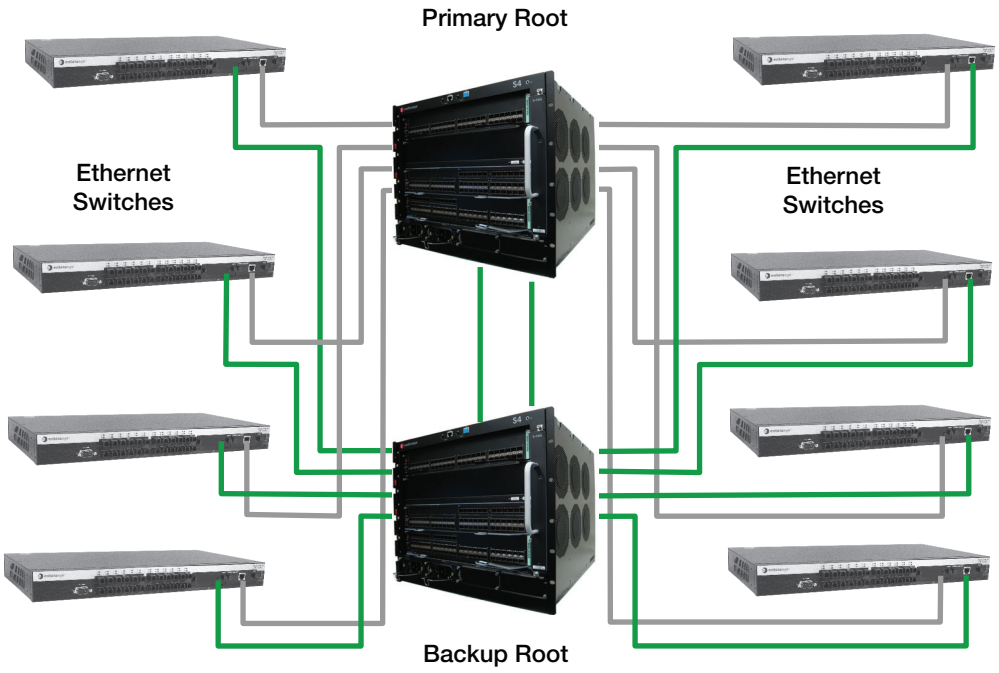
I/A Series® HARDWARE
Product Specifications

invensys
Foxboro®

PSS 21H-7C3 B4

The MESH Control Network Ethernet Equipment



The MESH control network utilizes Invensys qualified Ethernet equipment to allow you to configure your system to meet your functional, performance, and plant requirements.

FEATURES

- System scalability by interconnecting Ethernet switches, each having 8-ports or more in various increments
- Support for Fast Ethernet (100 Mbps) and Gigabit (uplink only) Ethernet (1000 Mbps)
- Modular uplinks to high-speed backbones using 1 Gb 1000Base-T, 1000Base-SX, 1000Base-LX, 1000Base-LX/LH, 1000Base-BX, 1000Base-TX, and 1000Base-ZX standards
- Full duplex operation based on the IEEE 802.3 standards
- Rapid Spanning Tree Protocol (RSTP), manages redundant paths, prevents loops, and provides high speed convergence time for a network
- System Management software for monitoring the health of the control system and managing equipment in the system
- Network management and configuration via local port

- Virtual Local Area Networks (VLANs), separating the MESH Network into multiple segments. A total of 6 VLANs can be configured; VLANs configured for non-I/A Series communication can only be configured for TCP and UDP protocol use.
- Ethernet switches and converters are European Union (EU) Low Voltage and EMC directives safety certificated ("CE" logo marked on product).

INTRODUCTION

The MESH control network equipment described herein has been tested and qualified by Invensys for use with I/A Series® system products.

The qualified Ethernet switches offered are listed in Table 1. The qualified Media Converter offered is listed in Table 2.

Table 1. Qualified Ethernet Switches

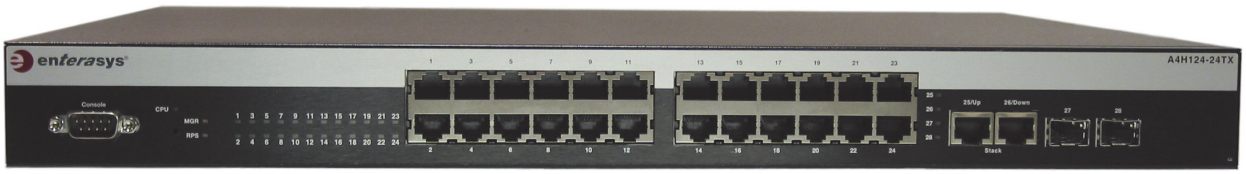
Switch	Page
(A4-Series) 24-Port Copper managed switch (P0973JM) with two RJ-45 uplink ports and two ports for Mini-GBIC modules	page 3
(A4-Series) 24-Port Fiber managed switch (P0973JN) with two RJ-45 uplink ports and two ports for Mini-GBIC modules	page 8
(A4-Series) 8-Port Copper/ 8-Port Fiber managed switch (P0973JP) with two RJ-45 uplink ports and two ports for Mini-GBIC modules	page 12
(I-Series) Industrial managed switch, hardware consists of eight or sixteen fiber, twenty-four copper, or eight fiber with twelve copper ports (P0973GA/GB/HB/HC) with two SFP(a) ports for Mini-GBIC modules	page 16
(C-Series) 26-Gigabit (SFP(a)) Port managed switch (P0973KJ (C5)) provides up to twenty-six 1Gb copper/fiber uplinks (ISL) or alternatively, a combination of Gigabit and 100Mb ports with up to twenty-four 100Mb end device fiber connections using the 100Base-FX Mini-GBIC (P0973JE).	page 21
(B-Series) 24-Gigabit (RJ-45) Port managed switch (P0973LK) provides up to twenty-four 10/100/1000Base-TX Gigabit ports. Four SFP(a) ports can be populated with 1000Base-X Mini-GBIC uplink (ISL) connector modules.	page 24
(S-Series) SSA Chassis managed switch (P0973KK) with 48-port 1000Base-T 1 Gb SFP uplink ports and 4-port 10G SFP uplink ports configurable as 1 Gb uplink ports or alternatively, a combination of Gigabit and 100Mb ports with up to forty-eight 100Mb end device fiber connections using the 100Base-FX Mini-GBIC (P0973JE)	page 33
(S-Series) S4 Chassis managed switch (P0973KD) with up to 192 1 Gb SFP uplink ports, configured as fiber or copper uplinks or alternatively, a combination of Gigabit and 100Mb ports with up to 190 100Mb end device fiber connections using the 100Base-FX Mini-GBIC (P0973JE)	page 36

(a) Small Form Factor Pluggable

Table 2. Qualified Media Converters

Media Converter	Page Reference
Media Converter 100Base-FX to 100Base-TX (P0972XH)	page 42
Media Converter 100Base-FX to 100Base-TX (P0972XH_D)	page 43

(A4-SERIES) 24-PORT COPPER MANAGED SWITCH (P0973JM)



FEATURES

The 24-Port Copper managed switch features:

- 24-ports of 100Base-TX
- Two fixed RJ-45 10/100/1000 ports, configurable for uplink
- Two 1000Base-X uplink Gigabit (SFP) ports
- Full duplex operation
- Supports VLAN configurations
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allow local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet, 802.1w Rapid Spanning Tree Protocol (RSTP)
- Optional redundant power supply
- Shelf, desk, or 19-inch rack mounting.

INTRODUCTION

The 24-Port Copper managed switch (P0973JM) provides twenty-four 100Base-TX ports with RJ-45 connectors, two fixed 10/100/1000 stacking / uplink (ISL) ports and two 1000Base-X uplink (ISL) Gigabit (SFP) ports.

The two 1000Base-X uplink (ISL) Gigabit (SFP) ports can be populated with MGBIC uplink (ISL) connector modules listed in Table 3.

The switch allows high-performance, full-featured layer-2 Ethernet switching in small to medium-sized network applications, as well as high-performance direct end-station connectivity.

OPTIONAL REDUNDANT POWER SUPPLY

See “REDUNDANT POWER SUPPLY (P0973BP)” on page 29.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) at the left, right, and rear of the switch. Do not connect the switch to the ac power source until instructed to do so later in the installation process.
- Ambient temperature at the air inlet for each switch must be maintained between 0° and 50°C (32° to 122°F). Temperature changes must be maintained within 10°C (18°F) per hour.

UPLINK/SWITCH INTERFACES

Table 3 lists the 24-Port Copper switch and the uplink interfaces that can be added to the switch. The uplink connectors are added to specific uplink interfaces.

Table 3. 24-Port Copper Managed Switch (P0973JM) Interfaces

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
24-Port Copper managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules	P0973JM	Two 1 Gb uplink RJ-45 ports, 1000Base-T for Cat5 copper cables	n/a	
		Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules	Uplink module 1000Base-SX with LC connector	P0972WT - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-LX with LC connector	P0972WU - 10 km (6.2 mi) with SMF
			Uplink module 1000Base-LX/LH with LC connector	P0972YQ - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-ZX with LC connector	P0973FT - 80 km (49.6 mi) with SMF
			Uplink module 1000Base-T with RJ-45 connectors	P0972YL - 100 m (330 ft)
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973JB and P0973JC modules	P0973JD[(a)] - 10 km (6.2 mi) with SMF Mini-GBIC Kit

Table 3. 24-Port Copper Managed Switch (P0973JM) Interfaces (Continued)

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
24-Port Copper managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules (Cont.)	P0973JM	Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules (Cont.)	Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KM and P0973KN modules	P0973KP[b] - 40 km (25 mi) S-SMF Mini-GBIC Kit
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KQ and P0973KR modules	P0973KS[c] - 120 km (74.6 mi) S-SMF Mini-GBIC Kit

(a) Kit P0973JD is comprised of two Mini-GBICs (P0973JB and P0973JC). P0973JC transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973JB transmits “upstream” uses the 1310 nm wavelength.
(b) Kit P0973KP (40 km (25 mi)) is comprised of two Mini-GBICs (P0973KM and P0973KN). P0973KN transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973KM transmits “upstream” uses the 1310 nm wavelength over Simplex Single Mode Fiber (S-SMF).
(c) Kit P0973KS (120Km) is comprised of two Mini-GBICs (P0973KQ and P0973KR). P0973KR transmits “downstream” (from the core of the network to the edge) uses the 1590 nm wavelength, and the “edge” P0973KQ transmits “upstream” uses the 1490 nm wavelength over Simplex Single Mode Fiber (S-SMF) at a minimum distance of 30 km (19 mi).

FUNCTIONAL SPECIFICATIONS

24-PORT COPPER MANAGED SWITCH (P0973JM)

Power

INTERNAL
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
Supports connection for redundant power supply

MAXIMUM POWER CONSUMPTION
31 Watts

MAXIMUM HEAT DISSIPATION
105 BTUs/Hr

MAXIMUM CURRENT
0.5 A at 110 V ac, 0.47 A at 220 V ac

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to +50°C (32 to +122°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions - Nominal

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.1 cm (17.36 in)

DEPTH
36.85 cm (14.5 in)

Mass - Approximate
2.61 kg (5.8 lb)

Cable Connectors

SWITCH PORTS
RJ-45

UPLINK PORTS
RJ-45 copper and LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, (EMI) (Class A) EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024,
AS/NZS CISPR 22, VCCI V-3

Product Safety
UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950,
IEC 60950, EN 60825, 21 CFR 1040.10

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

(A4-SERIES) 24-PORT FIBER MANAGED SWITCH (P0973JN)

FEATURES

The 24-Port Fiber managed switch features:

- 24-ports of 100Base-FX
- Two fixed RJ-45 10/100/1000 ports, configurable for uplink
- Two 1000Base-X uplink Gigabit (SFP) ports
- MT-RJ connectors on switch ports
- Full duplex operation
- Supports VLAN configurations
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allow local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet, 802.1w Rapid Spanning Tree Protocol (RSTP)
- Optional redundant power supply.

INTRODUCTION

The 24-Port Fiber managed switch (P0973JN) provides twenty-four 100Base-FX ports with MT-RJ connectors, two fixed 10/100/1000 stacking / uplink (ISL) ports and two 1000Base-X uplink (ISL) Gigabit (SFP) ports.

The two 1000Base-X uplink (ISL) Gigabit (SFP) ports can be populated with Mini-GBIC uplink (ISL) connector modules listed in Table 4.

The switch allows high-performance, full-featured layer-2 Ethernet switching in small to medium-sized network applications, as well as high-performance direct end-station connectivity.

OPTIONAL REDUNDANT POWER SUPPLY

See “REDUNDANT POWER SUPPLY (P0973BP)” on page 29.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) at the left, right, and rear of the switch. Do not connect the switch to the ac power source until instructed to do so later in the installation process.
- Ambient temperature at the installation site must be maintained between 0° and 50°C (32° to 122°F). Temperature changes must be maintained within 10°C (18°F) per hour.

UPLINK/SWITCH INTERFACES

Table 4 lists the 24-Port Fiber managed switch and the uplink interfaces that can be added to the switch. The uplink connectors are added to specific uplink interfaces.

Table 4. 24-Port Fiber Managed Switch (P0973JN) Interfaces

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
24-Port Fiber managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules	P0973JN	Two 1 Gb uplink RJ-45 ports, 1000Base-T for Cat5 copper cables	n/a	
		Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules	Uplink module 1000Base-SX with LC connector	P0972WT - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-LX with LC connector	P0972WU - 10 km (6.2 mi) with SMF
			Uplink module 1000Base-LX/LH with LC connector	P0972YQ - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-ZX with LC connector	P0973FT - 80 km (49.6 mi) with SMF
			Uplink module 1000Base-T with RJ-45 connectors	P0972YL - 100 m (330 ft)

Table 4. 24-Port Fiber Managed Switch (P0973JN) Interfaces (Continued)

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
24-Port Fiber managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules (Cont.)	P0973JN	Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules (Cont.)	Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973JB and P0973JC modules	P0973JD[a] - 10 km (6.2 mi) with SMF Mini-GBIC Kit
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KM and P0973KN modules	P0973KP[b] - 40 km (25 mi) S-SMF Mini-GBIC Kit
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KQ and P0973KR modules	P0973KS[c] - 120 km (74.6 mi) S-SMF Mini-GBIC Kit

(a) Kit P0973JD is comprised of two Mini-GBICs (P0973JB and P0973JC). P0973JC transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973JB transmits “upstream” uses the 1310 nm wavelength.

(b) Kit P0973KP (40 km (25 mi)) is comprised of two Mini-GBICs (P0973KM and P0973KN). P0973KN transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973KM transmits “upstream” uses the 1310 nm wavelength over Simplex Single Mode Fiber (S-SMF).

(c) Kit P0973KS (120Km) is comprised of two Mini-GBICs (P0973KQ and P0973KR). P0973KR transmits “downstream” (from the core of the network to the edge) uses the 1590 nm wavelength, and the “edge” P0973KQ transmits “upstream” uses the 1490 nm wavelength over Simplex Single Mode Fiber (S-SMF) at a minimum distance of 30 km (19 mi).

FUNCTIONAL SPECIFICATIONS

24-PORT FIBER MANAGED SWITCH (P0973JN)

Power

INTERNAL
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
Supports connection for redundant power supply

MAXIMUM POWER CONSUMPTION
66 Watts

MAXIMUM HEAT DISSIPATION
224 BTUs/Hr

MAXIMUM CURRENT
0.5 A at 110 V ac, 0.47 A at 220 V ac

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to +50°C (32 to +122°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.1 cm (17.36 in)

DEPTH
36.85 cm (14.5 in)

Mass - Approximate
2.7 kg (5.95 lb)

Cable Connectors

SWITCH PORTS
MT-RJ fiber

UPLINK PORTS
RJ-45 copper and LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
I47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, (EMI) (Class A) EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3

Product Safety
UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950,
IEC 60950, EN 60825, 21 CFR 1040.10

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

(A4-SERIES) 8-PORT COPPER / 8-PORT FIBER MANAGED SWITCH (P0973JP)

FEATURES

The 8-Port Copper/8-Port Fiber managed switch features:

- 8-ports of 100Base-FX
- 8-ports of 100Base-TX
- Two fixed RJ-45 10/100/1000 ports, configurable for uplink
- Two 1000Base-X uplink Gigabit (SFP) ports
- RJ-45 Category 5 connectors on switch copper ports
- MT-RJ connectors on switch fiber ports
- Full duplex operations
- Supports VLAN configurations
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allow local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet, 802.1w Rapid Spanning Tree Protocol (RSTP)
- Optional redundant power supply
- Shelf, desk, or 19-inch rack mounting.

INTRODUCTION

The 8-Port Copper/8-Port Fiber managed switch (P0973JP) provides eight 100Base-TX ports with RJ-45 connectors, eight 100Base-FX ports with MT-RJ connectors, two fixed 10/100/1000 stacking / uplink (ISL) ports and two 1000Base-X uplink (ISL) Gigabit (SFP) ports.

The two 1000Base-X uplink (ISL) Gigabit (SFP) ports can be populated with Mini-GBIC uplink (ISL) connector modules listed in Table 5.

The switch allows high-performance, full-featured layer-2 Ethernet switching in small to medium-sized network applications, as well as high-performance direct end-station connectivity.

OPTIONAL REDUNDANT POWER SUPPLY

See “REDUNDANT POWER SUPPLY (P0973BP)” on page 29.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) at the left, right, and rear of the switch. Do not connect the switch to the ac power source until instructed to do so later in the installation process.

- Ambient temperature at the installation site must be maintained between 0° and 50°C (32° to 122°F). Temperature changes must be maintained within 10°C (18°F) per hour.

UPLINK/SWITCH INTERFACES

Table 5 lists the 8-Port Copper/8-Port Fiber switch and the uplink interfaces that can be added to the switch. The uplink connectors are added to specific uplink interfaces.

Table 5. 8-Port Copper / 8-Port Fiber Managed Switch (P0973JP) Interfaces

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
8-Port Copper/ 8-Port Fiber managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules	P0973JP	Two 1 Gb uplink RJ-45 ports, 1000Base-T for Cat5 copper cables	n/a	
		Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules	Uplink module 1000Base-SX with LC connector	P0972WT - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-LX with LC connector	P0972WU - 10 km (6.2 mi) with SMF
			Uplink module 1000Base-LX/LH with LC connector	P0972YQ - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-ZX with LC connector	P0973FT - 80 km (49.6 mi) with SMF
			Uplink module 1000Base-T with RJ-45 connectors	P0972YL - 100 m (330 ft)

Table 5. 8-Port Copper / 8-Port Fiber Managed Switch (P0973JP) Interfaces (Continued)

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
8-Port Copper/ 8-Port Fiber managed switch with two RJ-45 ports for uplink and two ports for Mini-GBIC modules (Cont.)	P0973JP	Two 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules (Cont.)	Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973JB and P0973JC modules	P0973JD[a] - 10 km (6.2 mi) with SMF Mini-GBIC Kit
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KM and P0973KN modules	P0973KP[b] - 40 km (25 mi) S-SMF Mini-GBIC Kit
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KQ and P0973KR modules	P0973KS[c] - 120 km (74.6 mi) S-SMF Mini-GBIC Kit

(a) Kit P0973JD is comprised of two Mini-GBICs (P0973JB and P0973JC). P0973JC transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973JB transmits “upstream” uses the 1310 nm wavelength.

(b) Kit P0973KP (40 km (25 mi)) is comprised of two Mini-GBICs (P0973KM and P0973KN). P0973KN transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973KM transmits “upstream” uses the 1310 nm wavelength over Simplex Single Mode Fiber (S-SMF).

(c) Kit P0973KS (120Km) is comprised of two Mini-GBICs (P0973KQ and P0973KR). P0973KR transmits “downstream” (from the core of the network to the edge) uses the 1590 nm wavelength, and the “edge” P0973KQ transmits “upstream” uses the 1490 nm wavelength over Simplex Single Mode Fiber (S-SMF) at a minimum distance of 30 km (19 mi).

FUNCTIONAL SPECIFICATIONS

8-PORT COPPER / 8-PORT FIBER MANAGED SWITCH (P0973JP)

Power

INTERNAL
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
Supports connection for redundant power supply

MAXIMUM POWER CONSUMPTION
47 Watts

MAXIMUM HEAT DISSIPATION
160 BTUs/Hr

MAXIMUM CURRENT
0.5 A at 110 V ac, 0.47 A at 220 V ac

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to +50°C (32 to +122°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.1 cm (17.36 in)

DEPTH
36.85 cm (14.5 in)

Mass - Approximate
2.7 kg (5.95 lb)

Cable Connectors

SWITCH PORTS
RJ-45 copper and MT-RJ fiber

UPLINK PORTS
RJ-45 copper and LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, (EMI) (Class A) EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3

Product Safety
UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950,
IEC 60950, EN 60825, 21 CFR 1040.10

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

(I-SERIES) MANAGED INDUSTRIALLY HARDENED SWITCH (P0973GA/GB/HB/HC)

FEATURES

The hardware configurable Industrial Fiber managed switch features:

- 8-ports or 16-ports of 100Base-FX, or 24-ports of 100Base-TX, or 8-ports 100Base-FX and 12-ports of 100Base-TX (depending on hardware configuration)
- Two 1000Base-X uplink Gigabit (SFP) ports
- Fully Hardened Ethernet Switch
- Redundant DC power connections
- Convection cooled
- Full duplex operation
- Supports VLAN configuration
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allows local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet and 802.1w Rapid Spanning Tree Protocol (RSTP)
- Tabletop mounting (as shipped), DIN rail with kit P0973GE, or 19-inch rack mounted with kit P0973GG.

INTRODUCTION

The Industrially Hardened managed switches provide the following ports:

- P0973GA - twenty-four 100Base-TX ports with RJ-45 connectors
- P0973GB - eight 100Base-FX ports with LC connectors
- P0973HB - sixteen 100Base-FX ports with LC connectors
- P0973HC - eight 100Base-FX ports and twelve 100Base-TX ports with LC/RJ-45 connectors

As well, each has two 1000Base-X uplink Gigabit (SFP) ports, which can be populated with Mini-GBIC uplink connector modules (P0973GH, P0973GJ, or P0973FU).

This switch, part of the I-Series line of switches, is an industrially hardened Ethernet switch especially designed to handle networking in physically demanding environmental conditions. I-Series switches feature convection cooling, dc power, and industrial-grade components that ensure continued uptime. I-Series switches are unique for hardened switches because they embed advanced security features that protect the confidentiality, integrity and availability of industrial automation applications.

High-availability features include support for redundant dc-power connections, rapid re-convergence (802.1w RSTP). I-Series switches provide the automation industry with a fully hardened switch without sacrificing features and security.

An I-series switch is powered via an external 24 V dc power supply (P0922YU).

The switch allows high-performance, full-featured Layer-2 Ethernet switching in small to medium-sized network applications, as well as high-performance direct end-station connectivity.

EXTERNAL POWER SUPPLY

Refer to *DIN Rail Mounted Power Supply* (PSS 21H-2W3 B4) for the product specifications for the FPS400-24 power supply (P0922YU).

INSTALLATION GUIDELINES

NOTE

When installing switches within the same enclosure as I/A Series Control Processors, it is recommended that the I-series switches be utilized. These switches have been developed for this purpose.

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

WARNING

Install only in accordance with the Local and National Codes of the authorities having jurisdiction over your site. Utilize proper wiring method for all power input and output wiring that complies with the governing electrical codes in accordance with the authority having jurisdiction over the Class I, Div. 2 installations.

Class I, Div 2 installations require that all devices connected to this product must be UL approved for the area in which it is installed. Only UL approved wiring with temperature ratings greater than 90°C (194°F) are permitted for Class I, Div 2 installations operating at temperatures up to 60°C (140°F) ambient.

The dc power to the I-series switch must be provided by a reliably grounded dc power source that complies with the Safety Extra Low Voltage (SELV) requirements of IEC 60950 based safety standards. Use 14 to 20 AWG supply solid copper wires suitable for 30°C (86°F) above surrounding ambient temperature. The switch must be properly grounded utilizing a 14 to 20 AWG cable to comply with emission and immunity requirements. When installing the switch, always make the ground connection first and disconnect last. A readily accessible disconnect device that is suitably approved and rated shall be incorporated in the field wiring.

SWITCH HARDWARE CONFIGURATION

Table 6 lists the Industrial Fiber switch and the (IOM) Input Output Modules that can interface with the switch, increasing the switch's functionality and/or port capacity. The uplink connectors (GBICs) are added to the two 1000Base-X uplink Gigabit (SFP) ports providing gigabit interface to The MESH Network backbone.

Table 6. I-Series Managed Switch Modules

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
24-port RJ-45 100Base-TX Copper managed Industrial switch with two SFP ports for Mini-GBIC modules.	P0973GA	Two 1 Gb SFP uplink ports, 1000Base-X, for Mini-GBIC modules	1 Gb uplink module 1000Base-SX with LC connectors	P0973GJ - with MMF Industrial Mini-GBIC Compatible with P0972WT - Refer to Table 11 on page 45 to determine maximum range for your specific application.
8-port LC MMF 100Base-FX Fiber managed Industrial switch with two SFP ports for Mini-GBIC modules.	P0973GB		1 Gb uplink module 1000Base-LX with LC connectors	P0973GH -10 km with SMF (6.2 mi) Industrial Mini-GBIC Compatible with P0972WU
16-port LC MMF 100Base-FX Fiber managed Industrial switch with two SFP ports for Mini-GBIC modules.	P0973HB		1 Gb uplink module 1000Base-ZX with LC connectors	P0973FU - 80 km (49.6 mi) with SMF Industrial Mini-GBIC Compatible with P0973FT
8-port LC MMF 100Base-FX Fiber and 12-port 100Base-TX managed Industrial switch with two SFP ports for Mini-GBIC modules.	P0973HC		1 Gb uplink module 1000Base-LX/LH with LC connectors	P0973JA - MMF; Refer to Table 11 on page 45 to determine maximum range for your specific application. Industrial Mini-GBIC Compatible with P0972YQ.

Table 7. I-Series Switch Mounting Kits and Power Cables

Description	Invensys Part No.
Table Top mount	N/A (part of unit)
I-series DIN rail mounting kit	P0973GE
I-series rack-mounting kit for racks 48.3 cm (19-inch)	P0973GG
24 V dc output Power cable assembly for I-series switch, when used with power supply P09722YU	P0972RN
120 V ac input Power cable assembly for power supply P09722YU (83.8 cm (33 in))	P0926CM
120 V ac input Power cable assembly for power supply P09722YU (122 cm (48 in))	P0926TM

FUNCTIONAL SPECIFICATIONS

INDUSTRIAL FIBER MANAGED SWITCH (P0973GB)

Power

INTERNAL
dc Input power only
24 V dc external power

EXTERNAL
Supports connection for redundant power supply

POWER CONSUMPTION
29.76 Watts

MAXIMUM CURRENT
1.24A at 24V dc

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
-40 to +60°C (-40to +140°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

OPERATIONAL SHOCK
50 G trapezoidal shock

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk, DIN or Rack - 48.3 cm (19-inch) equipment rack, 2U high

Dimensions

HEIGHT
8.89 cm (3.5 in)

WIDTH
18.41 cm (7.25 in)

DEPTH
33.86 cm (13.33 in)

Mass - Approximate
5.06 kg (11.13 lb)

Cable Connectors

SWITCH PORTS
LC fiber

UPLINK PORTS
SFP with LC fiber Mini-GBICs

Vibration
Random: MIL-STD-810F
Vibration - IEC 60068-2-6
Shock - IEC 60068-2-27

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
47 CFR Parts 2 and 15, CSA C108.8, EN 55022, EN 55024, EN 61000-3-2, EN 61000-3-3, AS/NZS CISPR 22, and VCCI V-3

Standard EMC
FCC Part 15-Class A, ICES-003 Class A, BSMI, VCCI-Class I,
CISPR 22-Class A, EN 55024, EN 55022B Class A

Industrial EMC
EN55011

Standard Safety
UL 60950-1, CSA 22.2, EN60950-1

Humidity
IEC 60068-2-30

Certification for Switch
The switch is certified for use in hazardous locations within the guide lines of:

HAZARDOUS LOCATIONS:
ISA12.12.01 Class I, Div 2

CONTAMINATION
Class G1 (Mild) as defined in ISA Standard S71.04

(C-SERIES) 26-GIGABIT (SFP) PORT MANAGED SWITCH (P0973KJ)

FEATURES

The 26-Gigabit (SFP[1]) Port managed switch features:

- 24 1000Base-X Gigabit (SFP) and two 10G SFP ports configurable as 1G uplink ports of non-blocking SFP Mini-GBIC connectivity
- Full duplex operation
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allow local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet, 802.1w
- Rapid Spanning Tree Protocol (RSTP)
- Optional redundant power supply
- Shelf, desk, or 19-inch rack mounting.

It delivers extensive Layer 2/3/4 packet classification and marking based on any of the following:

- MAC address
- Physical port
- IP address
- IP Protocol
- IP ToS/DSCP marking
- TCP/UDP port
- IP subnet
- Address Resolution Protocol (ARP) & ARP Redirect

INTRODUCTION

The 26-Gigabit (SFP) Port managed switch (P0973KJ) provides twenty-six modular 1000Base-X Gigabit (SFP) ports. All twenty-six ports can be populated with Mini-GBIC uplink connector modules listed in Table 8. The twenty-four 1000Base-X SFP ports can be populated with the 100Base-FX Mini-GBIC (P0973JE) module for device connectivity if the switch is running on firmware 06.61.08.0013 or greater.

The switch allows high-performance, full-featured layer-2 Ethernet switching in small to medium-sized network applications. It has been designed to be utilized as an uplink switch in The MESH control network.

OPTIONAL REDUNDANT POWER SUPPLY

See “REDUNDANT POWER SUPPLY (P0973BP)” on page 29.

(1) Small Form Factor Pluggable

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) at the left, right, and rear of the switch. Do not connect the switch to the ac power source until instructed to do so later in the installation process.
- Ambient temperature at the installation site must be maintained between 0° and 50°C (32° to 122°F). Temperature changes must be maintained within 10°C (18°F) per hour.

UPLINK/SWITCH INTERFACES

Table 8 “26-Gigabit (SFP) Port Managed Switch (P0973KJ) and 24-Gigabit RJ-45 Port Managed Switch (P0973LK) Interfaces” on page 26 lists the 26-Gigabit (SFP) Port switch and the uplink interfaces that can be added to the switch. The uplink connectors are added to specific uplink interfaces.

NOTE

Ports 25 and 26 of the 26-Gigabit (SFP) Port managed switch (P0973KJ) have dual port speeds of 1Gb or 10Gb. 10Gb speeds are not currently supported on The MESH control network.

FUNCTIONAL SPECIFICATIONS

26-GIGABIT (SFP) PORT MANAGED SWITCH (P0973KJ)

Power

INTERNAL
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
Supports connection for redundant power supply

HEAT DISSIPATION
223.1 BTUs (65.4 watts)/hr

POWER CONSUMPTION
29 Watts

MAXIMUM CURRENT
1.5A

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to 50°C (32°F to 122°F)

RELATIVE HUMIDITY
5 to 95% (non-condensing)

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (non-condensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.1 cm (17.36 in)

DEPTH
36.85 cm (14.5 in)

Mass - Approximate
5.075 kg (11.2 lbs)

Cable Connectors

UPLINK PORTS
RJ-45 copper or LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
FCC 47 CFR Part 15 (Class A), ICES-003 (Class A), EN 55022 (Class A), EN 55024, EN 61000-3-2, EN 61000-3-3, AS/NZ CISPR-22 (Class A). VCCI V-3. CNS 13438 (BSMI), 2004/108/EC (EMC Directive)

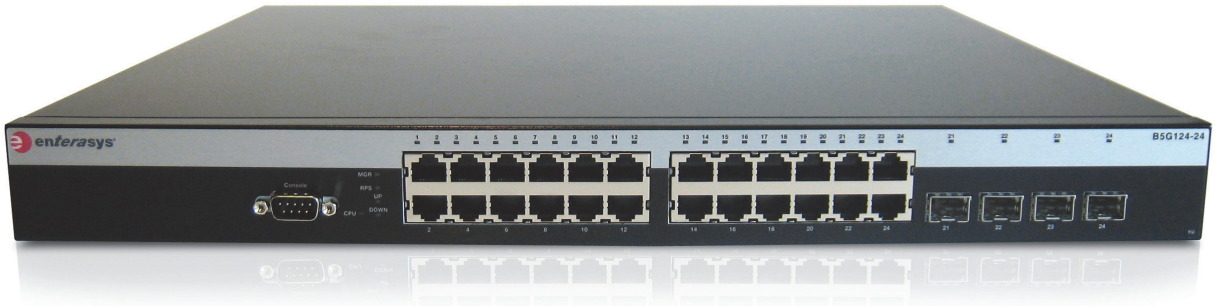
Product Safety
UL 60950-1, FDA 21 CFR 1040.10 and 1040.11, CAN/CSA C22.2 No. 60950-1, EN 60950-1, EN 60825-1, EN 60825-2, IEC 60950-1, 2006/95/EC (Low Voltage Directive)

Environmental
2002/95/EC (RoHS Directive), 2002/96/EC (WEEE Directive), Ministry of Information Order #39 (China RoHS)

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

(B-SERIES) 24-GIGABIT RJ-45 PORT MANAGED SWITCH (P0973LK)



FEATURES

The 24-Gigabit RJ-45 port managed switch features:

- 20 10/100/1000Base-TX Gigabit ports configurable as 1G uplink ports
- 4 Four optional 10/100/1000Base-TX or SFP(2) 1000Base-X Mini-GBIC ports for uplink (ISL) connector modules
- SFP(2) ports for 1000Base-X Mini-GBIC uplink (ISL) connector modules
- Full duplex operation
- Monitoring and configuration tasks via local console port, or any SNMP/RMON based management application.
- Port mirroring technology and diagnostics that allow local network traffic to be redirected to an external probe for detailed analysis
- Compliance with industry standards, including IEEE 802.3u Fast Ethernet, 802.1w
- Rapid Spanning Tree Protocol (RSTP)
- Optional redundant power supply
- Shelf, desk, or 19-inch rack mounting.

It delivers extensive Layer 2/3/4 packet classification and marking based on any of the following:

- MAC address
- Physical port
- IP address
- IP Protocol
- IP ToS/DSCP marking
- TCP/UDP port
- IP subnet
- Routing Information Protocol (RIP v1/v2)
- Internet Control Message Protocol (ICMP)
- Address Resolution Protocol (ARP) & ARP Redirect
- Dynamic Host Configuration Protocol (DHCP) Relay
- Bootstrap Protocol (BOOTP) Relay

INTRODUCTION

The 24-Gigabit (RJ-45) Port managed switches (P0973LK) provide twenty10/100/1000Base-TX Gigabit ports. Four optional 10/100/1000Base-TX or SFP ports that can be populated with 1000Base-X Mini-GBIC uplink (ISL) connector modules listed in Table 8. If an SFP port is populated with a Mini-GBIC then the corresponding 1000Base-TX copper port cannot be used.

The switches allow high-performance, full-featured layer-2 Ethernet switching in small to medium-sized network applications.

(2) Small Form Factor Pluggable

OPTIONAL REDUNDANT POWER SUPPLY

See “REDUNDANT POWER SUPPLY (P0973BP)” on page 29.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for this switch. If the guidelines are not followed, unsatisfactory network performance may result.

- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) at the left, right, and rear of the switch. Do not connect the switch to the ac power source until instructed to do so later in the installation process.
- Ambient temperature at the installation site must be maintained between 0° and 50°C (32° to 122°F). Temperature changes must be maintained within 10°C (18°F) per hour.

UPLINK/SWITCH INTERFACES

Table 8 “26-Gigabit (SFP) Port Managed Switch (P0973KJ) and 24-Gigabit RJ-45 Port Managed Switch (P0973LK) Interfaces” on page 26 lists the 24-Gigabit RJ-45 Port switch and the uplink interfaces that can be added to the switch. The uplink connectors are added to specific uplink interfaces.

NOTE

Ports 21-24 can be used as 1 Gigabit fix copper or utilized as a SFP GBIC that can be installed with fiber connectivity. If a SFP GBIC is utilized, the corresponding fixed (RJ-45) copper port will be disabled. Ports 21-24 should be reserved for ISL ports.

Table 8. 26-Gigabit (SFP) Port Managed Switch (P0973KJ) and 24-Gigabit RJ-45 Port Managed Switch (P0973LK) Interfaces

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
26-Gigabit (SFP) Port managed switch -AND- 24-Gigabit (RJ-45) Copper Port managed switch	P0973KJ P0973LK	Twenty-six 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules Twenty-four 1 Gb 1000Base-TX ports and four SFP ports for 1000Base-X Mini-GBIC modules	Uplink module 1000Base-SX with LC connector	P0972WT - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-LX with LC connector	P0972WU - 10 km (6.2 mi) with SMF
			Uplink module 1000Base-LX/LH with LC connector	P0972YQ - MMF -Refer to Table 11 on page 45 to determine maximum range for your specific application.
			Uplink module 1000Base-ZX with LC connector	P0973FT - 80 km (49.6 mi) with SMF
			Uplink module 1000Base-T with RJ-45 connectors	P0972YL - 100 m (330 ft)
			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973JB and P0973JC modules	P0973JD[(a)] - 10 km (6.2 mi) with SMF Mini-GBIC Kit
			100Mb MGBIC 100Base-FX device interface module with LC connectors	P0973JE - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.

Table 8. 26-Gigabit (SFP) Port Managed Switch (P0973KJ) and 24-Gigabit RJ-45 Port Managed Switch (P0973LK) Interfaces (Continued)

Switch		Uplink Ports (on Switch)	Uplink Connectors (Add to Interfaces)	
Description	**Invensys Part No.**	**Description**	**Description**	**Invensys Part No.**
26-Gigabit (SFP) Port managed switch -AND- 24-Gigabit (RJ-45) Copper Port managed switch (CONT.)	P0973KJ P0973LK	Twenty-six 1 Gb uplink ports, 1000Base-X, for Mini-GBIC modules Twenty-four 1 Gb 1000Base-TX ports and four SFP ports for 1000Base-X Mini-GBIC modules (CONT.)	Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KM and P0973KN modules Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KQ and P0973KR modules	P0973KP[(b)] - 40 km (25 mi) S-SMF Mini-GBIC Kit P0973KS[(c)] - 120 km (74.6 mi) S-SMF Mini-GBIC Kit

(a) Kit P0973JD is comprised of two Mini-GBICs (P0973JB and P0973JC). P0973JC transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973JB transmits “upstream” uses the 1310 nm wavelength.

(b) Kit P0973KP (40 km (25 mi)) is comprised of two Mini-GBICs (P0973KM and P0973KN). P0973KN transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973KM transmits “upstream” uses the 1310 nm wavelength over Simplex Single Mode Fiber (S-SMF).

(c) Kit P0973KS (120Km) is comprised of two Mini-GBICs (P0973KQ and P0973KR). P0973KR transmits “downstream” (from the core of the network to the edge) uses the 1590 nm wavelength, and the “edge” P0973KQ transmits “upstream” uses the 1490 nm wavelength over Simplex Single Mode Fiber (S-SMF) at a minimum distance of 30 km (19 mi).

FUNCTIONAL SPECIFICATIONS

24-GIGABIT (RJ-45) PORT MANAGED SWITCH (P0973LK)

Power

INTERNAL
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
Supports connection for redundant power supply

HEAT DISSIPATION
164 BTUs/hour

POWER CONSUMPTION
48 Watts

MAXIMUM CURRENT
2A Maximum

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to 50°C (32°F to 122°F)

RELATIVE HUMIDITY
5 to 95% (non-condensing)

Storage Conditions

TEMPERATURE
-40 to +70°C (-40 to +158°F)

RELATIVE HUMIDITY
5 to 95% (non-condensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.1 cm (17.36 in)

DEPTH
36.85 cm (14.5 in)

Mass - Approximate
4.92 kg (10.85 lb)

Cable Connectors

UPLINK PORTS
RJ-45 copper or LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
FCC 47 CFR Part 15 (Class A), ICES-003 (Class A), EN 55022 (Class A), EN 55024, EN 61000-3-2, EN 61000-3-3, AS/NZ CISPR-22 (Class A). VCCI V-3. CNS 13438 (BSMI), 2004/108/EC (EMC Directive)

Product Safety
UL 60950-1, FDA 21 CFR 1040.10 and 1040.11, CAN/CSA C22.2 No. 60950-1, EN 60950-1, EN 60825-1, EN 60825-2, IEC 60950-1, 2006/95/EC (Low Voltage Directive)

Environmental
2002/95/EC (RoHS Directive), 2002/96/EC (WEEE Directive), Ministry of Information Order #39 (China RoHS)

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

REDUNDANT POWER SUPPLY (P0973BP)

Redundant Power Supply (P0973BP)

Features

The redundant power supply for the 24-Port Copper (P0973JM), 24-Port Fiber (P0973JN), 8-Port Copper/ 8-Port Fiber (P0973JP), 26-Gigabit (SFP) Port (P0973KJ) and 24-Gigabit (RJ-45) Port (P0973LK) managed switches features:

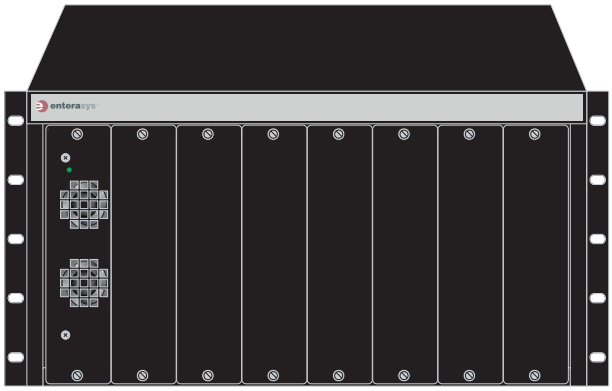
- Support for up to eight P0973JM, P0973JN, P0973JP, P0973KJ, or P0973LK managed switches (one supply/switch)
- Desktop, shelf, or 19-inch rack mounting
- Up to 156 W of power per supply (with up to eight supplies/chassis).

Overview

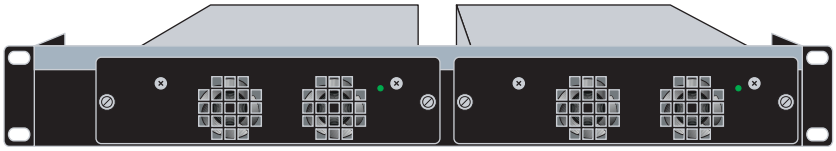
The 156 watt redundant power supply (P0973BP) can supply redundant power for the P0973JM, P0973JN, P0973JP, P0973KJ, or P0973LK managed switches. It operates in a parallel capacity with the switch's internal power supply. In the event of an ac power loss or failure of an internal power supply, the redundant power supply supports the full load of the switch without affecting network operation.

The (RPS) redundant power supply (P0973BP) must be used with the (RPSC) Redundant Power Supply Chassis (P0973BM/BN). This chassis does not have AC power connections or electronics.

The P0973BN power supply chassis accommodates two RPSes (P0973BP) which can support up to two P0973JM, P0973JN, P0973JP, P0973KJ, or P0973LK switches. The P0973BM power supply chassis accommodates up to eight RPSes (P0973BP) which can support up to eight P0973JM, P0973JN, P0973JP, P0973KJ, or P0973LK switches.



Redundant Power Supply Chassis (P0973BM) - Eight Slot



Redundant Power Supply Chassis (P0973BN) - Two Slot

FUNCTIONAL SPECIFICATIONS

REDUNDANT POWER SUPPLY (P0973BP)

Power

AC INPUT RANGE
85-264 V ac Hz, 47 to 63 Hz

OUTPUT
102 W or 156 W continuous

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
5 to +40°C (41 to +104°F)

RELATIVE HUMIDITY
5 to 90% (noncondensing)

Storage Conditions

TEMPERATURE
-30 to +73°C (-22 to +164°F)

RELATIVE HUMIDITY
5 to 90% (noncondensing)

PHYSICAL SPECIFICATIONS

Mounting
Redundant power supply chassis (P0973BM for eight RPS and P0973BN for two RPS)

Mass - Approximate
1.75 kg (3.85 lb)

Dimensions

HEIGHT
19.6 cm (7.7 in)

WIDTH
5.2 cm (2.04 in)

DEPTH
25.7 cm (10.1 in)

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
(Applies to P0973BM with eight power supplies installed and working with eight switches)
47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024; AS/NZS CISPR 22, and VCCI V-3

Product Safety
UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, and IEC 60950

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

FUNCTIONAL SPECIFICATIONS

REDUNDANT POWER SUPPLY CHASSIS (P0973BM)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack, 5U high

Dimensions

HEIGHT
22.26 cm (8.77 in)

WIDTH
44 cm (17.3 in)

DEPTH
26.4 cm (10.4 in)

Mass - Approximate
5.27 kg (11.6 lb)

Power Supply Slots
Eight slots for redundant power supplies (P0973BP)

REDUNDANT POWER SUPPLY CHASSIS (P0973BN)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
5.5 cm (2.2 in)

WIDTH
48.2 cm (19 in)

DEPTH
18 cm (7.0 in)

Mass - Approximate
0.95 kg (2.09 lb)

Power Supply Slots
Two slots for redundant power supplies (P0973BP)

(S-SERIES) SSA CHASSIS MANAGED SWITCH (P0973KK)

FEATURES

The features of the SSA Chassis managed switch (P0973KK) are:

- Up to 48 - 1000Base-X 1 Gb SFP uplink ports
- 4-port 10G SFP uplink ports configurable as 1G uplink ports
- Rapid Spanning Tree (RSTP), IEEE 802.1w compatible
- Monitoring and configuration tasks via local port, or SNMP-based management application
- Distributed switching architecture for maximum uptime
- No single point of failure - contains integral redundant power supplies.

INTRODUCTION

The SSA Chassis managed switch provides fifty-two SFP 1000Base-X 1Gb uplink ports.

The switch allows high-performance, full-featured Ethernet switching in small to medium-sized network applications, as well as high-performance direct end-station connectivity.

Distributed switching architecture with redundant processors and integral load-sharing redundant power supplies make the SSA Chassis managed switch extremely reliable.

POWER SUPPLY

The chassis utilizes a 625 watt power supply (ordered separately) that requires one separately fused, 15-amp power circuit within 182 cm (6 ft) of the power supply. For redundancy, a second supply slot is available.

NOTE

Two separate branch circuits are required for the redundant power supply. Requires two 15 A ac outlets independently fused within 182 cm (6 ft) of power supply, each outlet uses a separate 15 A power circuit per power supply.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for the SSA Chassis managed switch. If the guidelines are not followed, unsatisfactory network performance may result.

- The SSA Chassis managed switch may be mounted in a 19" rack, such in the G50 Server enclosure, discussed in *G50 Server Enclosure* (PSS 21H-2X50 B4).
- If installed in an enclosure other than the G50 Server enclosure, be aware that the air flow for the SSA Chassis managed switch is different from other The MESH control network switches and this may impact the air circulation in the enclosure.
- To ensure proper ventilation and prevent overheating, leave a minimum clearance space of 5.1 cm (2.0 in) of clearance on either side and in the rear of the unit.
- To install the SSA Chassis managed switch as a freestanding unit on a shelf, the shelf must be able to adequately support the static weight of the unit.
- The power supplies for the SSA Chassis managed switch require two three-pronged power receptacles capable of delivering the current and voltage specified below. ac outlets on independently fused circuits are required for each power supply, and must be located less than 2 m (6 ft) from the site. The power cord used and type of outlet is dependent on the country. In the United States, two power cords with NEMA 5-15P plugs are provided with each power supply.
- Ambient temperature at the air inlet for each switch must be maintained between 5° and 40°C (41° to 104°F). Temperature changes must be maintained within 10°C (18°F) per hour.
- To install the SSA Chassis managed switch as a rack mounted unit using the SSA rail kit (shipped with the SSA switch), ensure that the rack used will support the unit and that the rack will remain stable after installation.

The SSA Chassis switch can be mounted on a desktop, or in three types of racks:

- Four-post rack
- Two-post rack (18 cm (7 in) posts)
- Two-post rack (7.6 cm (3 in) posts).

FUNCTIONAL SPECIFICATIONS

SSA CHASSIS MANAGED SWITCH (P0973KK)

Power

INTERNAL
Up to 2 ac Input power supplies (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

EXTERNAL
N/A

HEAT DISSIPATION
BTUs (65.4 watts)/hr

POWER CONSUMPTION
625 Watts

MAXIMUM CURRENT
8A

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
5°C to 40°C (41°F to 104°F)

RELATIVE HUMIDITY
5% to 90% (non-condensing)

Storage Conditions

TEMPERATURE
-30°C to 73°C (-22°F to 164°F)

RELATIVE HUMIDITY
5% to 90% (non-condensing)

PHYSICAL SPECIFICATIONS

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack,1U high

Dimensions

HEIGHT
4.4 cm (1.7 in)

WIDTH
44.7 cm (17.6 in)

DEPTH
59.43 cm (23.4 in)

Mass - Approximate
11.79 kg (26 lb)

Cable Connectors

UPLINK PORTS
RJ-45 copper or LC fiber

Vibration
Vibration - IEC 68-2-36, IEC 68-2-6
Shock - IEC 68-2-29
Drop - IEC 68-2-32

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
FCC 47 CFR Part 15 (Class A), ICES-003 (Class A), EN 55022 (Class A), EN 55024, EN 61000-3-2, EN 61000-3-3, AS/NZ CISPR-22 (Class A). VCCI V-3. CNS 13438 (BSMI), 2004/108/EC (EMC Directive)

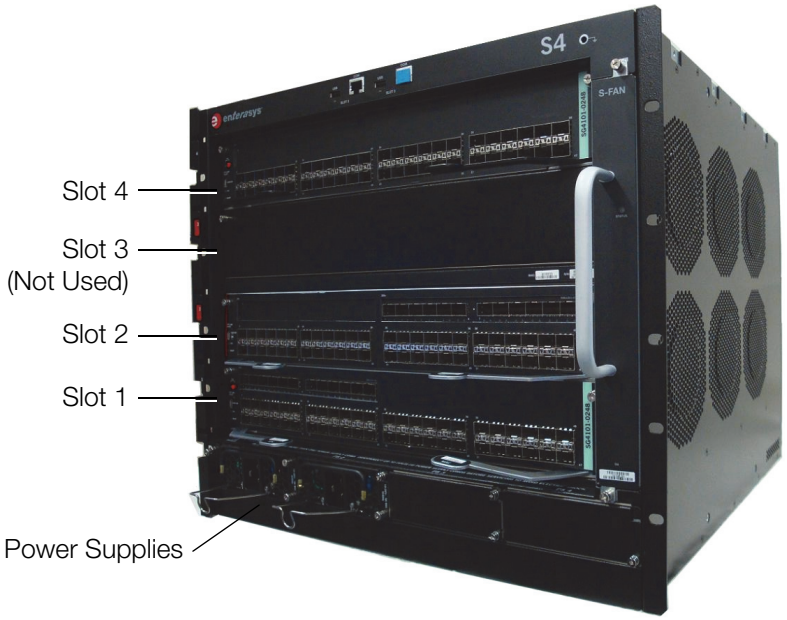
Product Safety
Safety: UL 60950-1, FDA 21 CFR 1040.10 and 1040.11, CAN/CSA C22.2, No. 60950-1, EN 60950-1, EN 60825-1, EN 60825-2, IEC 60950-1, 2006/95/EC (Low Voltage Directive)
Modules which support laser connections also meet the EN 60825 and 21 CFR 1040.10 standards.

Environmental
2002/95/EC (RoHS Directive), 2002/96/EC (WEEE Directive), Ministry of Information Order #39 (China RoHS)

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

(S-SERIES) S4 CHASSIS SWITCH (P0973KD)



FEATURES

The features of the S4 Chassis managed switch (P0973KD) are:

- Up to 192 1Gb SFP uplink ports depending on the choice of modules
- Selectable switch modules/uplink modules and interfaces (see Table 9, “S4 Chassis Switch Modules/Uplink Modules,” on page 38)
- Rapid Spanning Tree (RSTP), IEEE 802.1w compatible
- Monitoring and configuration tasks via local port, or SNMP-based management application
- Distributed switching architecture for maximum uptime
- No single point of failure - contains integral redundant power supplies.

INTRODUCTION

The S4 Chassis managed switch provides up to one hundred ninety two SFP uplink ports depending on the number of blades and modules installed.

The S4 Chassis managed switch consists of three usable slots within a 4-slot chassis with four empty power supply locations and a front mounted fan assembly. The 3-slots can be populated with Ethernet blades/modules, depending on the needs of the user.

Slot 2 in the switch must be populated with an S4 S-series Network I/O Fabric module (P0973KG) for switch operations. The I/O Fabric module is the master blade for the switch, controlling the other slot locations. To achieve proper failover in the event of an I/O Fabric module failure, Slot 3 cannot be populated.

The switches allow high-performance, full-featured Ethernet switching in medium to large-sized network applications.

Direct end-station connectivity is possible when using the 100Mb GBIC (P0973JE).

NOTE

S4 Chassis managed switches requires a minimum of two power supplies installed. If the P0973KE power supply is utilized then a 20-amp branch circuits is required. If the P0973LJ power supply is being utilized then a 15-amp branch circuits can be used.

POWER SUPPLY

The S4 chassis utilizes up to four power supplies (ordered separately) that requires one separately fused 20-amp or 15-amp power circuit within 182 cm (6 ft) of the power supply. For redundancy, four supply slots are available.

INSTALLATION GUIDELINES

The following guidelines must be observed when a site is selected for the S4 Chassis managed switch. If the guidelines are not followed, unsatisfactory network performance may result.

- The S4 Chassis managed switch may be mounted in a 19" rack, such in the G50 Server enclosure, discussed in *G50 Server Enclosure* (PSS 21H-2X50 B4).
- If installed in an enclosure other than the G50 Server enclosure, be aware that the air flow for the S4 Chassis managed switch is different from other The MESH control network switches and this may impact the air circulation in the enclosure.
- For proper cooling, there must be a minimum amount of clearance 152 mm (6 in) behind the chassis and 51 mm (2 in) of clearance on either side of the chassis.
- If installing the S4 Chassis managed switch as a freestanding unit on a shelf, ensure that the shelf can support a minimum weight of approximately 24.7 kg (54.45 lb) per fully loaded chassis plus the weight of the connected network cables. The weight includes the chassis, fan tray, two power supplies, and three modules.
- If installing the S4 Chassis managed switch in an equipment rack, ensure that the rack can support and remain stable with the chassis installed.
- Each P0973KE ac power supply requires a three-pronged power receptacle capable of delivering the current and voltage specified below. An ac outlet on a separately fused circuit is required for each P0973KE supply to provide power redundancy, and must be located within 1.8 m (6 ft) from the site. The power cord used and type of outlet is dependent on the country. In the United States, a power cord with a NEMA 5-20P plug is provided with each P0973KE supply.
- Ambient temperature at the air inlet for each switch must be maintained between 5° and 40°C (41° to 104°F). Temperature changes must be maintained within 10°C (18°F) per hour.

SWITCH/UPLINK MODULES

Table 9 lists the type of Ethernet switch modules and optional uplink modules which are compatible with the S4 Chassis managed switch. This managed switch has three usable slots for switch modules (blades).

Table 9. S4 Chassis Switch Modules/Uplink Modules

Switch Modules		Uplink Modules (add to switch module)		Uplink Connectors (add to uplink module)	
Description	**Invensys Part No.**	**Description**	**Invensys Part No.**	**Description**	**Invensys Part No.**
(Slot 2 only) Plug-in S150 I/O Fabric switch module with 2 expansion slots for Network Option Modules	P0973KG	1 Gb uplink Network Option Module with 12 SFP ports	P0973KH	Uplink module 1000Base-SX with LC connectors	P0972WT - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
				Uplink module 1000Base-LX/LH with LC connectors	P0972YQ - MMF - Refer to Table 11 on page 45 to determine maximum range for your specific application.
(Slot 1 or 4 only) Plug-in S130 I/O switch module with expansion slot for Network Option Modules	P0973KF			Uplink module 1000Base-LX with LC connectors	P0972WU - 10 km (6.2 mi) with SMF
				Uplink module 1000Base-ZX with LC connector	P0973FT[(a)] - 80 km (49.6 mi) with SMF
				Uplink module 1000Base-T with RJ-45 connectors	P0972YL - 100 m (330 ft)

Table 9. S4 Chassis Switch Modules/Uplink Modules (Continued)

Switch Modules		Uplink Modules (add to switch module)		Uplink Connectors (add to uplink module)	
Description	**Invensys Part No.**	**Description**	**Invensys Part No.**	**Description**	**Invensys Part No.**
(Slot 2 only) Plug-in S150 I/O Fabric switch module with 2 expansion slots for Network Option Modules	P0973KG	1 Gb uplink Network Option Module with 12 SFP ports (Continued)	P0973KH (Cont.)	Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973JB and P0973JC modules	P0973JD[b] - 10 km (6.2 mi) SMF Mini-GBIC Kit
				100Base-TX with LC connectors	P0973JE - MMF
(Slot 1 or 4 only) Plug-in S130 I/O switch module with expansion slot for Network Option Modules	P0973KF			Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KM and P0973KN modules	P0973KP[c] - 40 km (25 mi) S-SMF Mini-GBIC Kit
				Bi-directional downlink/uplink Mini-GBIC Kit - includes both P0973KQ and P0973KR modules	P0973KS[d] - 120 km (74.6 mi) S-SMF Mini-GBIC Kit

(a) It is not recommended to use the P0973FT MGBIC over distances less than 8 km (5.0 mi).
(b) Kit P0973JD is comprised of two Mini-GBICs (P0973JB and P0973JC). P0973JC transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973JB transmits “upstream” uses the 1310 nm wavelength.
(c) Kit P0973KP (40 km (25 mi)) is comprised of two Mini-GBICs (P0973KM and P0973KN). P0973KN transmits “downstream” (from the core of the network to the edge) uses the 1490 nm wavelength, and the “edge” P0973KM transmits “upstream” uses the 1310 nm wavelength over Simplex Single Mode Fiber (S-SMF).
(d) Kit P0973KS (120Km) is comprised of two Mini-GBICs (P0973KQ and P0973KR). P0973KR transmits “downstream” (from the core of the network to the edge) uses the 1590 nm wavelength, and the “edge” P0973KQ transmits “upstream” uses the 1490 nm wavelength over Simplex Single Mode Fiber (S-SMF) at a minimum distance of 30 km (19 mi).

FUNCTIONAL SPECIFICATIONS

S4 CHASSIS SWITCH (P0973KD)

Standards Supported
IEEE 802.1q, 802.1d, 802.1p, 802.1w, 802.1x, 802.3, 802.3ad
Fast Ethernet: IEEE 802.3u, 100Base-FX
Gigabit Ethernet: IEEE 802.3z, 1000Base-T

Fault Tolerance

SWITCH MODULES
Independent, hot-swappable modules

POWER SUPPLIES
1:1 redundant integral supplies

Number of 1 Gb SFP Uplink ports (module configuration dependent)
Up to 192

Input (Voltage/Current) at Output Power

P0973KE
20A, 100-240VAC input, (1200/1600W)

P0973LJ
15A, 100-240VAC input, (930/1600W)

Link Power Budget
The maximum drive distance depends on the quality of the installed single-mode and multi-mode fiber-optic cable segment. Use the link power budget to calculate the maximum cable length of the attached segment. The link power budget must not be exceeded.

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
5°C to 40°C (41°F to 104°F)

RELATIVE HUMIDITY
5 to 90% (noncondensing)

Storage Conditions

TEMPERATURE
-30°C to 73°C (-22°F to 164°F)

RELATIVE HUMIDITY
5 to 90% (noncondensing)

PHYSICAL SPECIFICATIONS

S4 CHASSIS MANAGED SWITCH (P0973KD)

Mounting
Desk or Enclosure - 48.3 cm (19-inch) equipment rack, 9U high

Chassis Dimensions - Nominal

HEIGHT
40 cm (15.75 in)

WIDTH
44.7 cm (17.6 in)

DEPTH
47.32 cm (18.63 in)

Mass - Approximate

CHASSIS
24.7 kg (54.45 lb)

Cables

COPPER
1000Base-T, RJ-45

FIBER
1000Base-SX, 1000Base-LX, 1000Base-LX/LH, 1000Base-BX, or 1000Base-ZX LC connector

MEDIA TYPE
MMF (62.5 µm)/SMF (9 µm)), S-SMF (9 µm) or STP CAT5 cables

REGULATORY COMPLIANCE AND CERTIFICATION

Electromagnetic Compatibility (EMC)
47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, EN 55022, EN 61000-3-2,
EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3

Product Safety
UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, IEC 60950
Modules which support laser connections also meet the EN 60825 and 21 CFR 1040.10 standards.

Location
UL/UL-C listed as suitable for use in ordinary locations and meets ordinary safety standards for fire and shock hazards.

Contamination
Class G1 (Mild) as defined in ISA Standard S71.04

MEDIA CONVERTER 100BASE-FX TO 100BASE-TX (P0972XH_D)

Front View

FEATURES

The features of the Media Converter (P0972XH) are:

- Copper RJ-45 to MT-RJ fiber media conversion
- 100Mbps speed adaptation
- Multimode fiber up to 2 km
- Link Loss Carry Forward, (LLCF) and Link Loss Return (LLR) aids in troubleshooting a remote network connection for all fiber optic ports
- Auto-Recovery restarts fiber link between two back-to-back line cards after a link loss event
- MDI-II to MDI-X switch eliminates the need for crossover cables on twisted-pair ports.

INTRODUCTION

The Media Converter (P0972XH) supports mixed media networks by enabling copper-to-fiber media conversion. It includes auto-recovery to automatically restore link on the fiber line after a link loss event. Auto-recovery works in conjunction with Link Loss Return and Link Loss Carry Forward to identify the loss of a remote network connection. It's impact resistant enclosure is made of high durability, fade resistant plastic.

FUNCTIONAL SPECIFICATIONS

MEDIA CONVERTER 100BASE-FX TO 100BASE-TX (P0972XH_D)

Link Length
MMF, 2 km (1.25 mi)
CAT 5 cable, 100 m (330 ft)

Power Internal
ac Input power (auto-sensing)
100 V ac to 240 V ac, 50 to 60 Hz

Power Consumption
10 W

ENVIRONMENTAL SPECIFICATIONS

Operating Conditions

TEMPERATURE
0 to +50°C (32 to + 132°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

Storage Conditions

TEMPERATURE
-25 to +70°C (-12 to +158°F)

RELATIVE HUMIDITY
5 to 95% (noncondensing)

PHYSICAL SPECIFICATIONS

Dimensions - Nominal (19-inch Rack Width)

HEIGHT
26 mm (1.06 in)

WIDTH
70 mm (2.76 in)

DEPTH
97 mm (3.83 in)

Mounting
Desk, shelf, or wall mount

Mass - Approximate
0.55 kg (1.2 lb)

RECOMMENDED SWITCH TYPES PER ENVIRONMENT

Table 10 lists the types of switches which are recommended, based on the operating conditions in your installation site.

Table 10. Switch Types Recommended Per Installation Environment

Operating Conditions @ Site	Switch Types Supported
Temperature Range: 5 to +40°C (41 to +104°F) - for S-Series switches 0 to +50°C (32 to +122°F) - for A-Series and C-Series switches Relative Humidity: 5 to 90% (non-condensing)	All currently qualified switches All currently qualified GBICs
Temperature Range: -40 to +60°C (-40 to +140°F) - for I-Series switches Relative Humidity: 5 to 95% (non-condensing) Operational Shock: 50 G trapezoidal shock	P0973GA, P0973GB, P0973HB, P0973HC switches Includes GBICs (P0973GJ, P0973JA, P0973GH, and P0973FU) NOTE: When installing switches within the same enclosure as I/A Series Control Processors, it is recommended that the I-series switches (P0973GA/GB/HB/HC) be utilized.

OPERATING RANGE FOR MINI-GBIC UPLINK CONNECTOR MODULES

Table 11 lists the operating ranges for the Mini-GBIC uplink connector modules that can be used with The MESH network switches. Refer to the sections above for the Mini-GBIC modules which can be used which each switch type.

Table 11. Operating Range for Mini-GBIC Uplink Connector Modules[a]

Product Part Number[b]	Cable Type	Modal Bandwidth		Range	
		Light Wavelength	MHz/km	Min. (Meters)	Max. (Meters)
P0972WT and P0973GJ	62.5µm	850	160	2	220
	62.5µm		200	2	275
	50µm		400	2	500
	50µm		500	2	550
P0972YQ and P0973JA	62.5µm	1310	160	2	2000
	50µm		400	2	1000
P0972WU and P0973GH	9-10µm	1310	-	-	10000
P0973FT[c] and P0973FU	9-10µm	1550	-	-	80000
P0973JB[d]	9µm	1310/1490	-	-	10000
P0973JC[d]	9µm	1490/1310	-	-	10000
P0973JE[e]	62.5µm	1310	160	2	2000
	50µm		400	2	1000
P0973KM[d]	9µm	1310/1490	-	5000	40000
P0973KN[d]	9µm	1490/1310	-	5000	40000
P0973KQ[d]	9µm	1490/1590	-	30000	120000
P0973KR[d]	9µm	1590/1490	-	30000	120000

(a) Transmission distances are provided as a nominal guide only. Refer to the optical specifications and the specific characteristics of your fiber installation to determine targeted distances.

(b) Industrial MGBIC to be used with I-series industrial switch (P0973GA) with thermal limits of -40 to +60°C (-40 to +140°F). All other MGBICs are thermal rated at 0 to +50°C (32 to +122°F).

(c) It is not recommended to use the P0973FT MGBIC over distances less than 8 km (5.0 mi).

(d) P0973JB/JC, P0973KM/KN and P0973KQ/KR are bi-directional Mini-GBICs. Both upstream and downstream switches transmit on the same fiber but at different frequencies. When ordering these Mini-GBICs, you must acquire a matching pair, one of each type. For a matching pair, order kits P0973JD (10 km (6.2 mi)), P0973KP (40 km (25 mi)), or P0973KS (120 km (74.6 mi)) which include one of each of the required modules.

(e) This Mini-GBIC (P0973JE) is not to be used as an uplink (ISL) port. This Mini-GBIC has been qualified to be used for an end device (CP, ATS, FCM, workstation, etc.) 100Mb switch port.

NETWORK SIZING (SWITCH SIZING)

The following tables provide suggestions for sizing requirements, depending on your network. For more complete sizing guidelines, refer to *The MESH Control Network System Planning and Sizing* (B0700AX).

Table 12. Network Sizing (Switch Sizing) For Small/Medium Networks

Small Networks		Medium Networks	
2-8 Switches (<224 ports)		8-24 Switches (<600 ports)	
Topology		Topology	
Star	Tree	Star	Tree
Root Switches Recommended	*Root/Core Switches Recommended*	*Root Switches Recommended*	*Root/Core Switches Recommended*
P0973KK, P0973KJ, or P0973LK	All switches, except those Not Recommended	P0973KK, P0973KJ, or P0973LK	P0973KK, P0973KJ, or P0973LK
Root Switches Not Recommended	*Root Switches Not Recommended*	*Root Switches Not Recommended*	*Root Switches Not Recommended*
P0972WP/YC, P0973JM/JN/JP, and P0973GA/GB/HB/HC	P0972WP/YC and P0973GA/GB/HB/HC	P0972WP/YC, P0973JM/JN/JP, and P0973GA/GB/HB/HC	P0972WP/YC, and P0973GA/GB/HB/HC

Table 13. Network Sizing (Switch Sizing) For Large/Extra-Large Networks

Large Networks		Extra-Large Networks	
20 – 72 Switches (<1700 ports)		> 54 Switches	
Topology		Topology	
Star	Tree	Star	Tree
Root Switches Recommended	*Root/Core Switches Recommended*	*Root Switches Recommended*	*Root/Core Switches Recommended*
P0973KK or P0973KD	P0973KJ, P0973LK, P0973KK, or P0973KD	P0973KD Network <190 switches	P0973KJ, P0973LK, P0973KK, or P0973KD
Root Switches Not Recommended	*Root Switches Not Recommended*	*Root Switches Not Recommended*	*Root Switches Not Recommended*
P0972WP/YC, P0973JM/JN/JP, and P0973GA/GB/HB/HC	P0972WP/YC, P0973JM/JN/JP, and P0973GA/GB/HB/HC	All (except above listed)	P0972WP/YC, P0973JM/JN/JP, and P0973GA/GB/HB/HC

System Configuration Features

The following table compares the features and protections available in the three available network configurations.

Table 14. System Configuration Features

Standard Configuration	Security Enhanced Configuration
Network's ability to recovery from a “Spanning Tree Failure” event.	
FEATURE: Rapid Spanning Tree and Loop Protection Algorithm (LPA)	FEATURE: Loop Detection Policy (LDP) and Loop Protection Algorithm (LPA)
“STP Loop (Data Storm)” protected network if LPA is deployed	“STP Loop (Data Storm)” loop detection (Sub-second recovery from event)
Switches Recommended	*Switches Recommended*
All switches, (V-series switches not supported, All switches within the network must be running latest firmware release)	P0973KK and P0973KD (at root and core)

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