# Amphenol
## RJ-Switch



IP67 rugged Ethernet Managed Switch
RESMLAC 28MG
- Installation Guide -

# Contents

| ISO 9001 | cULus | CE | FC |
|---|---|---|---|
| **Total Quality** | **Standard Locations** | **European Directives** | **US Emissions** |

This manual applies to the following products:

- **RESMLAC 28 MG**

  Rugged IP67 Managed Ethernet Switch with 24 gigabit ports + 4 optional fiber ports.
  For options and detailed P/N, please consult us.

| Révision | Date | Modifications |
|---|---|---|
| 1.0 | August 2011 | Initial document |
| 1.1 | November 2011 | Pinout of power connector. |

## *Amphenol Statement of Limited Warranty:*

The characteristics of the Products shall be defined as those published in the most recent version of the Vendor's specifications, unless different characteristics are expressly agreed between the Vendor and the Customer.

Unless expressly agreed to the contrary, the guarantee shall be valid for one year from the date of delivery.

The guarantee shall be made invalid:

- Where the cover of the switch enclosure have been opened.
- Where the components have been damaged in transit or have not been stored by the Customer in conditions in accordance with the specification.
- Where the components have been subjected to abuse (mechanical, electrical or thermal) on installation or on use and, in the case of slices/dice, have been subjected to handing or such operations as the welding of connecting wires mounting by soldering or sticking.
- Where the unfitness or defectiveness of the components has resulted from exceeding the maximum values for usage (temperature limit, maximum voltage, etc.) as defined by the Vendor, or from incorrect choice of application.

Furthermore, the guarantee shall not cover consequential liability, direct or indirect which may result from the failure of a component supplied by the Vendor.

The foregoing constitutes the Vendor's guarantee in its entirely and takes the place of any other format guarantee, implied or otherwise.

The guarantee is limited, at the Vendor's option, to either the replacement or the repair of the component accepted by him as being defective, to the exclusion of any other from of compensations.


## *FCC Statement:*

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

## *CE Declaration of conformity:*

This equipment complies with the requirements relating to electromagnetic compatibility, EN 55022 class B for ITE and EN 50082-1.

This meets the essential protection requirements of the European Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

## *Copyright & Trademarks:*

**Note: All information in this document is subject to change without notice.**

# Section 1    General Information

This manual will help you install and maintain the 28 ports Amphenol Rugged Ethernet Gigabit Managed switches.

Military applications can now take full advantage of 1000Mbps Gigabit Ethernet performance.
The installation guide describes how to install and use the hardened Ethernet RESMLAC28MG Military Rugged Switch. Capable of operating at extreme temperature of -35°C to +75°C and meet the toughest industrial and military environments such as MIL-STD-810F, MIL-STD-1275B, MIL-STD-461E up to the highest levels. The mentioned ability turns the RESMLAC28MG to the optimal solutions switch of choice for harsh environments constrained by space.

Developed for military and harsh mobile applications, the RESMLAC28MG features mechanical packaging enhancements designed for MIL-STD-810F airborne and ground environmental compliance and high reliability. The unit has been especially hardened to improve ingress, impact, and shock/vibration protection, as well as eliminate all moving parts through passive cooling, and interface through sealed MIL-D-38999 and SCE TERRAPIN circular connectors.
Leveraging best-in-class switching technology from Techaya, the RESMLAC28MG serves as a robust solution for providing local area network (LAN) connectivity to IP-enabled computing and net-centric devices. Compact in size, the RESMLAC28MG is particularly useful for expanding port density to tactical IP routers in space-constrained airborne and ground vehicle environments.
RESMLAC28MG is specifically designed for Data Acquisition & Transmission, Battlefield Communication C4ISR, Rugged Networks, Mobile Communications, Combat vehicles and Avionic & Shipboard Systems.

**Operation**

The switch supports triple speed 10/100/1000BaseTx (up to 1000 Mbps) for each of the 24 ports. Each of these ports will independently auto-sense the speed, allowing you to interface to regular, fast or gigabit Ethernet devices.
The switch offers also 4 combo ports providing alternative 4 ports 100/1000Base-FX. These ports withstands up to 10 Gbps.

**Performance Specifications**

These general specifications apply to these switches. Refer to Section 5 for complete technical specifications.

| | |
|---|---|
| Copper Ports | 24x 10/100/1000BaseT(x) (Shielded SCE Terrapin connectors) |
| Fiber ports | 4x optional combo fiber ports up to 10Gbps rated |
| Voltage | 24Vdc Nominal (18-32V)<br>Power Consumption: 20W Typical |
| Ethernet Standards | • IEEE 802.3 (10BaseT), 802.3u (100BaseTX), 802.3x (Full Duplex), 802.3z (Gigabit)<br>• IEEE 802.1x MAC based Authentication<br>• IEEE 802.1Q Vlan Tagging<br>• IEEE 802.1P QoS<br>• IEEE 802.1S Multiple STP<br>• IEEE 802.1W Rapid STP<br>• IEEE 802.1AD Link Aggregation |
| MIL standards | MILSTD-1275, MILSTD-461E, MILSTD-810F GM, IP67 |
| Electromagnetic | MIL-STD-461E Electromagnetic compatibility<br>• CE-102, CS-114, CS-115, CS-116, RE-102, RS-103 |
| Operating Temp. | -35ºC to +75ºC (-31ºF to +167ºF) – Cold Start-Up |
| Waterproof | IP67 |

## Section 2 | Hardware

**Overview**

The switches can be mounted directly to a flat surface or to a wall. Refer to the mechanical drawing below. Its high protected enclosure makes it able to withstand immersion (IP67 rating).

The Ethernet connections come out from rugged MIL-DTL-38999 serie III connectors for power and fiber and with SCE Terrapin connectors for Ethernet.

**Front Panel Display**

The following describes the front panel, and LED indicators of the RESMLAC28MG.





**LED Indicators for Power**

The Single Power 1 and Power 2 Led indicators on the front panel provide the operative status of the switch. Some models come with only 1 power supply, some come with 2 separate power supplies.

On models with only 1 power supply, only Power 1 LED indicator will be operational.
Once the LED is turned on, the switch is powered and ready-for-use.
This LED will be ON solid green when proper power has been applied to the unit.

**LED indicators for Ethernet ports**

Each port has 2 LEDs indicators:

- Link / Activity (Off – there is no link, Steady Green – There is a device connected, Flashing Green – there is data transmission)
- Speed (Steady Green for 1000Mbps, Off for 100 and 10 Mbps)

# Section 3 | Installation

**Selecting a Site**

As with any electronic device, you should place the switch where it will not be subject to extreme temperatures, humidity, or electromagnetic interference that exceeds the RESMLAC28MG's profile. Specifically, the site you select should meet the following requirements:

- The ambient temperature should be between -35 to 75 degrees Celsius.
- The relative humidity is recommended to be less than 95% percent, non-condensing.
- Surrounding electrical devices should not exceed the electromagnetic field (RFC) standards for MIL-STD-461E.

The switches are pre-equipped with plastic or metallic caps on all ports, including power and Ethernet.

→ **Make sure all connectors are protected with cap or sealed plug to ensure sealing and prevent from deterioration of the contacts.**
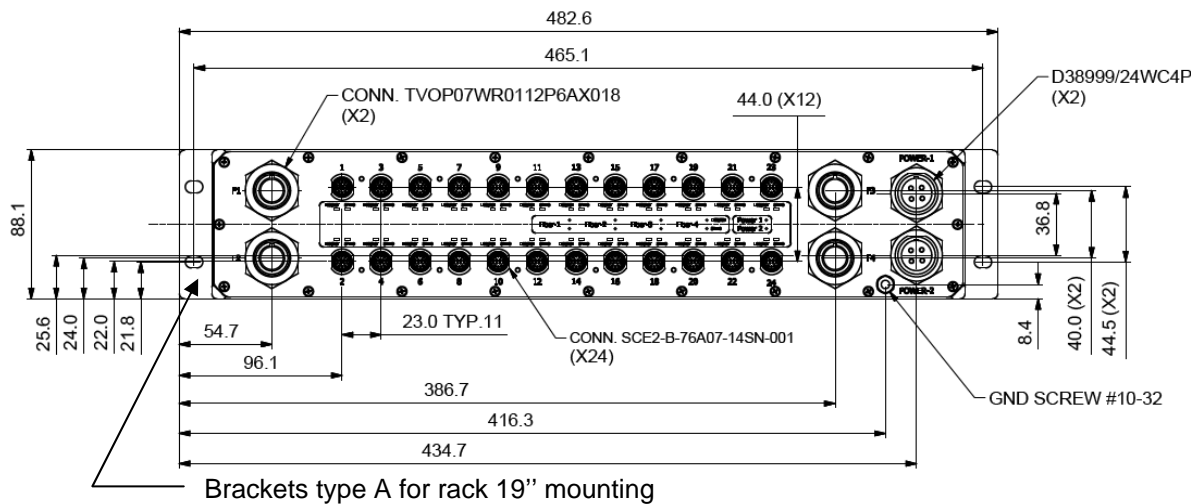
**Mounting**

The RESMLAC28MG Ethernet Switch can be fastened to any flat surface by mounting the box directly or installed inside a 19'' rack. Refer to the mechanical drawings below. Make sure to allow enough room to route your Ethernet and power cables.
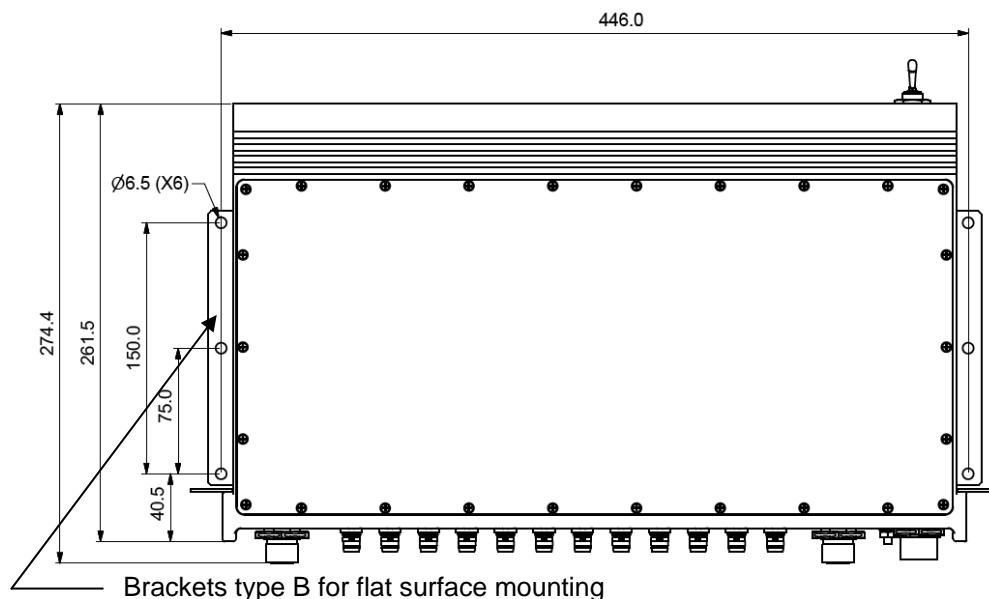Two types of brackets are available:

- Type A for 19'' rack mounting
- Type B for mounting on any flat surface. By default type B is proposed.

6x Screws with flat and spring washer are needed to fix the brackets onto the switch.
Screw type: Pan head screw #8-32 UNC - 0.5'' stainless steel

Brackets type A for rack 19'' mounting

Brackets type B for flat surface mounting

## Section 4 | Wiring

**Overview**

These switches provide connections to Ethernet devices in harsh environment. Typically a port is used to connect to another Ethernet switch or hub that is connected to the main Ethernet backbone. The other Ethernet ports are then connected to Ethernet devices such as communication systems, Ethernet I/O, or industrial computers. Electrical isolation is provided on the Ethernet ports for increased reliability.

Please follow normal Ethernet wiring practices when installing these switches.

**Power plug wiring**

The switches should be powered using mating plugs and backshells compliant with MIL-DTL-38999 series III. We suggest using hereunder accessories. Another backshell can be used but it must ensure a correct sealing protection.

**Power plug part number**

Military designation: JD38999/26WC4SN

Amphenol designation: TV06RW1304S

This plug is size 13. It is coming with 4 contacts size 16 (13 A nominal current).

**Power plug wiring**

| Contact | Signal | Suggested Harness Color | |
|---------|--------|--------------------------|---|
| A | 24 V (+) | red | |
| B | Not connected | Not connected | |
| C | 24 V (-) | black | |
| D | Not connected | Not connected | |

**Note: cable assemblies where both A and B are connected to 24V+ and both C and D are connected to 24V- are accepted.**

**Tooling**

The plugs are using crimp contacts size 16.

We suggest using hereunder tooling.

| Crimping tools | | Amphenol No | Military No |
|----------------|---|-------------|-------------|
|  | Crimping tool | 809857 | M22520/1-01 |
|  | Positioner | 809858 | M22520/1-04 |

| Plastic insertion and removal tools | Colour | Amphenol No | Military no |
|-------------------------------------|--------|-------------|------------|
|  | Blue | 809855 | M81969/14-03 |

## Backshell

We suggest using TVNSA backshells with corresponding heat shrinks to come with the TV06RW1304S plug for power..

These backshells, providing an electrical continuity between cable and connector, ensure a high level or of EMI/RFI protection. The sealing is ensured by straight heat shrink molded piece at the rear of the backshell. NSA and SA backshells ensure the shielding by clamping the braid with a screwing system. The free inner ring avoids twisting of the braid during screwing.

Heat-shrinks are molded pieces for harsh environment, fluid resistant (with preinstalled adhesive).

Backshell designation: TVNSA 13 014

Heat shrink designation: 804223

### TVNSA backshell dimensions
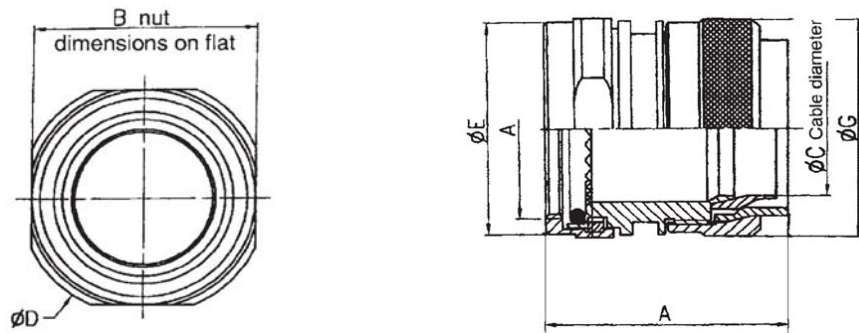


| Plug size | A length mm (in) | A thread Metric | B max mm (in) | C max mm (in) | Ø E max mm (in) | Ø G max mm (in) |
|---|---|---|---|---|---|---|
| 13 (C) | 35.60 (1.402) | M18x1.0 -6H | 22.70 (0.894) | 12.70 (0.500) | 21.64 (0.852) | 22.60 (0.890) |

### TVNSA backshell assembly instruction

1. Prepare the cable for termination process and slide onto the cable the items in the order shown on figure 1.

2. Screw the backshell at the rear of the connector.

3. Fold back the braid on the outer jacket and fix it (figure 2).

4. Install the braid as shown on figures 3 and 4:

Release the braid and cover the backshell (a) and the connector's shell. Slide the first ring (b) over the braid. Fold back the braid on the ring (b) and slide the second ring (c) over the braid and the first ring (b). Screw the last ring (d) at the rear of the backshell. If necessary, fix the extra braid on the outer jacket of the cable. If this installation (double folding of the braid) is not possible, refer to figure 5: Slide the first ring (b).

Release the braid and cover the backshell (a) and the connector's shell. Cut the braid as shown. Slide the second ring (c) over the braid and the first ring (b).

Screw the last ring at the rear of the backshell.
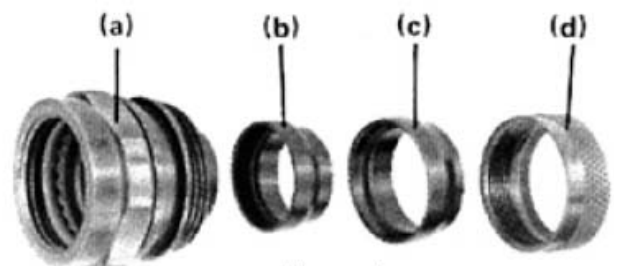
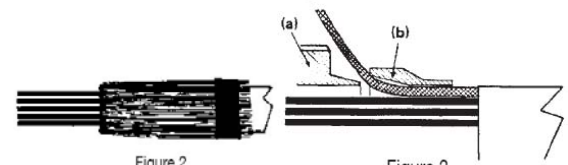5. Install the heat-shrink molded piece.
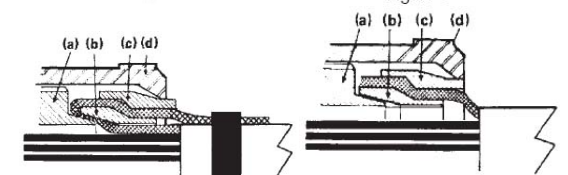


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

## Ethernet plug wiring

These switches provide connections to Ethernet devices on the battlefield. Typically a port is used to connect to another Ethernet switch or hub that is connected to the main Ethernet backbone. The other Ethernet ports are then connected to Ethernet devices such as communication systems, Ethernet I/O, or industrial computers. Electrical isolation is provided on the Ethernet ports for increased reliability.

Please follow normal Ethernet wiring practices when installing these switches.

## Ethernet plug part number

The switches should be connected using mating inline receptacles from SCE Terrapin series.

We suggest using the L1K Latch inline receptacle or 01K Snatch inline receptacle.

P/N for the latch inline receptacle: SCE2-B-L1K07-14PN.

Note: A grounding ring is provided with the 985 option.

P/N for the latch inline receptacle with grounding ring: SCE2-B-L1K07-14PN-985.

This plug has size 7. It is coming with 14 contacts 23 AWG with solder termination. Only contacts A to H should be connected following to below wiring.
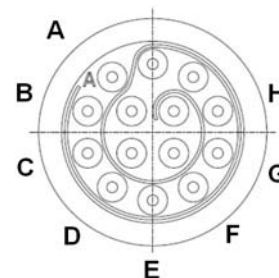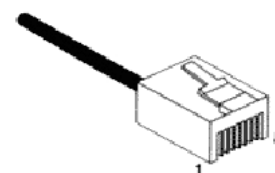
**SCE2-B-LIK07-14PN pinout**

*- Rear view -*

## Ethernet plug pinout

Use data-quality (not voice-quality) twisted pair cable rated category 5e (or better) with standard RJ45 connectors.

Wiring of Ethernet cordsets shall respect following table. (T568B colour code).

| SCE2 | RJ-45 | Signal type | Colour |
|------|-------|-------------|--------|
| A | 1 | Tx 2 | White / Orange |
| B | 2 | Rx 2 | Orange |
| C | 3 | Tx 3 | White / Green |
| D | 4 | Rx 1 | Blue |
| E | 5 | Tx 1 | White / Blue |
| F | 6 | Rx 3 | Green |
| G | 7 | Tx 4 | White / Brawn |
| H | 8 | Rx 4 | Brawn |

## Accessories

Accessories such as heatshrinks boots, braid retention strap and metal dust caps can be offered. Consult the TERRAPIN catalog for further details.

Here are the heatshrinks suggested for using with SCE2-B-L1K07-14PN:

| Right angled or Straight boot | Amphenol P/N | Raychem Tyco P/N | Hellerman P/N |
|-------------------------------|--------------|------------------|---------------|
| Straight | 123GB-0798-07-S | 202K132-25/225 | 154-44-GW24 |
| Right angled | 123GB-0798-07-R | 202D132-25/225 | 1107-4-GW24 |

**DB9 plug wiring**

These switches can be accessed with a serial connection.

The serial port is available only on **port 1**.
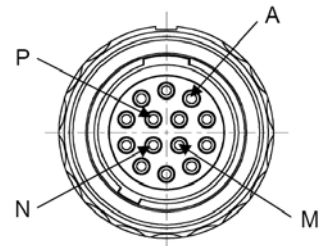
**SCE to DB9 cordset**

To access the switch using a serial link, we suggest preparing a cordset SCE to DB9.

The DB9 shall be female connector.

Use a latch inline receptacle for the SCE connector.
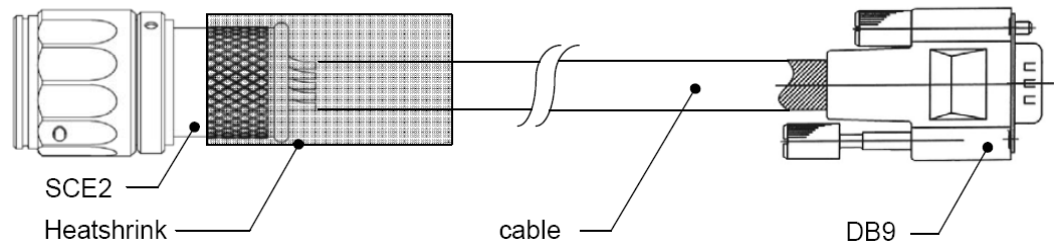
P/N : SCE2-B-L1K07-14PN.

This plug has size 7. It is coming with 14 contacts 23 AWG with solder termination. Only contacts M, N and P should be connected following to enclosed wiring.



**SCE2-B-LIK07-14PN pinout**

*- Rear view -*

**Suggested cordset**



**Cordset Wiring**

| SCE2 | DB-9 | Signal type |
|------|------|-------------|
| M | 2 | Rx |
| N | 3 | Tx |
| P | 5 | GND |

# Section 5 | Management

**Accessing to the switch**

You can access to the switch with 3 ways:

- Web interface
- Hyper Terminal / Console / CLI
- Telnet

Each access method is independent and can be used separately.

After accessing the switch, use the *Techaya MILTECH-9028 Users manual* for details regarding management features with CLI.

The web interface comes with an on-line help.

**Web Interface**

Web interface access requires that you know the IP address of the switch.

Use any of the 24 ports to connect to your computer.

Change your computer's IP address to the same subnet before trying accessing the switch.

- The default IP address of the switch is 192.168.1.111.
- The default subnet mask is 255.255.255.0.
- The User Name is "admin".
- The password is "admin" or *blank/empty*.

**Hyper Terminal**

Hyper Terminal access requires connecting the SCE/DB9 cordset to the **port 1** of the switch.

Open HyperTerminal and configure its properties with:

- Bits per second: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

**Telnet**

Telnet access requires enabling the telnet option via the web interface of via the CLI.

Then you can access to Telnet using the switch IP address.

## Section 6

# Features Overview

Here's a brief explanation of some of the features found in these switches documented by this manual.

ETHERNET PORTS

- 24 x switched 10/100/1000 (Triple speed Ethernet) ports
- 4 Gigabit Combo ports for fiber up to 10G per port

STANDARDS COMPLIANCE

- IEEE 802.3 10 Mbps 10BASE-T (Ethernet)
- IEEE 802.3u 100BASE-TX 100 Mbps (Fast Ethernet)
- IEEE 802.3x Full Duplex
- IEEE 802.3z 1000BASE-TX (Gigabit Ethernet)
- IEEE 802.1x MAC based Authentication
- IEEE 802.1Q Vlan Tagging
- IEEE 802.1P QoS
- IEEE 802.1S Multiple STP
- IEEE 802.1W Rapid STP
- IEEE 802.1AD Link Aggregation

STANDARDS

- MILSTD-1275B
- MILSTD-461E: CE-102, CS-114, CS-115, CS-116, RE-102, RS-103
- MILSTD-810F GM
- IP67
- Support up to 50ms holdup time, and 6VDC drops

CHASSIS

- Low profile rugged aluminum extrusion
- Conductively cooled w/custom internal heat-sinks
- Ingress protection against sand, dust and moisture
- Anodize Coating, MIL-A-8625, Type II, Class 2

PERFORMANCE

- 96.8 Mbps wire speed forwarding rate
- 56 Gbps maximum forwarding bandwidth
- 8K MAC Address

## NETWORKING - GENERAL

- Wire-speed hardware-based 28 ports gigabit ethernet switch
- Multicasting (IGMP Snooping), GARP, GMRP, MLD and GVRP.
- Multicast groups up to 8K for both IPv4 and IPv6
- Broadcasting and flooding Control up to 8K Groups
- 802.1q Tagged based VLAN up to 4K VLAN groups
- Bridge support for VLAN Q-in-Q
- Link Aggregation 802.3ad, up to 16 members in group
- Link Aggregation mechanism based on L2/ L3/ L4 parameters.
- Jumbo Frame support up to 10K
- WEB, CLI, Telnet Management.

## NETWORKING – QUALITY OF SERVICE

- QoS Multi-Layer Classifier: 802.1p, EtherType, VLAN-ID, IPv4/6 DSCP/ToS, and UDP/TCP ports & ranges traffic classification.
- Per port WFQ and Strict Queuing scheduling
- DSCP remarking for both IPv4 and IPv6 frames
- Ingress policer and ingress shaper per port with 500Kbps granularity
- Egress shaper per port with 500Kbps granularity
- Full-duplex flow control (IEEE802.3X) and half-duplex backpressure, symmetric and asymmetric

## NETWORKING – SECURITY

- Security via Radius Authentication 802.1x, Port / MAC access control
- Port Security
- Per port ingress and egress port mirroring.
- Mirroring per VLAN and per content awareness match
- Private VLAN support per VLAN (Isolated and Promiscuous ports)
- Content Aware Policiers:
  - o 128 Content Aware Policers
  - o 16 Content Aware rate policers with rates from 1fps to 32 million fps
  - o 8 UDP/TCP port range policers
  - o Advanced ACL through hardware based match patterns
  - o Content Aware Policers for generic MAC, ARP, IPv4, IPv6 protocols
  - o No restriction on any mix of entries to Content Aware Policers
  - o Content Aware Policers actions are permit/deny, police, count, snoop and mirror
  - o Special support for IP fragments, UDP/TCP port ranges and ARP
  - o Extensive CPU DoS prevention
  - o Surveillance functions by Content Aware Policers counters
  - o Multiple ACLs per port for optimal usage of Content Aware Policers

- Storm controllers for flooded broadcast, multicast and Unicast

NETWORKING – REDUNDANCY AND RING PROTECTION

- Spanning Tree (802.1d), RSTP (802.1w) and multiple Spanning Tree (802.1S) for fast recovery rings
- RPR for up to 30 units per ring with recovery time <50ms hardware based
- 20-Gbps bandwidth for ring topology
- QoS consistency across stack / ring
- Mirroring across stack / ring
- Link aggregation groups spanning multiple switches in stack / ring

POWER

- Voltage Input: 24Vdc Nominal (18-32V)
- Option for Redundant Power Supply with load sharing, 48VDC and 90~230VAC
- Power Consumption: 20W Typical
- Exceed MIL-STD-1275B and MIL-STD-704A Surge and Spike protection with 50ms holdup time and 6VDC drops
- Chassis grounding

SHOCK/VIBRATION/HUMIDITY

- MIL-STD-810F; 501.4I, 501.4II, 502.4I, 502.4II, 507.4, 500.4II, 514, 516I, 516VI, 514.5, 512.4
- IP67

PHYSICAL

- Dimensions: 440mm (L) x 200mm (W) x 88mm (H), including connectors & hardware, 2U, 19'' rack
- Weight: 5.6kg
- Set of 6.5mm mounting holes on bottom for mounting to any flat surface.
- 19'' standard mounting ears

COOLING

- No Moving Parts. Passive Cooling

OPERATING TEMP

- -35ºC to +75ºC (-31ºF to +167ºF) – Cold Start-Up

STORAGE TEMP

- -45ºC to +85ºC (-49ºF to +185ºF)

## Section 7 | Service Information

**Service Information**

We sincerely hope that you never experience a problem with any **Amphenol** product. If you do need service, call **Amphenol** at +33(0) 450 89 28 00 and ask for Applications Engineering. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RMA (Return Material Authorization) number will be given to you.

**Amphenol** tracks the flow of returned material with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

The applications engineer you are speaking with will fill out an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Normally, repairs are completed in two days. Sometimes difficult problems take a little longer to solve.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

**For Your Convenience:**
Please fill in the following and keep this manual with your **Amphenol** system for future reference:

P.O. #:_____    Date Purchased: _____

Purchased From:_____

**Product Support**

To obtain support for Amphenol products:

**Visit our website.** http://www.rjswitch.com

**Phone:** +33(0) 450 89 28 00

**Fax:** +33(0) 450 96 29 75

**E-mail:** mailto:contact@rjswitch.com

**Mailing Address:** Amphenol, Promenade de l'Arve, B.P.29, 74311 Thyez Cedex, France

**For more information**

You will find all useful information on the RJ-Switch series on the dedicated website:

## http://www.rjswitch.com