ 8 bits, no parity, 1 stop bit (8N1), no flow control

### 4.5.2. Out-of-Band Access via Network

The RES240X has no IP address set by default, it is necessary to assign an IP address statically or enable dhcp. Because the required configuration steps can only be done in the CLI, an initial access is required. The procedure for assigning an IP address to the device is described in the following. User input is printed in bold letters.

1. Connect to the serial port (lower) with supplied Kontron DB9 adapter
2. Connect network to the Ethernet Service Port (upper)
3. Ensure that the system is powered up
4. Log in as admin and enter privileged mode by typing 'enable'. No passwords are required by default

```
User: admin
Password:
(Ethernet Fabric) >enable
Password:
(Ethernet Fabric) #
```

5. Set IP address and netmask. (see below for an example IP address setting)

```
(Ethernet Fabric) #serviceport ip 192.168.50.107 255.255.255.0
```

The GbE management interface is available from now on. Alternatively, DHCP can be set.

```
(Ethernet Fabric) #serviceport protocol dhcp
```

An IP address will be assigned to the serviceport by a DHCP server.

6. Save configuration using the 'write mem' command and confirm with 'y'

```
(Ethernet Fabric) #write mem
```

```
This operation may take a few minutes. Management interfaces will not be available during this time.
```

```
Are you sure you want to save? (y/n) y
```

```
Config file 'current/startup-config' created successfully.
```

```
Configuration Saved!
```

```
(Ethernet Fabric) #
```

To access the CLI via Gigabit Ethernet serviceport, open a telnet connection to the configured IP address, port 23.

### 4.5.3. In-Band Access via Network

The GbE switch network port (in-band management access) has no IP address set by default, it is necessary to assign an IP address either statically or by using DHCP to the network port. Because the required configuration steps are done in the CLI, an initial access using the serial port is required. The procedure for assigning an IP address to the network port is described in the following. User input is printed in bold letters.

1. Connect to the serial port (lower) with supplied Kontron DB9 adapter.
2. Connect network to a free port on the front plate.
3. Ensure that the system is powered up.
4. Log in as admin and enter privileged mode by typing 'enable'. No passwords are required by default.

```
User: admin
Password:
(Ethernet Fabric) >enable
Password:
(Ethernet Fabric) #
```

5. Set IP address, netmask and default gateway. See below for an example IP address setting.

```
(Ethernet Fabric) #network parms 192.168.50.107 255.255.255.0 192.168.50.254
```

The GbE management interface is available from now on. Alternatively, DHCP can be set for the network port

```
(Ethernet Fabric) #network protocol dhcp
```

An IP address will be given to the network port by a DHCP server.

6. Save configuration by using the 'write mem' command and confirm 'y'.

```
(Ethernet Fabric) #write mem
```

```
This operation may take a few minutes. Management interfaces will not be available during this time.
```

```
Are you sure you want to save? (y/n) y
```

```
Config file 'current/startup-config' created successfully.
Configuration Saved!
(Ethernet Fabric) #
```

To access the CLI via the Gigabit Ethernet in-band network port, open a telnet connection to the configured IP address, port 23. It might make sense to separate the management network from the data path by setting appropriate VLANs. For additional information on the system configuration, refer to the ESC-PTP-POP CLI Reference Manual.

## 4.6. Firmware administration

### 4.6.1. Firmware description

The RES2404-PTP-PoE firmware includes an initial bootcode, the bootloader, Linux kernel and rootfs and the FASTPATH switching application. All firmware is preinstalled on the system and can only be updated by a dedicated failsave update procedure.

The system supports two permanent storage devices for the firmware:

- ▶ An on-board integrated eMMC (2GB), which contains the bootloader as well as the operating system, the switching application and configuration data.
- ▶ An on-board write protected 4MB NOR flash which keeps the initial bootcode, bootloader environment and a failsave image of the bootloader.

### 4.6.2. Failsave update

The system provides two image locations in the eMMC flash for two independent instances of the firmware. This allows recovery from the redundant system in case the update fails due to power loss or other reasons.

Firmware files are protected with checksums to allow detection of corrupted images. In case checksum failures are detected while booting e.g. image1, the system will reset and boot image2. In case image2 is corrupted too, the system will load the failsave bootloader from NOR flash.

### 4.6.3. Update procedure

The firmware will be updated using the CLI. The CLI commands described below are executed in the privileged mode of the CLI command tree. Please refer to the "ESC-RES-PTP CLI Reference Manual" for more information about the CLI commands and how to use them.

Firmware update is only possible for the currently not used image, leaving the currently used image untouched during firmware update. This keeps always one known working image available.

There is only one update package "system.pkg" that includes all necessary parts of the firmware, images of bootloader, kernel, root filesystem including switch management application and MD5 checksum file for consistency check.

When performing a firmware update, the firmware package will be loaded from a remote TFTP server.

In the update description below, instructions use a TFTP server with example IP address 192.168.70.2.

To update the RES2404-PTP-PoE, follow the steps below:

1. Log in to the privileged exec mode of the CLI of the system
2. Prepare network access of the system, the update package "system.pkg" has to be available on the corresponding TFTP directory
3. Check, which image is currently used

```
(Ethernet Fabric) #show bootvar

image1 : System Firmware (PTP + PoE)
image2 : System Firmware (PTP + PoE)
```

```

-----
image1          image2          current-active  next-active
-----
GA-5.00-20170322194904  BETA-9.99-20170216153906  image1         image1
-----

```

4. Copy system package into the currently not used image location, in this example image2

```
(Ethernet Fabric) #copy tftp://192.168.170.2/system.pkg image2
```

```

Mode..... TFTP
Set Server IP..... 192.168.170.2
Path..... ESC-PTP_GA5.01/
Filename..... system.pkg
Data Type..... Code
Destination Filename..... image2

```

```

Management access will be blocked for the duration of the transfer
Are you sure you want to start? (y/n) y

```

```

File transfer in progress. Management access will be blocked for the duration ..
TFTP Code transfer starting...
Write image to flash starting...

```

```

File transfer operation completed successfully.
(Ethernet Fabric) #

```

5. Select image2 as new boot image

```
(Ethernet Fabric) #boot system image2
Activating image image2 ..
```

6. Check correct boot image for next time boot using the command 'show bootvar'

```
(Ethernet Fabric) #show bootvar
```

```

image1 : System Firmware (PTP + PoE)
image2 : System Firmware (PTP + PoE)

```

```

-----
image1          image2          current-active  next-active
-----
GA-5.00-20170322194904  GA-5.01-20170329140828  image1         image2
-----

```

7. Restart the system, to get new firmware running

```
(Ethernet Fabric) #reload
Are you sure you would like to reset the system? (y/n)y
```

8. Verify that new firmware is running

```
(Ethernet Fabric) #show board version all
```

```

Product Information
System description      : Kontron RES2404-AC-PTP, GA-5.01-20170329140828, Linux 4.10.0
Product name           : RES2404-AC-PTP
Product serial number  : 0400349945
Product part number    : 1059-9518

```



```
Product manufacturer      : Kontron
Board name                : ESC2404-PTP
Board serial number       : 0400349945
Board part number         : 1060-0269
Board manufacturer        : Kontron
Fastpath version          : 8.3.0.1-FastPath-Ent-esw-xgs4-gto-kex-R-CLS-6AIQH
```

9. Please note , it is not allowed to update the second image, in this example. image1, with the same Firmware version

While trying this, the system will print a comment that this is not allowed.

```
"Firmware with this UUID is already installed"
```

## Appendix – List of Acronyms

<b>ADC</b>	Analog Digital Conversion
<b>CLI</b>	Command Line Interface
<b>CMOS</b>	Complementary Metal Oxide Semiconductor
<b>CPLD</b>	Complex Programmable Logic Device
<b>CPU</b>	Central Processing Unit
<b>DDR</b>	Double Data Rate Memory
<b>DHCP</b>	Dynamic Host Configuration Protocol
<b>DIMM</b>	Dual-Inline Memory Module
<b>DRAM</b>	Dynamic Random Access Memory
<b>ECC</b>	Error Correcting Code
<b>EEPROM</b>	Electrically Erasable Permanent Read-only Memory
<b>EMC</b>	Electromagnetic Compatibility
<b>EMI</b>	Ethernet Management Interface
<b>FAT</b>	File Allocation Table file-system
<b>GND</b>	Ground
<b>GPIO</b>	General Purpose Input/Output
<b>MAC</b>	Media Access Control
<b>MDIO</b>	Management Data Input/Output
<b>MII</b>	Media Independent Interface
<b>MMC</b>	Module Management Controller
<b>MTBF</b>	Meantime Between Failures
<b>NEBS</b>	Network Equipment-Building System
<b>PCB</b>	Printed Circuit Board
<b>PCI</b>	Peripheral Component Interconnect
<b>PCIE</b>	PCI Express
<b>PLD</b>	Programmable Logic Device
<b>PLL</b>	Phase Locked Loop
<b>PoE</b>	Power over Ethernet
<b>POST</b>	Power On Self-Test
<b>PSE</b>	Power Sourcing Equipment
<b>PTP</b>	Precision Time Protocol
<b>RAM</b>	Random Access Memory
<b>RFI</b>	Request For Information
<b>SDK</b>	Software Development Kit
<b>SDR</b>	Sensor Device Record
<b>SEL</b>	System Event Log
<b>SFP</b>	Small Form-factor Pluggable transceiver
<b>SGMII</b>	Serial Gigabit Media Independent Interface
<b>SMS</b>	System Management Service
<b>SNMP</b>	Simple Network Management Protocol

<b>SPD</b>	Serial Presence Data
<b>SPI</b>	Serial Peripheral Interconnect
<b>SWS</b>	Software Implementation Specification
<b>TTL</b>	Transistor-Transistor Logic
<b>UART</b>	Universal Asynchronous Receiver Transmitter
<b>UDP</b>	Universal Datagram Protocol
<b>USB</b>	Universal Serial Bus
<b>VLAN</b>	Virtual Local Area Network
<b>WEEE</b>	Waste Electrical & Electronic Equipment
<b>XAUI</b>	10 Gigabit Attachment Unit Interface
<b>XGMII</b>	10 Gigabit Media Independent Interface

## About Kontron

Kontron is a global leader in IoT/Embedded Computing Technology (ECT). As a part of technology group S&T, Kontron, together with its sister company S&T Technologies, offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall. For more information, please visit: <http://www.kontron.com/>

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