



Magnum 6K16V Managed Fiber Switch



Hardware

Installation and User Guide

Magnum™ 6K16V

Managed Fiber Switch

Hardware

Installation and User Guide

Part #: 84-00125 (Rev. A)

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Important: The Magnum 6K16V Managed Fiber Switch contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with Magnum 6K16V Switch products, consult Section 6, Troubleshooting, of this User Guide.

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Federal Communications Commission**Radio Frequency Interference Statement**

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: 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 in a residential installation. This equipment generates, uses, and can radiate 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.***

Canadian Emission

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil respecte toutes les exigences du Règlement sur le matériel du Canada. Cet appareil est Classe B.

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Revisions

06/04 : New port modules has been added and updated on Alarm contacts

01/04 : Added Section 3.5 (Alarm Contacts) and 3.7.1 (Console Port pins)

12/03: Updated Section 3.3 “DIN-Rail”, and Appendix B “DC Power”

10/03 : Initial Release with Rev A

THE MAGNUM LINE

Ethernet connectivity products

"Designed and Manufactured in the USA"

Overview

GARRETTCOM, INC. OFFERS THE PREMIUM-QUALITY MAGNUM™ LINE OF ETHERNET LAN CONNECTIVITY PRODUCTS WITH INDUSTRY-STANDARD FUNCTIONALITY AND BUILT-IN FIBER CONFIGURABILITY. MAGNUM PRODUCTS ARE DESIGNED FOR USE IN DEMANDING CARRIER CLASS, INDUSTRIAL GRADE AND OEM APPLICATIONS WHERE RELIABILITY IS A PRIMARY CONSIDERATION.

6K-SERIES MANAGED FIBER SWITCHES, GIGABIT, 100 AND 10 MBPS, FIBER AND COPPER PORTS, MIX-AND MATCH. FEATURES SFF FIBER AND DC POWER IN 1U UNITS.

4K-SERIES SWITCHES, 100 AND 10 MBPS, COPPER PORTS WITH OPTIONAL FIBER PORT, WITH AUTO-NEGOTIATING FULL SWITCHING PERFORMANCE.

QUAD-SERIES FIBER SWITCHES, 100 & 10MBPS, FIBER AND COPPER PORTS, MIXED-SPEED AND MIXED-MEDIA TYPES, FULL SWITCHING PERFORMANCE.

"OUTDOOR" ETHERNET SWITCH, FOR TEMPERATURE UNCONTROLLED LOCATIONS

6 10/100 AND 2 100MB FIBER PORTS, CAN BE CONNECTED IN STRINGS

MIXED-MEDIA FIBER HUB, 16-PORT STACKABLE, 10/100 AUTO-SENSING

DUAL SPEED 8-PORT AND 16-PORT STACKABLES, 10/100 AUTO-SENSING

STACKABLE HUBS, SNMP OPTIONAL

10MB SERIES AND 100MB SERIES, BOTH W/ OPTIONAL PORT MODULES

PERSONAL SWITCHES, 10/100MB

8 PORT DUAL SPEED, AUTO-NEGOTIABLE WITH FIBER OPTION

PERSONAL HUBS, 100MB OR 10/100MB

8-PORT, WITH TWO SWITCHED PORTS (1 FIBER BUILT IN)

PERSONAL HUBS, 10MB SERIES

8-PORT + AUI, STACKABLE TO 5 HIGH, + OPTIONAL BNC OF FIBER PORT

8 OR 9-PORT AND 4 OR 5-PORT PERSONAL HUBS, W/ MAN. UP-LINK SW.

MEDIA CONVERTERS, 10MB AND 100MB SERIES

ALL MEDIA COMBINATIONS, INCL. FIBER ST, SC, MM., SINGLE MODE

THE “X-LINE” OF CONFIGURABLE MIXED MEDIA PRODUCTS:
STACKABLE CONCENTRATORS, SNMP OPTIONAL, 13-PORTS
MINI-CONCENTRATORS, 7 PORTS, REPEATERS, 2-PORTS
REPEATER PORT MODULES (RPMS), 6 TYPES FOR ETHERNET
MEDIA

BRIDGE PORT MODULES (BPMS), 4 TYPES, FOR SEGMENT
ISOLATION

TRANSCEIVERS, 10MB SERIES MINI-TRANSCEIVERS AND COAX
MODELS

JUNE, 04

1.0 SPECIFICATIONS

1.1 Technical Specifications

Performance

Filtering / Forwarding Rate:

Ethernet: 14,880 pps

Fast Ethernet: 148,800 pps

Gigabit Ethernet: 1, 488,000 pps

Switching Processing Type: Store and Forward with IEEE 802.3x full-duplex flow -control, non-blocking

Data Rate: 10Mbps, 100Mbps and 1000Mbps

Address Table Capacity: 4K node, self-learning with address aging

Packet buffer size : 240KB for 10/100 and 120KB for 1000Mb

Latency: 5 μ s + packet time (100 to 100Mbps)

15 μ s + packet time (10 to 10 Mbps, and 10 to 100Mbps)

Network Standards and Compliance, hardware

Ethernet V1.0/V2.0 IEEE 802.3: 10BASE-T,

IEEE 802.3u: 100Base-TX, 100BASE-FX

IEEE 802.3z: 1000BASE-TX Ethernet (Auto-Negotiation)

IEEE 802.3ab: 1000BASE-TX Ethernet

IEEE 802.1p: Priority protocol

IEEE 802.1d: Spanning tree protocol

IEEE 802.1q: VLAN Tagging

IEEE 802.3x: Flow Control

Maximum 10 Mbps Ethernet Segment Lengths

Unshielded twisted pair - 100 m (328 ft)

Shielded twisted pair - 150 m (492 ft)

10BASE-FL multi-mode fiber optic - 2 km (6,562 ft)

10BASE-FL single-mode fiber optic - 10 km (32,810 ft)

Maximum Standard Fast Ethernet Segment Lengths:

10BASE-T (CAT 3, 4, 5 UTP) - 100 m (328 ft)

100BASE-TX (CAT 5 UTP) - 100 m (328 ft)

Shielded twisted pair - 150 m (492 ft)

100BASE-FX, half-duplex, multi-mode - 412 m (1350 ft)

100BASE-FX, full-duplex, multi-mode - 2.0 km (6,562 ft)

100BASE-FX, half-duplex, single-mode - 412 m (1350 ft)

100BASE-FX, full-duplex, single-mode - 20.0 km (66K16V ft)

100BASE-FX, full-duplex, Long Reach - 40.0 km (122K ft)

Maximum Standard Gigabit Ethernet Segment Lengths:

1000BASE-T (CAT5e or higher is recommended) - 100 m (328 ft)

1000BASE-SX, full-duplex, multi-mode(62.5 μ m cable) - 220m

1000BASE-SX, full-duplex, multi-mode(50 μ m cable) - 550m

1000BASE-LX, full-duplex, single-mode(62.5 μ m cable) - 5Km

Fiber Multi-mode connector types supported:

Fiber Port, ST-type (twist-lock):Fiber multi-mode, 10Mb 10BASE-FL

Fiber Port, MTRJ-type (plug-in):SFF Fiber multi-mode100BASE-FX

Fiber Port, SC-type (snap-in):Fiber optic multi-mode, 100BASE-FX

Fiber Port, ST-type (twist-lock): Fiber optic m.-mode, 100BASE-FX

Fiber Port, 1000BASE-FX, GBIC modules

Fiber Single-mode connector types:

Fiber Port, SC-type: Fiber optic single-mode, 100BASE-FX

Fiber Port, LC-type Fiber SFF single-mode, 100BASE-FX

Fiber Port, 1000BASE-FX, GBIC modules

LEDs: Per Port (one set at the port, one set in top or front)

LK: Steady ON when media link is operational

ACT: ON with receiver port activity

FDX/HDX: ON = Full-Duplex Mode

OFF = Half-Duplex Mode

100/10: ON = 100Mbps speed

OFF = 10 Mbps

Operating Environment

Ambient Temperature:

-40° to 140° F (-40° to 60°C) for UL60950 and Component Parts rating

-60° to 205° F (-50° to 95°C) for IEC 60068 Type Test short term rating

Storage Temperature: -60° to 210°F (-50° to 100°C)

Ambient Relative Humidity: 5% to 95% (non-condensing)

Altitude: -200 to 13,000 ft. (-60 to 4000m)

Conformal Coating (humidity protection) option: Request quote

Alarm Relay Contacts

One NC indicating internal power, one NC software controllable

Packaging

Enclosure: Rugged High strength sheet metal. Suitable for vertical wall or DIN-Rail mounting

Dimensions: 9.5 in. H x 8.75 in. W x 1.75 in. D

24.1 cm H x 22.2 cm W x 4.4 cm D

Cooling method: Convection, designed for vertical mounting, no fans

Weight: 4.21 lbs. (1.9 kg)

Management Console connector

DB-9 for RS-232 “ null-modem “ cable (sometimes called an X-modem cable)

Power Supply (Internal)

AC Power Connector: IEC-type, male recessed at rear of chassis,

Input Voltage: 100 to 240 VAC (auto-ranging)

Input Frequency: 47 to 63 Hz (auto-ranging)

Power Consumption:

50 watts typical (for a fully loaded fiber model)

30 watts typical (for a fully-loaded copper only model)

DC Power Supply (Options)

-48VDC Power Input Voltage : -36 to -70 VDC

24VDC Power Input Voltage : 20 to 36VDC

125VDC Power Input Voltage : 115 to 150VDC

5VDC Power Input Voltage : (+) or (-) 5%

Std. Terminal Block : “ -, GND, + ”

Power Consumption: same as for AC models, see above

For DC internal power supplies at -48VDC, 24VDC and 125VDC, including Dual Source options (for continuity of operation when either of the DC input sources are interrupted), see Appendices B and C.

Per-port jumpers and switches

The copper daughter board has an internal switch for selecting MDI-MDIX crossover on port # 1. Factory default setting is MDI, user port.

Other port-specific user settings (such as FDX or HDX, copper 10/100 speed) can be fixed using software commands.

Agency Approvals

UL listed (UL60950), cUL, CE, Emissions meet FCC Part 15, Class A
NEBS L3 and ETSI compliant

IEEE P1613 Environmental Standard for Electric Power Substations

IEC61850 EMC and Operating Conditions Class C for Power Substations

NEMA TS-2 and TEES for traffic control equipment.

Warranty: Three years, per UL 60950 temperature rating Made in USA

NEBS Test Classification: NEBS Compliant

Email sales@GarrettCom.com for details.

1.2 Ordering Information**Magnum Managed Fiber Switch (16 ports max)****MODEL DESCRIPTION**

Magnum 6K16V-Magnum 6K16V Managed Fiber Switch, base unit for vertical mounting

May be configured with a selection of 10/100/1000 6K16V fiber and copper port connector types, 16 total ports max. Two metal brackets for vertical wall or panel mounting. Wire speed filtering and forwarding across all ports, 802.3x flow control, 802.1p priority packet processing, self-learning 4K-node address table, large 240KB packet buffers for 10/100 and 120KB for 1000Mb. For licensed managed networks software (MNS-6K and S-ring), See separate data sheets.

Magnum 6K16V-24VDC: Same as 6K16V except the power input is 24VDC

Magnum 6K16V-5VDC: Same as 6K16V except the power input is 5VDC reg & fused

Magnum 6K16V-48VDC: Same as 6K16V except the power input is -48VDC

Magnum 6K16V-125VDC: Same as 6K16V except the power input is 125VDC

Configuration Options:

Each Magnum 6K16V base unit has TWO port module slots

Magnum 6K16V Port Modules

6KP8V-MTRJ SFF Fiber module, w/eight 100Mb mm FX MT-RJ connectors

6KP8V-MLC SFF Fiber module, w/eight 100Mbps mm FX LC connectors

6KP8V-SLC SFF Fiber module, w/eight 100Mbps sgl-m FX LC connectors

6KP4V-FXSC "2+2" 100Mb Fiber module, w/ four 100Mb 2km FX SC connectors

6KP4V-FXST "2+2" 100Mb Fiber module, w/ four 100Mb 2km FX ST connectors

6KP4V-F10ST "2+2" 10Mb Fiber module, w/ four 10Mb 2km FL ST connectors

6KP4V-FLSTFX "2+2" ST Fiber module, w/ two 100Mb & two 10Mb ports, 2km

6KP8V-RJ45 TP Module, w/eight 10/100Mbps auto-negotiating RJ-45 ports

6KP8V-45MT "4+4" module, w/four RJ-45 ports and four 2km mm FX MT-RJ's

6KP8V-45MLC "4+4" module, w/four RJ-45 ports and four 2km mm LC connectors

6KP8V-45SLC "4+4" module, w/four RJ-45 ports and four 2km sgl-m LC connectors

6KP6V-RJMST "4+2" module, w/four RJ-45 ports and two 2km mm FX SC's

6KP6V-RJMSC "4+2" module, w/four RJ-45 ports and two 2km mm FX ST's

6KP6V-RJSSC "4+2" module, w/four RJ-45 ports and two 20km Sgl.m FX SC's

6KP6V-RJSSCL "4+2" module, w/four RJ-45 ports and two 40km Sgl.m FX SC's

6KP6V-MT10ST "4+2" module, w/four MTRJ ports and two 10Mb 2km FL ST's

6KP6V-RJ10ST "4+2" module, w/four RJ-45 ports and two 10Mb 2km FL ST's

6KM-BLNK Blank cover for one 6K16V (A,B) module slot opening in a 6K16V

Gigabit (1000Mb) module option

6KP5V-G4RJ "G+2" module, w/one GBIC transceiver and four 10/100 RJ-45 connectors

6KP3V-G2SC "G+2" module, w/one GBIC transceiver and two 100Mb 2km FX SC

fiber ports connector

GBPM-2OTX Two-port Gigabit 6K module for 6K16V Switches, provides two GBIC open transceiver port for a user-selectable GBIC transceiver module

GBPM-COTX One slot Gigabit 6K module for 6K16V Switches, uses one 6K16V slot and provides one GBIC open transceiver port for a user-selectable GBIC transceiver module

GBIC-SXSC GBIC transceiver module for use in GBPM-xOTX, one 1000BASE-SX port with mm SC fiber connector

GBIC-LXSC10 GBIC transceiver module for use in GBPM-xOTX, one 1000BASE-LX/LH port with 1310nm sgl. mode SC(10km) fiber connector

GBIC-LXSC25 GBIC transceiver module for use in GBPM-xOTX, one 1000BASE-LX/LH port with 1310nm sgl. mode SC(25km) fiber connector

GBIC-LXSC40 GBIC transceiver module for use in GBPM-xOTX, one 1000BASE-ZX port with 1550nm, sgl. mode SC(40km) fiber connector

GBIC transceiver module for use in GBPM-COTX, one LX port with mm SC fiber connector

GBIC-LXSC70 GBIC transceiver module for use in GBPM-xOTX, one 1000BASE-ZX port with 1550nm, sgl. mode SC(70km) fiber connector

GBIC-TP GBIC transceiver module for use in GBPM-xOTX, one 802.3ab 1000BASE-T port, RJ-45 connector

CONSOLE CBL Industry standard serial cable, DB-9 connectors for RS-232 “ null-modem “ connection (sometimes called an X-modem cable), used to connect a PC or a character terminal to the Management port.

CONSOLE USB Industry standard serial cable, DB-9 connectors for RS-232 “ null-modem “ connection (sometimes called an X-modem cable) to connect to a managed switch, and a USB port to connect to a PC

DIN-RAIL-VRM Set of two DIN-Rail holders for a secure vertical mount of a 6K16V unit, with screws to attach to metal mounting brackets and to the 6K16V case.

GarrettCom, Inc. reserves the right to change specifications, performance characteristics and/or model offerings without notice.

2.0 Introduction

2.1 Inspecting the Package and Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier of any damage that you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

- 1 Magnum 6K16V Managed Fiber Switch, base unit
(configured with user-selected port module options installed)
- 1 AC Power Cord (U.S. and other 115 VAC only)
- 1 Set of two metal vertical mounting brackets, with screws to the case
- 1 Installation and User Guide (this manual)
- 1 Product Registration Card

Remove the items from the shipping container. Be sure to keep the shipping container should you need to re-ship the unit at a later date. To validate the product warranty, please complete and return the enclosed Product Registration Card to GarrettCom, Inc. as soon as possible.

In the event there are items missing or damaged, contact the party from whom you purchased the product. If the unit needs to be returned, please use the original shipping container if possible. Refer to Section 6, Troubleshooting, for specific return procedures.

2.2 Product Description - Magnum 6K16V Managed Fiber Switch

Magnum 6K16V Managed Fiber Switches provide modularity of fiber and copper ports, 10Mb 100Mb and Gigabit speed ports, and comprehensive management software in a compact industrial-grade package. Setting a new standard for Industrial and Carrier Class applications, heavy duty Ethernet Switch jobs are readily accommodated with an extended temperature rating of -40°C to 60°C by the UL Component Parts method, or -50°C to 95°C by the IEC 60068 Type Test method. With options such as all popular DC power input types, worldwide AC power, and DIN-Rail mounting, the hardened Magnum 6K16V is a “go-anywhere do-anything” Industrial Ethernet Switch.

The large family of port modules offer the choice of all fiber media (all connector types, multi- and single-mode) and 10/100 Mb auto-negotiating RJ-45 ports. Standard GBIC ports can be configured for a variety of Gigabit cabling types and distances.

High performance features include non-blocking speed on all ports and 802.1p QoS Traffic Prioritization. Magnum 6K16Vs are “plug-and-play” ready for use as backbone switches where a mix of bursty data traffic and priority streaming traffic for VoIP and audio/video applications is present.



Magnum 6K16V Fiber Switches are provided with LAN management software including SNMP, Tag- and Port-based VLANs, IGMP Snooping and Port Security, control via command line interface. For high availability LANs using ring topologies, Spanning Tree Protocol, Link-Loss-Learn and S-Ring are available. See the Managed Networks Software (MNS-6K) and S-Ring datasheets for additional details on the comprehensive set of software programs and options.

Designed for use in transportation and traffic control systems, power utilities, industrial factory-floor jobs, and video surveillance systems with segments requiring Gigabit backbone interconnections, the Magnum 6K16V is easy to install and operate. The next generation of industrial applications will need advanced managed network software, operation at extended temperatures, fiber ports modularity, support for self-healing ring structures, and gigabit backbone configurability. The Magnum 6K16V has

all of these, and is available now.

Magnum 6K16V Managed Fiber Switches have heavy duty metal cases and auto-ranging power supplies for operation with standard AC power worldwide. Internal DC power supplies are optional. All DC power input types (5V, 24V, 48V, 125V) are supported, and dual source input is optional on all except 5VDC..

There are two Alarm Relay contacts provided on each Magnum 6K16V Switch to monitor basic operations.. One is for hardware, and will signal loss of power internally. The other is software controllable and will signal user-defined software events such as a security violation or an S-Ring fault condition.

The wide variety of port modules are key to the flexibility and adaptability.

2.2.1 Eight-port SFF fiber modules (6K8-MTRJ, 6K8-MLC), 100Mb fiber

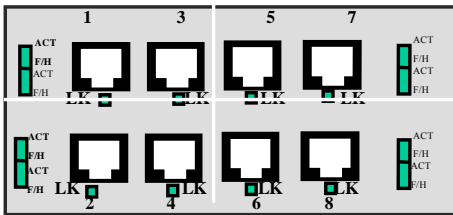
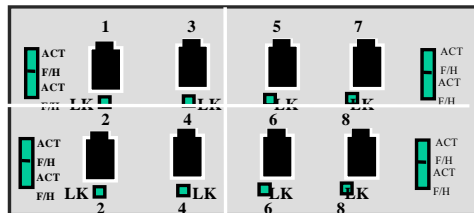


Fig.2.2.2 :
SFF Fiber Port
Modules,
6K8-MTRJ (to the left)
and
6K8-MLC or -SLC
(below)

In an eight-port SFF fiber port module, all of the fiber ports are of the same speed (100Mb), mode, and connector type. Models are available with Small Form Factor (SFF) are multi-mode MT-RJ or LC-type connectors, and single-mode LC-type connectors.



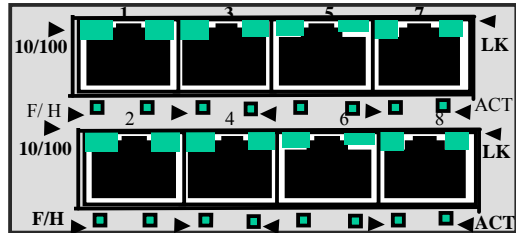
The 100Mb fiber eight-port modules for the Magnum 6K16V's normally are set (factory default) to operate in full-duplex mode for best fiber distance and performance. Using the 6K16V's MNS software, the user may select full- or half-duplex mode per-port through set-up of the software (See Magnum 6K16V MNS Software Manual) for the flexibility to adapt to any FDX or HDX type of Fast Ethernet devices).

There are three LED's per fiber port. The Link (LK) LED indicates "ready for

operation” on that port when lit, the F/H LED indicates operation in full-duplex mode when ON (half-duplex when OFF), and the blinking ACT LED indicates receiving Activity on the port. A fiber cable must be connected into a SFF port and the Link (LK) indicator for that port must be ON (indicating there is a powered-up device at the other end of the cable) in order for a LK LED to provide valid indications of operating conditions on that port.

2.2.2 Eight-Port Copper Module, 6K8-RJ45

The 6K16V’s 8-port Copper port module, model 6K8-RJ45, provides eight 10/100Mb switched RJ-45 ports. The 10/100Mb switched ports normally (as a default setting) are independently N-way auto-



negotiating for operation at 10 or 100Mb speed in full- or half-duplex mode, i.e., each independently selects a mode and speed to match the device at the other end of the twisted pair cable. (See Section 4.3 for auto-negotiation details)

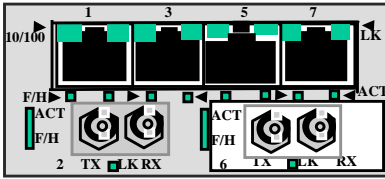
On the model 6K8-RJ45 module, there are four LEDs for each port, two in the connector and two separate. The LK (Link) LED indicates “ready for operation” on that port when lit. The blinking ACT (Activity) LED indicates receiving Activity on that port when lit. The 10/100 LED indicates operation at 100Mb speed when ON and at 10 Mb speed when OFF (when auto-negotiation is not disabled). The FDX/HDX LED is ON to indicate full-duplex operation and OFF to indicate half-duplex mode. A twisted pair cable must be connected into an RJ-45 port and the Link (LK) indicator for that port must be ON (indicating there is a powered-up device at the other end of the cable) in order for a LK LED to provide valid indications of operating conditions on that port.

Using the 6K16V’s MNS software, the user may disable auto-negotiation and fix the desired operation of each RJ-45 port. MNS Software set-up may select 10Mb or 100Mb speed and full- or half-duplex mode per-port as per user requirement. (See Magnum 6K16V MNS Software Manual for details info.).

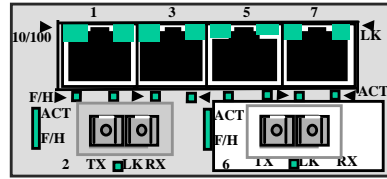
2.2.3 Six-Port “4 + 2” Combo Modules, 4@ 10/100 RJ-45 and 2@ 100Mb fiber

The combo six-port modules are combinations of copper and fiber media,

available as four 10/100 switched RJ-45 copper ports and two 100Mb switched multi-mode fiber ST, SC or single mode SC or Long Reach SC ports. For ports numbering, ports 1,3,5,7 are copper, ports 2 and 6 are fiber, ports 4 and 8 are not present.

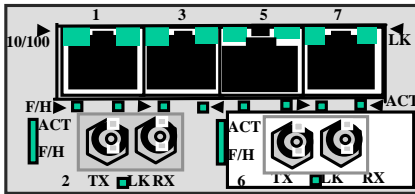


4@ RJ-45 + 2@ 100Mb SC



The four RJ-45 ports operate just like the 8-port copper module, and the two fiber ports operate at 100Mbps full-duplex (default). User mode control per port through the MNS software is also the same.

On Magnum “4+2” Combo modules, there are four LED’s for each RJ-45 port, which indicate status the same as described for the 6K8-RJ45 in Section 2.2.3 above. The fiber port’s LEDs indicate status the same way as described for the SFF fiber modules in Section 2.2.2 above. Color-coding on the panel of the module shows which LEDs belong to which port.



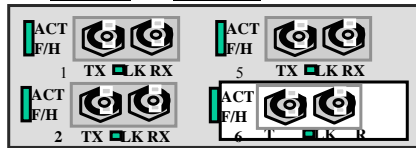
4@ RJ-45 + 2@ 10 Mb ST

ports. The operation of the SFF fiber and the RJ-45 half of the module is as described for those port types above. For detailed information about 10Mb mm ST fiber half of the module, see Section 2.2.5.

The Magnum Combo six-port modules are also available with 4@ MTRJ 100Mb mm SFF fiber and 2@10Mb fiber mm ST ports, and with 4@ RJ45 10/100 copper and 2@10Mb fiber mm ST

operation of the SFF fiber

2.2.4 Four-Port 10 Mb and 100Mb mm Fiber ST Modules



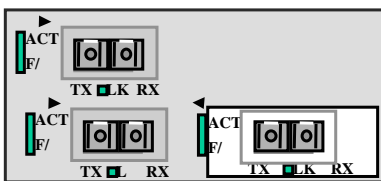
The 4-port @10Mb ST fiber modules behave the same as the 4@100Mb ST fiber modules except for the 10Mb speed. For ports numbering, ports 1, 2, 5, 6 are present, ports 3, 4, 7, 8 are not present. There is also a similar 100Mb fiber SC module.

The default setup on the 10Mb fiber module is half-duplex, which allows the Magnum 6K16V Switch to connect to any 10Mb hub or media converter or almost any other device with a 10Mb fiber Ethernet port. The default setting of the 100Mb module is full duplex. User mode-control per port through the MNS “port settings” software is the same as the other 6K16V modules.

The fiber ports support fiber cabling distances according to the 10BASE-FL and 100BASE-FX standards, i.e., 2km distance for multi-mode fiber. (Single-mode for up to greater distance may be available as a special order, request quote).

2.2.6 Gigabit (1000Mbps) port modules

The Magnum 6K16V offered a wide option Gigabit speed with multiple choice for the modular slot. While up to two Gigabit modules (maxm.) can be configured in the modular slot. The Gigabit port option for the modular slot comes in couple of different configuration. The two Giga port has been offered as GBPM-2OTX (fiber or RJ-45), whereas the single Gigabit module comes in flavor of G+4(10/100 RJ-45 ports) or G+2 (100Mb fiber ports) as shown below in the figure.



1@ 1000Mb Fiber SC + 2@ 100Mb SC

1@ 1000Mb Fiber SC + 4@ 10/100Mb

The 6K16V Modules provide a GBIC opening for insertion of industry-standard GBICs to provide Gigabit (Gb) media flexibility. GBIC models are available for both multi-mode (550m) and single-mode (10, 25,40,70)km fiber options, and for Gigabit copper as well, with new models appearing often.

The 1000Mb Gigabit fiber-port modules on the Magnum 6K16V are normally set (factory default) to operate in full-duplex mode for best fiber distance and performance. The 1000Mbps SC fiber-optic module on the Gigabit -SX and Gigabit-LX transceivers are compatible with the IEEE 802.3z Gigabit standards.

There are two LEDs mounted on each Gigabit port module. The Gigabit fiber port is fixed at 1000Mbps speed full-duplex mode at all times and has LEDs that indicate LK (Link status) and ACT (receiving activity) on that port when lit.

2.2.6 Packet Prioritization, 802.1p QOS

Quality of Service means providing consistent predictable data delivery to users from datagram paths that go all across a network. As a LAN device, the Magnum 6K16V can do its part to prevent any QOS degradation while it is handling Ethernet traffic through its ports and buffers.

The Magnum 6K16V switching hardware supports the IEEE 802.1p standard and fulfills its role in support of QOS, giving packet processing priority to priority tagged packets according to the 802.1p standard. In addition to hardware support for QOS, the MNS software (R2) supports two priority queues that can be shared across the eight levels of defined packet priorities for application-specific priority control by the user through software configuration settings.

2.2.7 Frame Buffering and Flow Control

Magnum 6K16V's are store-and-forward switches. Each frame (or packet) is loaded into the Switch's memory and inspected before forwarding can occur. This technique ensures that all forwarded frames are of a valid length and have the correct CRC, i.e., are good packets. This eliminates the propagation of bad packets, enabling all of the available bandwidth to be used for valid information.

While other switching technologies (such as "cut-through" or "express") impose minimal frame latency, they will also permit bad frames to propagate out to the Ethernet segments connected. The "cut-through" technique permits collision fragment frames (which are a result of late collisions) to be forwarded which add to the network traffic. Since there is no way to filter frames with a bad CRC (the entire frame must be present in order for CRC to be calculated), the result of indiscriminate cut-through forwarding is greater traffic congestion, especially at peak activity. Since collisions and bad packets are more likely when traffic is heavy, the result of store-and-forward operation is that more bandwidth is available for good packets when the traffic

load is greatest.

When the Magnum 6K16V Switch detects that its free buffer queue space is low, the Switch sends industry standard (full-duplex only) PAUSE packets out to the devices sending packets to cause “flow control”. This tells the sending devices to temporarily stop sending traffic, which allows a traffic catch-up to occur without dropping packets. Then, normal packet buffering and processing resumes. This flow-control sequence occurs in a small fraction of a second and is transparent to an observer. Another feature implemented in Magnum 6K16V Switches is a collision-based flow-control mechanism (when operating at half-duplex only). When the Switch detects that its free buffer queue space is low, the Switch prevents more frames from entering by forcing a collision signal on all receiving half-duplex ports in order to stop incoming traffic.

2.2.8 Managed Network Software (MNS-6K) for Magnum 6K16V

Magnum 6K16V's come with licensed MNS-6K software, which allow to configure the Magnum 6Ks as a Managed Switch and other Software enabled features. For additional information about MNS-6K, see the Magnum 6K16V MNS Software User guide in pdf format, a separate document normally accessed via your web-browser, at <ftp://ftp.garrettcom.com/>

or FTP client program by <ftp.GarrettCom.com> using

```
user : m6kuser
```

```
password : m6kuser
```

All MNS-6K software information, including new releases and upgrades related to MNS-6K software, can be accessed and download from GarrettCom's FTP site.

Alternatively, for documentation and general information, visit www.GarrettCom.com/techsupport/index.htm#software and look for Magnum 6K16V's MNS-6K info.

or email: support@GarrettCom.com for further information.

2.3 Features and Benefits

■ **Managed switching for high performance Ethernet LANs**

Magnum 6K16V Switches provide non-blocking (all ports can run at full speed at once) performance with standard Managed Networks Software (MNS-6K) included. They are typically used in LAN traffic centers with 16 100Mb or 8+2 Gigabit ports for backbone connections, where managed network services are desired.

■ **Switching services includes 802.1p QoS packet prioritization**

The Magnum 6K16V switching hardware supports QoS, giving packet processing priority to priority tagged packets according to the IEEE 802.1p standard. For port- and application-specific priorities, the QoS software may be configured by the user.

■ **Features Fiber-Built-In**

Magnum 6K16V Managed Fiber Switches are designed to naturally include fiber ports, and support mixes of multi-mode and single-mode; 10 Mb, 100Mb and 1000Mb speed; full- and half-duplex; classic Small Form Factor (SFF) and GBIC fiber connectors. RJ-45 10/100 ports can also be configured in the mix of port types.

■ **S-Ring and Link Loss Learn for reliable high availability using ring topology**

S-Ring along with the Link-Loss-Learn feature provides reliable fast recovery of a fault in a ring topology.

■ **Relay Contacts for monitoring internal power and user-defined software events**

Two Alarm Relay contacts monitor basic operations.. One is for hardware, and will signal loss of power internally. The other is software controllable and will signal user-defined software events such as a security violation or an S-Ring fault condition.

■ **Vertical mounting for efficient convection cooling, no fans, extended temp.**

Mounting brackets for vertical mounting are included. DIN-Rail mounting hardware is optional. Ethernet signal and power cables attach in the bottom. Two sets of status LEDs, one set viewable at the port connector and one set viewable from the front.

■ **Standard AC power input, -48VDC or 24VDC or 125VDC input is optional**

Standard AC power input is IEC plug, auto-ranging for worldwide use. For special applications, models with -48VDC or 24VDC or 125VDC are available. Dual Source DC input can also be selected and configured on the DC power input models.

■ **Heavy-duty design for Industrial Ethernet and extended temperature operation.**

Fiber ports take more power than copper ports, but the Magnum 6K16V design provides for this with heavy-duty components. The ambient temperature dual-rating is 60°C per UL methods, and 95°C per type test methods..

■ **MNS-6K licensed Network Management Software included, S-Ring optional**

Release 2.5 (fall '03) includes SNMP Switch Management with secure access control, RMON, CLI, Port Security; Port Mirroring; Port Settings Control; Telnet, TFTP, FTP support, Spanning Tree Protocol, Link-Loss-Learn, S-Ring (with license key) multi-level QoS, Port- and tag-based VLANs, GVRP, IGMP Snooping, SNMPc GUI support; Event Log; Sntp client for time-of-day; BootP and DHCP client for IP configuring, and password security. Web management is in beta-test. MNS-6K software is factory installed, supported and updated via Internet and GCI FTP Server.

2.4 Applications

Magnum 6K16V Fiber Switches offer high performance, modularity and availability. They provide the flexibility of 100Mbps fiber and copper ports as well as single or dual Gigabit(1000Mb) ports, with industry-standard LAN management software. Magnum 6K16V Switches are easily used in a variety of applications including client/server computing, secure VLAN- performance upgrades to departmental networks, and stream traffic for VOIP and audio/video applications, or a very diversified combination of mixed media in Industrial floor applications.. The performance characteristic of the 6K16V Switches enables them to inter-connect a series of subnets (one subnet per 6K16V Switch port) in a LAN traffic center. The subnet connections may be via fiber or twisted pair cabling, 100Mbps or 10 Mbps speed, and full-or half-duplex.

The mixed-media modular capability is ideal for Industrial applications where existing Ethernet LAN networks where existing cabling must be accommodated. The fiber-built-in media capability is ideal for integrating future-proof fiber cabling into the LAN structure.

Example 1 : Magnum 6K16V Switch for a Industrial application

Equipped with lots of useful features, hardened enclosure, wide spread of AC/DC power supply option, extended temperature rating qualifies the Magnum 6K16V Managed switch, for any Industrial factory-floors, traffic control, transportations systems and power utilities applications. The bundles of MNS-6K software operated features diversified this managed switch to operate and perform securely and reliably in all critical applications. The addition of *S-Ring* and *Link-Loss-Learn* software feature allow this Managed switch to provide a very secure highly available redundant network capability in any ring topology network.

In an Industrial environment where the factory floors are networked with Ethernet based mixed-media LANs, equipped with PLCs, computers for taking reading and data from M/C, Client/ Server databases and fetching these important datas to the central office data warehouses. The Managed 6K16V's modularity along with MNS-6K features, remarkably handle these kind of network very securely and reliably through out the Factory-floors. The DIN-Rail Mounting options on the Magnum 6K16, allow the Factory floor Industrial's user to mount securely anywhere on their Network setup.

The option for setting the ports at 10 or 100Mb on copper, and supporting the

10 or 100Mb fiber provide a very widespread option to the users to mix match their legacy and advance network needs. The modularity of the 6K16V Managed Fiber Switch makes it an attractive choice for use in applications with LAN connections to an organization's multiple site offices and factory- floors. The different locations can be easily connected together with the Fiber ports supported by the Magnum 6K16V Switch. A main NT-server in a secure area protected from earthquake or fire hazards can be connected to the full duplex Gigabit Fiber port.

Extended temp. ratings and wide options of AC/DC power supply qualifies this managed 6K16V switch to use in temp. controlled network floor and many others temp sensitive critical Industrial applications, where above normal room temp. is required to operate the network. Full-duplex future proof fiber media can easily connect long distance subnets and provide a stable secure network to all applications. The SNMP management capability of the Magnum 6K16V Switch helps create a database of all the network subnets to easily manage the network.

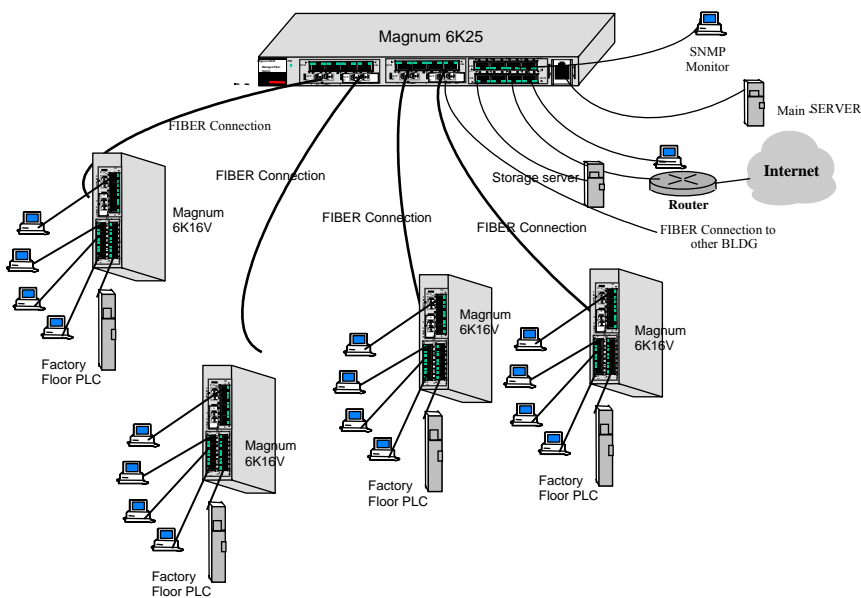


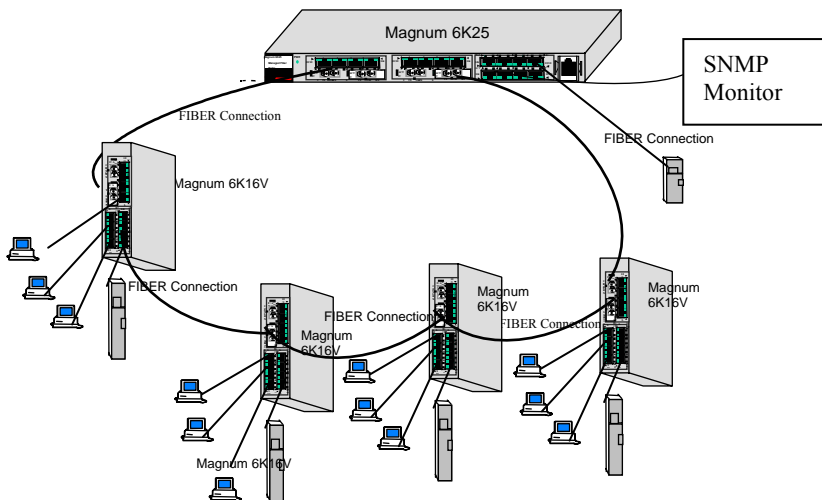
Fig. 2.1- The Industrial factory floor application with Magnum 6K16V

Example 2. In another application, a managed network is needed to provide a Redundant ring topology for a for maximum redundant network, where any faulty cable or disconnecting of cable can be reconfigured the network up running in mili-seconds . The ring topology of the network consists of high speed LAN segments supported by

100Mbps full-duplex future-proof fiber media to provide secure long distance LAN connection. The entire network is sharing a higher bandwidth Gigabit-enabled data-mining server for the vital database located in a separate secured building. The copper ports are required for multiple subnets inside the power plant to check the . The entire spread network will be manageable to provide easy, detectable, uninterrupted support through a viewable SNMP monitor.

The Magnum 6K16V Managed Fiber Switch equipped with the mix of copper and fiber ports provides an economical and seamless solution to the requirements. The user-configurable Magnum 6K16V provides an extra boost to the network requirements by providing copper/fiber media along with the higher bandwidth support of 10/100 and 1000Mb. The user can utilize the SNMP feature equipped with VLAN, RMON, STP and other standard managed LAN features to provide a secure and stable network.

The 6K16V Managed Fiber with S-ring and Link-Loss-Learn feature easily fulfilled the redundant requirement in a secured and faster reconfiguration time for cable breakup, by setting up in a ring topology. The Gigabit port option boosts the bandwidth for high speed to support the peak traffic and minimize congestion.



3.0 Installation

Before installing the equipment, it is necessary to take the following precautions:

- 1.) If the equipment is mounted in an enclosed or multiple rack assembly, the environmental temperature around the equipment must be less than or equal to 50°C.
- 2.) If the equipment is mounted in an enclosed or multiple rack assembly, adequate air flow must be maintained for proper and safe operation.
- 3.) If the equipment is mounted in an enclosed or multiple rack system, placement of the equipment must not overload or load unevenly the rack system.
- 4.) If the equipment is mounted in an enclosed or multiple rack assembly, verify the equipment's power requirements to prevent overloading of the building/s electrical circuits.
- 5.) If the equipment is mounted in an enclosed or multiple rack assembly verify that the equipment has a reliable and uncompromised earthing path.

This section describes installation of the Magnum 6K16V Switches, as well as connection of the various Ethernet media types.

3.1 Locating Magnum 6K16V Switches

For vertical panel mounting and wall mounting, see Section 3.4.

For vertical DIN-Rail mounting, see Section 3.3.

For DC power options, see Appendix B. For Dual Source, see Appendix C.

For AC power input, locate an AC receptacle that is within six feet (2 meters) of the intended Magnum 6K16V site. The rugged metal case of the Magnum 6K16V will normally protect it from accidental damage in a lab or workplace setting. Maintain an open view of the front to visually monitor the status LEDs. Keep an open area around the unit so that cooling can occur from convection while the unit is in operation. The 6K16V has no fans, so it is silent when in operation. Internal electronics use the case as a heat sink, so the unit may normally be quite warm to the touch.

3.2 Connecting Ethernet Media

The Magnum 6K16V Switches are specifically designed to support all standard Ethernet media types within a single Switch unit. This is accomplished by using a family of different port Modules which can be individually selected and configured per-port. See Section 2.4 for a description of the PMs.

The various media types supported along with the corresponding IEEE 802.3 and 802.3u standards and connector types are as follows:

| <u>IEEE Standard</u> | <u>Media Type</u> | <u>Max. Distance</u> | <u>Port Module</u> |
|--------------------------------------|--------------------------|----------------------|--------------------|
| <u>Fiber:</u> | | | |
| 100BASE-FX | mm ¹ Fiber | 220m (ft) | GBIC-SXSC |
| | sgl.m ² Fiber | 5Km | GBIC-LXSC |
| 100BASE-FX | mm ¹ Fiber | 2.0km (6,562 ft) | 6K6-MSK, -MST |
| | sgl.m ² Fiber | 18.0km (95K ft) | SSC, SSCL |
| small form factor | mm ¹ Fiber | 2.0km (6,562 ft) | 6K8-MTRJ, -MLC |
| small form factor | sgl.m ¹ Fiber | 15 km | 6KP8V- SLC |
| <u>Copper:</u> | | | |
| 10BASE-T and 100BASE-TX twisted pair | | 100m (328 ft) | 6K8-RJ45 |

¹ mm = multi-mode

² sgl.m = single-mode

3.2.1 Connecting Fiber Optic ST-type, "twist-lock"

The following procedure applies to installations using a PM with ST-type fiber connectors. This procedure applies to ports using a 6K16V module, MST-type port.

1. Before connecting the fiber optic cable, remove the protective dust caps from the tips of the connectors on the PM. Save these dust caps for future use.
2. Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

Note: One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.

3. Connect the Transmit (TX) port (light colored post) on the Magnum PM to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection.
4. Connect the Receive (RX) port (dark colored post on the PM) to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.
5. The LINK LED on the front of the PM will illuminate when a proper connection has been established at both ends (and when power is ON in the unit). If LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the PM connector to remedy this situation.

3.2.2 Connecting Fiber Optic SC-type, "Snap-In"

The following procedure applies to installations using a PM with SC-type fiber connectors, i.e., using 6K-MSK, 6K-SSC single-mode.

When connecting fiber media to SC connectors, simply snap on the two square male connectors into the SC female jacks of the 6KPM until it clicks and secures.

3.2.3 Connecting Single-Mode Fiber Optic

When using single-mode fiber cable, be sure to use single-mode fiber port connectors. Single-mode fiber cable has a smaller diameter than multi-mode fiber cable

(9/125 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode where xx/xx are the diameters of the core and the core plus the cladding respectively). Single-mode fiber allows full bandwidth at longer distances, and may be used to connect 10 Mb nodes up to 10 Km apart, or 18Km with the 6K-SSC.

The same procedures as for multi-mode fiber applies to single-mode fiber connectors. Follow the steps listed in Section 3.2.2 above.

3.2.4 Connecting Twisted Pair (RJ-45, CAT3, CAT5, Unshielded or Shielded)

The RJ-45 ports of the Magnum 6K16V can be connected to the following two media types: 100BASE-TX and 10BASE-T. CAT 5 cables should be used when making 100BASE-TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used. In either case, the maximum distance for unshielded twisted pair cabling is 100 meters (328 ft).

| <u>Media</u> | <u>IEEE Standard</u> | <u>Connector</u> |
|----------------------------|----------------------|------------------|
| Twisted Pair (CAT 3, 4, 5) | 10BASE-T | RJ-45 |
| Twisted Pair (CAT 5) | 100BASE-TX | RJ-45 |

NOTE : *It is recommended that high quality CAT. 5 cables (which work for both 10 Mb and 100Mb) be used whenever possible in order to provide flexibility in a mixed-speed network, since dual-speed ports are auto-sensing for either 10 and 100Mb/s.*

The following procedure describes how to connect a 10BASE-T or 100BASE-TX twisted pair segment to the RJ-45 port. The procedure is the same for both unshielded and shielded twisted pair cables.

1. Using standard twisted pair media, insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the port. Note that, even though the connector is shielded, either unshielded or shielded cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established

3.2.5 Connecting Twisted Pair (CAT5E or better, Unshielded or Shielded)

The RJ-45 Gigabit ports of the Magnum 6K16V can be connected to the media types, 1000BASE-T or CAT 5E or better 100-ohm UTP or shielded twisted pair (STP) balanced cable. The CAT 5E or better 100-ohm UTP or shielded twisted pair (STP) balanced cable is recommended to use when making 1000BASE-TX connections. In either case, the max distance for unshielded twisted pair cabling is 100 meters (328 ft).

| <u>Media</u> | <u>IEEE Standard</u> | <u>Connector</u> |
|-----------------------|----------------------|------------------|
| Twisted Pair (CAT 5E) | 1000BASE-T | RJ-45 |

NOTE : *It is recommended that high quality CAT. 5E cables (which work for both 100 Mb and 1000Mb) be used whenever possible in order to provide flexibility in a mixed-speed network.*

The following procedure describes how to connect a 1000BASE-T twisted pair segment to the RJ-45 port. The procedure is the same for both unshielded and shielded twisted pair cables.

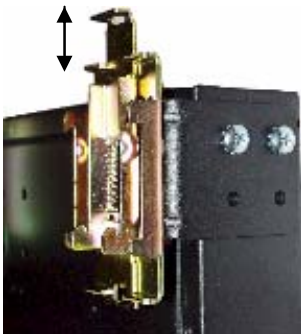
1. 1000Base-T connections require that all four pairs or wires be connected. Insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the port. Note that, even though the connector is shielded, either unshielded or shielded cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established

3.2.6 Connecting Gigabit Media Using GBICs

The Gigabit ports accept industry-standard GBICs for user selection of the gigabit media type desired. A selection of fiber and copper GBICs are available.

3.3 DIN-Rail Mounting

The Magnum 6K16V is designed for use in a “factory floor” industrial environment. It is available with optional DIN-Rail brackets to mount it securely in a metal factory floor enclosure, maintained vertically for proper convection cooling of the unit. The Magnum 6K16V requires two DIN-Rail mounting clips or latches for secure mounting, and these may be ordered as Model # DIN-RAIL-VRM. See a 6K16V viewed from the rear, at right, with model DIN-RAIL-VRM in place on the unit.



The Din Rail Latching clips are mounted on the upper rear corners of the 6K16V unit. Two threaded holes are provided on the sides of 6K16V for DIN-Rail mounting purposes. See side view at the left, with the top of the unit pointed to the right. The required two screws are included with the DIN-Rail brackets, and are no.10-32 X 3/8 PHIL. PAN w/star washer. The two heavy duty Din-Rail latches are designed so that they can be manually accessed from the top when the 6K16V is installed on a DIN Rail.

To install the 6K16V with the DIN-Rail brackets and latches attached to it, hold the 6K16V in the vertical position with the bottom out, and with the top moved in toward the DIN-Rail. Position the latches over the top of the DIN-Rail. Then, snap the latches

into holding position by moving the bottom of the 6K16V inwards to a vertical position. The DIN-Rail latches and brackets are heavy duty, and will hold the 6K16V securely in position, even with cabling attached to the unit.

To release the 6K16V from the DIN-Rail mounting, press the top of the two DIN-Rail latches down simultaneously to release the 6K16V so that it can be dismounted by pulling the bottom out. Once the bottom of the 6K16V is rotated out, the DIN-Rail latch is not engaged and the 6K16V can be moved up and out, free of the DIN-Rail mounting..

The picture below is a front / right-side view of a DIN-Rail mounted 6K16V. It shows vertical mounting of Magnum 6K16V on a DIN-Rail track for proper convection cooling of the unit. Note that there is air space in the rear, as the 6K126V unit is held out from the rear of the panel by the mounting brackets. The 6K16V design uses the case for cooling (patent pending), and needs to be mounted vertically with air flow space in the front, rear, and sides.



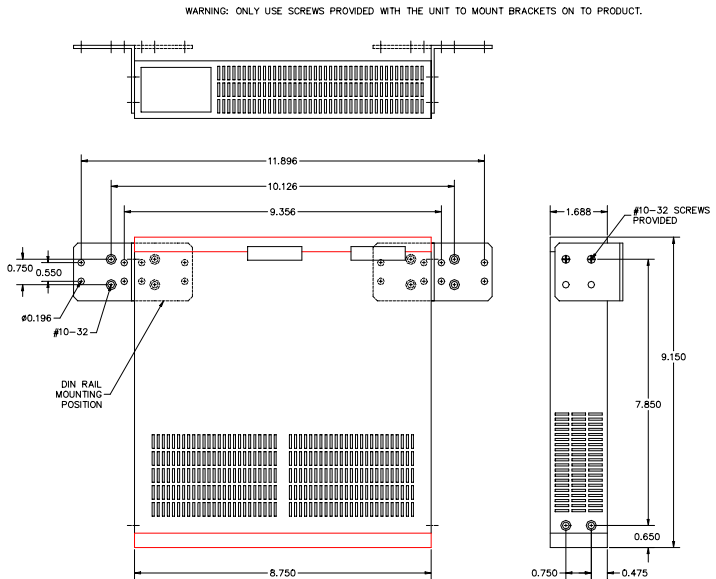
Fig 3.3.1- Magnum 6K16V mounted vertically with DIN-Rail brackets and latches

The DIN-Rail mounting brackets and latches are optional and need to be ordered as separate items, e.g Model # DIN-RAIL-VRM

3.3.1 Mounting Dimensions for 6K16V with metal brackets

Each Mangum 6K16V is supplied with metal mounting brackets and screws to mount the unit securely. It is recommended to mount the 6K16V vertically, as shown below, for proper cooling and long-life reliability. It is also advisable to mount the unit with space for air movement around the top and the sides, typically a minimum of 1 inch..

Note that the back of the 6K16V unit is held out from the panel or wall behind it, creating a rear space of about $\frac{1}{4}$ inch or 1 cm. This allows air circulation and cooling of the rear part of the case. Since the 6K16V uses special internal thermal techniques (patent pending) to move the heat generated by the electronic components inside into the case, the case may be quite warm to the touch during normal operation.



The unit can be mounted using the brackets turned outside (normal) or inside (if space is tight). Attach the mounting bracket either outside or inside as shown in the illustration above (dotted line shown for the brackets inside). The spacing for the mounting screws into the supporting wall or panel is a rectangle 11.89" x 7.85" center-to-center.

3.4 Powering the Magnum 6K16V Managed Fiber Switch

The Magnum 6K16V Switches incorporate an internal universal power supply and have a recessed male IEC connector for the AC power cord at the left-rear. A manual power ON-OFF switch is adjacent. A six-foot 115 VAC 60 Hz standard power cord is supplied with each unit shipped within the United States and Canada.

The auto-ranging power supply supports installation environments where the AC voltage is from 90 to 260 volts with a power input frequency between 47 and 63 Hz. The 16-port units will consume over 20 watts of power typically. When connecting the Ethernet cabling, there is no need to power down the unit. Individual cable segments can be connected or disconnected without concern for AC power-related problems or damage

to the unit.

Power supply options are available to suit the 6K16V Switches to special high-availability communications and/or heavy industrial-grade applications, including:

- * -48VDC, 24VDC and 125VDC with single DC input,
- * -48VDC, 24VDC and 125VDC with dual-source DC input,

See the Appendices of this manual for more details. Use an RFQ for other variations.

3.5 Alarm Contacts for monitoring internal power, and Software Traps

The Alarm Contacts feature, standard on Magnum 6K16V's, provides two Form C Normally Closed (NC) contacts to which the user can attach two sets of status monitoring wires at the green terminal block. When this option is present, the terminal block for Alarm Contacts is part of the Power Input panel in the Magnum 6K16's case. The AC or DC power input connection is in the same panel. A manual On-Off Switch for power to the unit is not available on 6K16 units with the Alarm Contacts option, as these two features occupy the same space in the case.

The first NC Alarm Contact (top position) is a "Software Alarm", operated by user settings in the MNS-6K software. The user can disable the Software Alarm feature with a software configuration command if desired. When the Software Alarm is enabled, the Form C Normally Closed (NC) contact is held close during normal software operation. A user-defined software malfunction, such as an SNMP Trap or a Software Security violation or an S-Ring Fault, causes the contact to open and thus trigger an alarm in the user's monitoring system

The second (bottom position) NC Alarm Contact is held close when there is power on the main board inside of the 6K16. This provides a "Hardware Alarm" because the NC contacts will open when internal power is lost, either from an external power down condition or by the failure of the power supply inside of the Magnum 6K16 Switch. Useful info. about Alarm contacts:

1. There is four terminal block (1,2,3,4) provided next to AC/DC power supply
2. The top two pins (1,2) are software operated
3. The bottom two pins (3,4) are hardware operated
4. By default it is NC (normally closed)
5. The software operation need to be enable and set to get the Alarm traps. For detail information about the Software Alarm and software control of SNMP alarm traps, please reference the Magnum MNS-6K Software User Manual. (Chapter 19th).

The Alarm Contacts are on the front left area (next to the DC power source) of the Magnum 6K16V unit and is green in color as shown in the picture.



Relay Contacts

3.6 6K16V Port Module (6KPM) Installation

Note: the modules used in the 6K16V vertical mount unit are similar to those used in rack-mount 6K units, except that the top LEDs are positioned for front viewing for the vertical-mount 6K16V model. The modules have the letter "V" in the model numbers, but otherwise are the same. In the Port Module materials below, all modules are referred to as "6KPM" for convenience in describing port module installation.

Magnum 6K16V Switches are normally received from the factory with all required 6KPM modules installed. There may be situations where 6KPM cards need to be added or replaced. In cases where additional 6KPM cards are needed, the faceplate for an available front-mounted slot must be removed. The following procedure describes this operation.

3.6.1 Preparation for Installing and Removing 6KPMs

STOP!!!

Be sure the power cord is unplugged from the chassis before attempting to remove and/or replace any PM cards. Failure to do so may result in damage to the unit and will void the warranty.

Caution- Avoid Static Discharge: The port modules (like most electronic equipment) are sensitive to static discharge. Use proper ESD measures when handling port modules.

Step 1. Make sure the 6KPM Card package has all necessary accessories to install it properly. Each 6KPM Card package except the Gigabit, for field installation contains (Daughterboard (Bigger) and Granddaughter board (smaller), three 5/8 stand offs for Granddaughter board, 6 standoff for daughter Board, nine #4-40 Pan-Head screws along with Front panel face plate package. The Front panel faceplate package includes 2 retainer brackets and four #2-56 flat head screws.

NOTE: Every 6KPM Card package comes with their matching Daughter and Granddaughter board. The copper 6KPM card should not work properly if mixed with other Fiber combo 6KPM card packages. Always install the PM module separately one by one to avoid the mixing. Do not change the Blue color DIP Switch setting ever, and leave it at factory default.

Step 2. Remove Chassis Cover

The Magnum 6K16V chassis consists of top-bottom, front and rear parts and assembled together with the help of 18 Philips-head screws. There are 6 screws located on the front panel of the unit (2 each on top and the bottom and one each at the side), 12 for top-bottom cover of the unit (6 each on the bottom side of the unit) and 6 screws each on the sides and 6 screws for the rear panel (2 each on top and bottom and one each on the side). Remove these screws. Once these screws are removed, the front panel is easily slid out to the front of the chassis base.

Figure 3.6.1a: Removing the Front panel from the unit

Caution: Be careful not to disturb the power supply.



Once the front panel is removed, the front cover may be slid out to the front of the unit. Hold on the back part and then carefully and slowly slide out the top chassis cover towards the front side, as shown in the picture.

When the chassis top cover has been removed, the interior of the unit is exposed. Looking down into the Magnum 6K16V unit, notice that there are individual PM installation spaces and female latch (white) connectors provided on the main board along with four stand-off's for each 6KPM card position. (See Figure 3.6.1b).

Figure 3.6.1b: Magnum 6K16V, Top view without chassis cover



Step 3. Remove front panel face plate retaining screws

There are two PM slots (A, B) located on the front of the chassis cover. Looking into the vertical placed Chassis cover of the unit, there are three brackets with retaining screws (#256 flat head) which hold each PM Face plate card slot securely. These six screws shown in the picture below are used to secure a PM face plate in position, but unscrew only four of the screws as shown in Fig. below. These screws are also used to secure the individual 6KPM cards screen plate which can be subjected to significant forces from the attached cables. (See Figure 3.6.1c)



Figure 3.6.1c: Top View – 6KPM retaining screws hold Face Plate

3.6.2 Installing 6KPM Cards in the Magnum 6K16V

Up to two front-mounted 6KPM cards may be installed in one Magnum 6K16V Managed Fiber Switch unit. Follow these steps to install a 6KPM.

- Step 1.** Remove top chassis cover. See procedure in Section 3.6.1 above.
- Step 2.** Placed Granddaughter board (as shown in fig. 3.6.2a and 3.6.2b) on the chassis built in stand off (female) provided at the front of the 6K16V Main Board and screw down tightly with the three 5/16 stand-off (male) on the top of the Granddaughter board. The 5/16 stand off has been used to place the daughter board on the top of the granddaughter board and latch it securely.

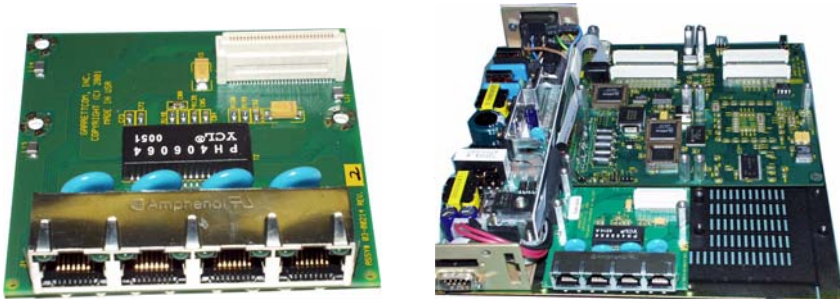


Fig 3.6.2a Granddaughter Board shown separately

Fig 3.6.2b Granddaughter Board placed in slot A and secured with three 5/16 stand-off's

Step 3. The figure here illustrates the basic layout of an individual PM card. Each 6KPM card fits into the space provided on the main board.



Fig. 3.6.2c Daughter Board, top view of version for 4 copper 10/100 ports

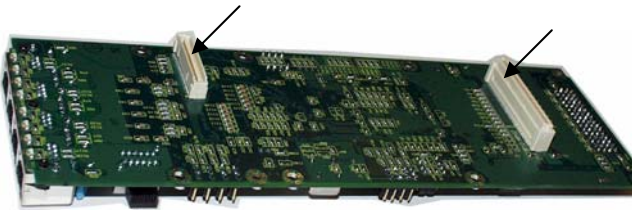


Fig 3.6.2d Daughter Board shown upside down with two male latch connectors

Step 4. Hold the daughter board with both hands at the end and align the two cream color latching connectors (male) placed at the bottom of the daughter board with the other female connector placed on the Granddaughter and main board. As shown below in Fig. 3.5.2e

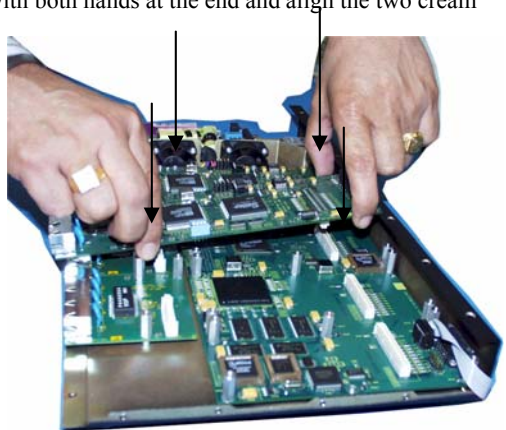


Fig. 3.6.2e Magnum 6KPM daughter board aligned with the bottom female connector for the installation

Step 5. Once the latching connectors are aligned properly and the mounting holes are aligned with stand offs then press slowly and firmly with two fingers (as shown below in Fig. 3.6.2f) on the top of the latching connectors until the connectors latched up securely.

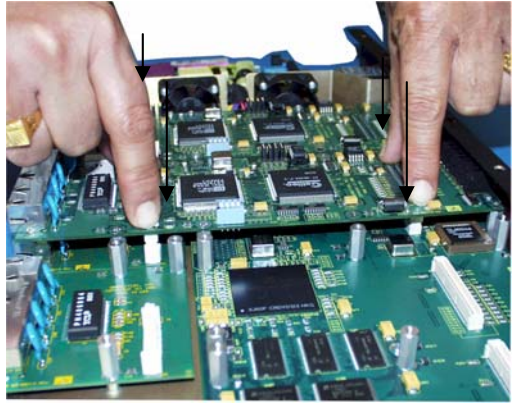
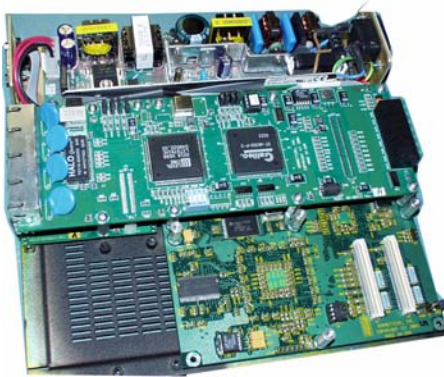


Figure 3.6.2f: Securely latching up 6KPM Cards into a Magnum 6K16V

NOTE: All 6KPM slots need not be filled in order for the Magnum 6K16V unit to be operational. When leaving 6KPM slots empty, always use a face plate (Magnum 6K8-BLNK) to cover the slot opening in the front panel. This will maintain proper cooling air flow, safety, and operation as required by FCC, CE, and other regulations.

Step 6. Now screw down the daughter board with 6 #440 screws, so that it holds the daughter board securely. The figure below shows the top view of 6KPM card



after successfully installing the 6KPM cards inside the Magnum 6K16V.

Fig. 3.6.2g Top View : 6KPM Module installed inside a 6K16V

Step 7. Once the installation of granddaughter and daughter modules is

done, the front panel screen plates need to be placed on the front of the chassis cover to complete the installation process for that port module. The front panel screen plate comes along with the package of port module separately along with 3 brackets and 6 #256 flat head screws. The brackets and screws have been

installed inside of the top cover.

Step 8. Once all 6KPM cards have been installed (including faceplates for empty slots), the chassis cover should be replaced. Make sure the chassis cover is aligned properly before securing the enclosure.

3.6.3 Removing 6KPM Cards

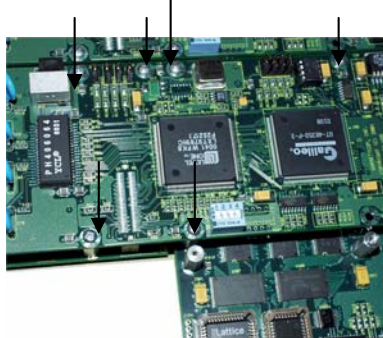
To properly remove a 6KPM card from the 6K16V Managed Fiber Switch, follow the 3 steps below.

Step 1. Remove chassis cover See procedures in Section 3.6.1 above.

Caution: Be sure the power cord is unplugged.

Step 2. Remove retaining screws placed on top for the 6KPM and Face Plate

On the top of the daughter module there are six retaining screws for each 6KPM card. These screws are used to secure a 6KPM card in position (see Figure 3.6.3a). Remove the three standoffs holding the Granddaughter board with the chassis. The screen faceplate screws out from the inside front of the chassis cover by loosening the 4 screws and bracket while holding it down firmly. **Figure 3.6.3a: Top View - 6 retaining screws shown by arrows**



Step 3. Remove 6KPM Card

Carefully and gently pull out the daughter board from the latching connectors, using both hands, gripping the board near the latch-up connectors as shown in Fig. 3.6.3b. If the now empty slot is to remain unused, be sure to install a 6KPM-BLNK face plate cover.



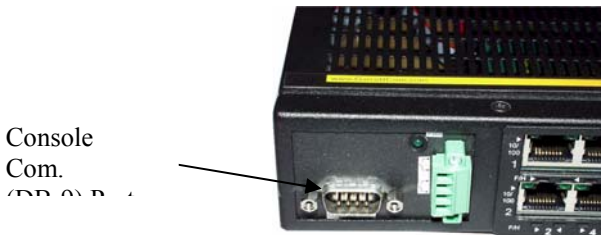
Figure 3.6.3b: Removing a 6KPM Card

If another 6KPM card is replacing the one that has been removed, follow the steps as described for installing a 6KPM card discussed in Section 3.6.1.

3.7 Connecting a Management Console Terminal to Magnum 6K16V

Use a DB-9 “null modem” cable (use on any serial port) or “one DB-9 and one USB” (USB port on the laptop) null modem cable to connect the Magnum 6K16V Console Port (the RS-232 port on the 6K16V Switch) to the your PC, so that your PC becomes the 6K16V’s Console Terminal.

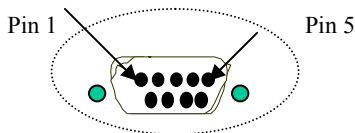
Note: A console cable (either of the two types) may be purchased as a separate item with the 6K16V unit. They are not “bundled” with the unit.



Enlarged view of Magnum 6K16V Console Port area

Note: For a detailed description of Managed Network Software (MNS-6K) and Magnum 6K16V Switch configuration for Network Management, please refer to Magnum 6K16V Software Manual available on GarrettCom’s FTP site. Some info. about the MNS-6K software is available in Section 2.2.9 of this manual.

3.7.1 RS-232 (DB-9) Console Com port (Serial port) pin assignments.



DB-9 (Console port connector)

| Pin | Signal | Description |
|-----|--------|---------------------------|
| 1 | CD | Carrier detect (not used) |
| 2 | RXD | Receive Data (input) |
| 3 | TXD | Transmit Data (output) |
| 4 | open | not used |
| 5 | GND | Signal Ground |
| 6-9 | open | not used |

The above provided information enables a management station (a PC or Console terminal) to connect directly to the Switch Console using a straight-through cable.

4.0 OPERATION

This chapter describes the functions and operation of the Magnum 6K16V Switch.

4.1 Switching Functionality

A Magnum 6K16V provides switched connectivity at Ethernet wire-speed among all of its ports. The Magnum 6K16V supports 10/100Mbps for copper media and 10 or 100Mb separate traffic domains for fiber ports to maximize bandwidth utilization and network performance. All ports can communicate to all other ports in a Magnum 6K16V, but local traffic on a port will not consume any of the bandwidth on any other port.

Magnum 6K16V units are plug-and-play devices. There is no software configuring necessary to be done for basic operation at installation or for maintenance. The only hardware configuration settings are user options for an UP-LINK Switch (resides inside the unit) on the 6K8-RJ45. Optional Half / Full duplex mode and 10 or 100Mbps selection for the switched ports must be configured through MNS software per unit as per the requirement. The internal functions of both are described below.

Filtering and Forwarding

Each time a packet arrives on one of the switched ports, the decision is taken to either filter or to forward the packet. Packets whose source and destination addresses are on the same port segment will be filtered, constraining them to that one port and relieving the rest of the network from having to process them. A packet whose destination address is on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Traffic needed for maintaining the operation of the network (such as occasional multi-cast packets) are forwarded to all ports.

The Magnum 6K16V Switches operate in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Address Learning

All Magnum 6K16V units have address table capacities of 4K node addresses suitable for use in larger networks. They are self-learning, so as nodes are added, removed or moved from one segment to another, the 6K16V Switch automatically keeps up with node locations.

An address-aging algorithm causes least-used addresses to fall out in favor of frequently-used addresses. To reset the address buffer, cycle power down-and-up.

4.2 Status LEDs

For all Magnum 6K16V models :

- PWR** : Power LED, ON when external power is applied to the unit.
LK : Steady ON, Link status for 10 Mbps and 100Mbps operation.
ACT : ON with port activity for 10 Mbps and 100Mbps operation.
F/H : Full / Half duplex LED, ON when the port is running full duplex, OFF for half duplex.
100/10 : Speed LED, ON when the speed is 100Mbps , OFF when the speed is 10 Mbps

4.3 Up-link Manual Switches set as (=) , for RJ-45 port only

The module has a manual Up-link switch, located on the inside of the board next to the 10/100Mb (6K8-RJ45) port # 1 which it controls. It enables the port's cable to be cascaded (X) to a 10/100Mb repeater or switching hub in the network. The Up-link Switch position is configured as (=) position by default from the factory settings on all the RJ-45 ports, either used for all copper module or combo module.

4.4 Auto-negotiation, for Fast Ethernet copper ports

The Managed Magnum 6K16V Fast Ethernet copper ports can be set for either fixed 100Mb speed or for 10/100 F/H N-way auto-negotiation per the IEEE802.3u standard. The selection is made via MNS software. The factory default setting is for auto-negotiation. At 10Mb or 100Mb-fixed speed, the user may select half- or full-duplex mode by MNS Software for each RJ-45 port separately. For detail information see Section 8 (Optimizing Port usage) of Magnum 6K16V Software user guide (MNS) .

See Section (2.2.9 at page no.13) of this manual to access the “6K16V Software userguide”

One frequently-used application for the Managed Magnum 6K16V Switch copper ports is to connect one of them using a fiber media converter to another Switch in the network backbone, or to some other remote 100Mb device. In this case, it is desirable to operate the fiber link at 100Mb speed, and at either half- or full duplex mode depending on the capabilities of the remote device. Standard commercially available Fast Ethernet media converters mostly do not support auto-negotiation properly, and require that the switched port to which they are connected be at 100Mb fixed speed. Attachment to 10/100 auto-negotiation ports typically will not work properly. The 6K16V Switch's RJ-45 ports handle this situation by configuring the ports as per desire through MNS software port settings and can check the port status of each port after the change.

When Magnum 6K16V RJ-45 copper ports are set for auto-negotiation and are connected to another auto-negotiating device, there are 4 different speed and F/H modes possible depending on what the other device supports. These are: (1) 100Mb full-duplex, (2) 100Mb half-duplex, (3) 10 Mb full-duplex and (4) 10 Mb half-duplex.

The auto-negotiation logic will attempt to operate in descending order and will normally arrive at the highest order mode that both devices can support at that time. (Since auto-negotiation is potentially an externally controlled process, the original “highest order mode” result can change at any time depending on network changes that may occur). If the device at the other end is not an auto-negotiating device, the 6K16V’s RJ-45 ports will try to detect its idle signal to determine 10 or 100 speed, and will default to half-duplex at that speed per the IEEE standard.

General information -

Auto-negotiation per-port for 802.3u-compliant switches occurs when:

- the devices at both ends of the cable are capable of operation at either 10 Mb or 100Mb speed and/or in full- or half-duplex mode, and can send/receive auto-negotiation pulses, and . . .
- the second of the two connected devices is powered up*, i.e., when LINK is established for a port, or
- the LINK is re-established on a port after being lost temporarily.

- **NOTE – *Some NIC cards only auto-negotiate when the computer system that they are in is powered up. These are exceptions to the “negotiate at LINK – enabled” rule above, but may be occasionally encountered.***

When operating in 100Mb half-duplex mode, cable distances and hop-counts may be limited within that collision domain. The Path Delay Value (PDV) bit-times must account for all devices and cable lengths within that domain. For Magnum 6K16V Fast Ethernet switched ports operating at 100Mb half-duplex, the bit time delay is 50BT.

4.5 Flow-control, IEEE 802.3x standard

Magnum 6K16V Switches incorporate a flow-control mechanism for Full-Duplex mode. The purpose of flow-control is to reduce the risk of data loss if a long burst of activity causes the switch to save frames until its buffer memory is full. This is most likely to occur when data is moving from a 100Mb port to a 10 Mb port and the 10Mb port is unable to keep up. It can also occur when multiple 100Mb ports are attempting to transmit to one 100Mb port, and in other protracted heavy traffic situations.

Magnum 6K16V Switches implement the 802.3x flow control (non-blocking) on Full-Duplex ports, which provides for a “PAUSE” packet to be transmitted to the sender when the packet buffer is nearly filled and there is danger of lost packets. The transmitting device is commanded to stop transmitting into the 6K16V Switch port for sufficient time to let the Switch reduce the buffer space used. When the available free-buffer queue increases, the Switch will send a “RESUME” packet to tell the transmitter to start sending the packets. Of course, the transmitting device must also support the 802.3x flow control standard in order to communicate properly during normal operation.

Note: When in Half-Duplex mode, the 6K16V Switch implements a back-pressure algorithm on 10/100 Mb ports for flow control. That is, the switch prevents frames from entering the device by forcing a collision indication on the half-duplex ports that are receiving. This temporary “collision” delay allows the available buffer space to improve as the switch catches up with the traffic flow.

4.6 Power Budget Calculations for Magnum 6K16V PM's with Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = $P_T(\text{min}) - P_R(\text{min})$

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the “Cable Loss” for 62.5/125 and 50/125 μm (M.m) is 2.8 dB/km,

and the “Cable Loss” for 100/140 (Multi-mode) is 3.3 dB/km,

and the “Cable Loss” for 9/125 (Single-mode) is 0.5 dB/km

and the “Cable Loss” for 9/125 (Single-mode) is 0.4 dB/km (LXSC25)

and the “Cable Loss” for 9/125 (Single-mode) is 0.25 dB/km

(LXSC40)

and the “Cable Loss” for 9/125 (Single-mode) is 0.2 dB/km (LXSC70)

The following data has been collected from component manufacturer’s (Agilent’s and Lucent’) web sites and catalogs to provide guidance to network designers and installers.

| Fiber Port Module | Speed, Std. | Mode | Std. km fdx (hdx) | Wave - length nm | Cable Size μm | X'mitr Output P _T , dB | R'cvr Sens. P _R , dB | Worst OPB, dB | Worst* distance Km, fdx | typical OPB, dB | typical* distance Km, fdx |
|-------------------|-------------|-------------|-------------------|------------------|-------------------------------|-----------------------------------|---------------------------------|--------------------|-------------------------|--------------------|---------------------------|
| 6KP4V-F10ST | 10Mb FL | Multi-Mode | 2 (2) | 850 | 62.5/125 100/140 50/125 | -15.0 -9.5 -19.5 | -31 -31 -31 | 14 19.5 19.5 | 5 5.9 3.4 | 17 23.5 13.5 | 6 7 4.8 |
| 6KPV-MST, MSC | 100Mb FX | Multi-mode | 2 (0.4) | 1300 | 62.5/125 50/125 | -20 -23.5 | -31 -31 | 9.0 5.5 | 3.0 2.0 | 14 12 | 5 4 |
| 6KPV-SSC | 100Mb FX | Single-mode | 18+ (0.4) | 1300 | 9/125 | -15 | -31 | 14 | 28 | 17.5 | 35 |
| 6KPV-SSCL | 100Mb FX | Single-mode | 40 (0.4) | 1300 | 9/125 | -5 | -34 | 29 | 58 | 32.5 | 65 |
| 6KPV-MTRJ | 100Mb FX | Multi-mode | 2 (0.4) | 1300 | 62.5/125 50/125 | -20 -23.5 | -31 -31 | 9.0 5.5 | 3.0 2.0 | 15.8 12.2 | 5.5 4.0 |
| 6KPV-MLC | 100Mb FX | Multi-mode | 2 (0.4) | 1300 | 62.5/125 | -19 | -31 | 12 | 4 | 16 | 5.7 |
| 6KPV-SLC | 100Mb FX | Single-Mode | 15+ (0.4) | 1310 | 9/125 | -15 | -28 | 11 | 22 | - | - |
| GBIC-SXSC | 1000Mb | Multi-mode | 0.55 | 1300 | 62.5/125 50/125 | -9.5 | -17 | 5.5 | 2 | 12.5 | 4 |
| GBIC-LXSC10 | 1000Mb | Single-mode | 10 | 1300 | 9/125 | -9.5 | -20 | 8.5 | 17 | 10.5 | 21 |
| GBIC-LXSC25 | 1000Mb | Single-mode | 25 | 1550 | 9/125 | -4.0 | -21 | 15 | 37.5 | 17.5 | 43 |
| GBIC-ZXSC40 | 1000Mb | Single-mode | 40 | 1550 | 9/125 | -4.0 | -21 | 15 | 60 | 17.5 | 70 |
| GBIC-ZXSC70 | 1000Mb | Single-mode | 70 | 1550 | 9/125 | -3.0 | -23 | 18 | 90 | 20.5 | 102 |

* **Note:** The use of either multi-mode or single-mode fiber to operate at 100Mbps speed over long distances (i.e., in excess of approx. 400 meters) can be achieved **only** if the following factors are both applied:

- The 100Mb fiber segment must operate in full-duplex (FDX) mode, i.e. the full-duplex (factory default) setting for 100Mbps fiber ports must be used, and
- The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.

(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)

5.0 Introduction - Magnum 6K16V Managed Fiber Switch Port Modules

This chapter describes each Port Module (PM), including appearance, functionality, and status displays.

5.1 Inspecting the Package and Product

This section applies only to PMs shipped as separate items, i.e., 6K16V PMs not factory installed in a Magnum 6K16V PM slot.

Examine the shipping container for obvious damage prior to installing a 6K16V PM; notify the carrier of any damage you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

1 or more 6K16V PMs

Installation instructions, with illustrations

Remove the 6K16V PM(s) from the shipping container. Be sure to keep the shipping container should you need to ship any of the PMs separately at a later date. In the event there are items missing or damaged, contact your supplier. If you need to return the unit, use the original shipping container if possible. Refer to Chapter 5 for specific return procedures.

5.2 6KPM Module Description

An important feature of the Magnum 6K16V is the use of Port Modules for flexible mixed-media connectivity to RJ-45 and fiber media. Since the Magnum 6K16V Switches have dual-speed capability for copper ports, the 6 or 8-port interfaces are designed to support all standard Ethernet media types at 10 or 100Mps speed. Each 6K16V PM provides six or eight ports for connecting Ethernet segments with its individual connector type and media.

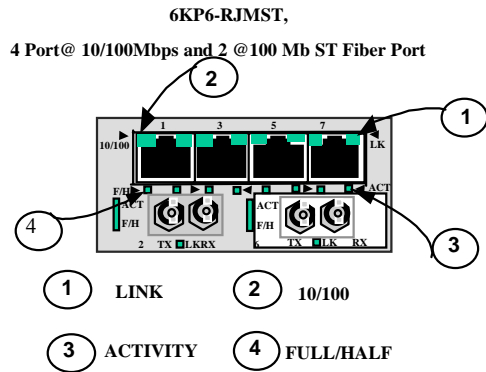
For a list of 6K16V Port Module types, refer to Section 1.2

Each 6K16V PM is individually described in the following sections.

NOTE: The port #1 on the RJ-45 ports on all the modules, either all RJ-45 ports or used for COMBO module is set as (=) other user ports.

5.2.1 6KP6-RJMST, 4@10/100Mbps RJ-45 and 2@100Mb multi-mode FX-ST “twist lock” Combo Module

The Magnum 6KP6-RJMST is a combo 6 port module of RJ-45's at 10/100Mbps and fiber optic ports at 100MB. The Combo module is equipped with dual-mode ST-type connectors and dual speed copper ports. The ST-connector functions as a fiber optic transceiver to support 100BASE-FX network segments. When installed in a Magnum 6K16V Managed Switch, the copper port supports the standard distance 100m on each port and the fiber port supports fiber optic cable distances up the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.



Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates the speed, if the LED is ON 100Mbps if it is OFF 10Mbps.

5.2.1a 6KP6-RJ10ST, 4@10/100Mbps RJ-45 and 2@10Mb multi-mode FX-ST “twist lock” Combo Module

The 6KP6-RJ10ST is a six port combo module that looks similar to the 100Mb combo module with the exception of 10Mb speed at the ST fiber module. The ST-connector functions as a fiber optic transceiver to support 10BASE-FX network segments. When installed in a Magnum 6K16V Managed Switch, the copper port supports the standard distance 100m on each port and the fiber port supports fiber optic cable distances up the IEEE-standard 10Mbps distance limits, i.e., typically 2km at full-duplex and half-duplex.

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates the speed, if the LED is ON, 100Mbps if it is OFF, 10Mbps.

5.2.1b 6KP4-F10ST, 4@10Mb multi-mode FX-ST “twist lock” Module

The Magnum 6KP4-F10ST is a 10Mb multi-mode fiber module with 4 ST-Fiber ports. All four fiber ports are ST connectors and configured as 10Mb Half-duplex by default. The 10Mb ST-fiber ports allow the user to connect their legacy 10Mb network to the Magnum 6K16V

switch. They also provide a convenient way for the half duplex

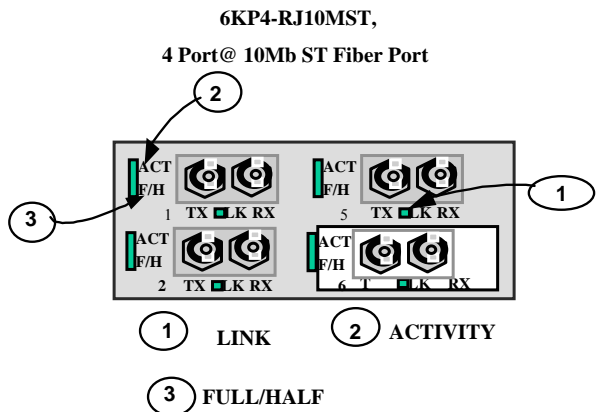
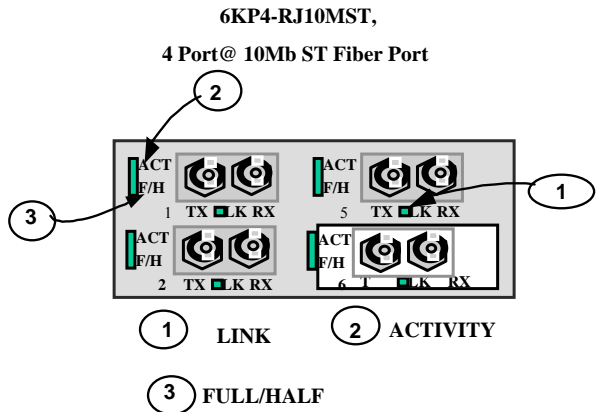
hub to connect to the switch through 10Mb fiber ports. It supports distances according to the 10Base-FL standard i.e, 2Km distance for multi-mode fiber. (Single-mode for 10Km distance may be available as a special order).

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and FDX/HDX LED indicating full-duplex mode when lit (or half-duplex if off).

5.2.1c 6KP4-FLSTFX, 2@10Mb & 2@100Mb multi-mode FX-ST “twist lock” Module

The Magnum 6KP4-FLSTFX is a combo fiber module with two 10Mb + two 100Mb multi-mode fiber module and in combine 4 ST-Fiber ports. All four fiber ports are ST connectors and configured as 10Mb Half-duplex by default for 10Mb fiber and 100Mb Full duplex for the

100Mb fiber. The 10Mb ST-fiber ports allow the user to connect their legacy 10Mb network to the Magnum 6K16V switch. They also provide a convenient way for the half duplex hub to connect to the switch through 10Mb fiber ports. Whereas the 100Mb ST

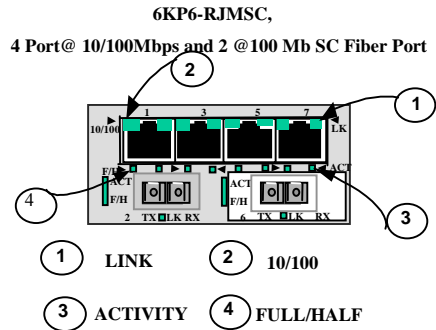


module allow to connect the 100Mb demand of Switch devices. It supports distances according to the 10Base-FL standard i.e, 2Km distance for multi-mode fiber. (Single-mode for 10Km distance may be available as a special order).

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and FDX/HDX LED indicating full-duplex mode when lit (or half-duplex if off).

5.2.2. 6KP6-RJMSC 4@10/100Mbps RJ-45 and 2@100Mb multi-mode FX-SC “snap-in” Fiber connector

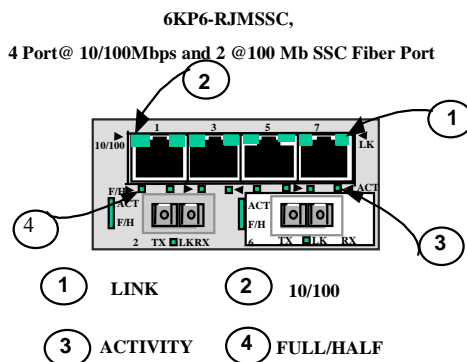
The Magnum 6KP6-RJMSC is also a Combo 6 Port module equipped with 4 10/100Mb RJ-45 ports along with 2 multi-mode 100Mbps fiber optic transceivers all in one module. This is similar to the 6K6-RJMST. It has the same LEDs indicating port activity (ACT), Link (LK), and FDX / HDX and 10/100 operation, and the same face-plate lettering.



While the functionality of these two modules is essentially the same, the 6KP6-RJMSC is equipped with an SC-type "snap-in" connector instead of an ST-type.

5.2.3 6KP6-RJSSC 4@ 10/100Mbps RJ-45 Ports and 2@100Mbps single-mode FX-SC-type, “snap-in” connector

The Magnum 6KP6-RJSSC is also a Combo module equipped with 4 dual speed copper ports and 2 Single-mode SC-type connectors. It provides an advantage through combining copper and Fiber functions in one module of the 6K16V Switch supporting four Copper and two single-mode fiber network segments.



The 6KP6-RJSSC, when installed in a Magnum 6K16V Switch operates on copper at the 100m distance. The Fiber is single-mode and cable lengths can be as much

as 25+ Km (see Power Budget, Section 4.5)

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, and a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates 100Mbps speed when lit and 10Mbps speed when off. To distinguish the single-mode 6 K6-RJSSC from the multi-mode 6K6-RJMSC, the label “Sgl. M.” is at the top of the faceplate of the 6K6-RJSSC.

5.2.4 6KP6-RJSSCL 4 @ 10/100 Mb copper port and 2@100Mbps single-mode FX-SC-type, “snap-in” connector

The Magnum 6KP6-RJSSC is also a Combo module equipped with 4 dual speed copper ports and 2 Single-mode (Long Reach) SC-type connectors. It provides a combination of copper and Fiber functions in one module to the 6K16V Switches, supporting four Copper and two single-mode (Long-Reach) fiber network segments.

The 6KP6-RJSSC, when installed in a Magnum 6K16V Switch has copper supporting the 100m distance and Fiber supporting single-mode fiber cable lengths of as much as 40+ Km (see Power Budget, Section 4.5)

Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and a FDX/HDX LED indicating full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates the speed for the copper port, which is 100Mbps when the LED is ON and 10 Mb when the LED is OFF.

5.2.4a 6KP6-RJ10ST 4 @ 10/100 Mb copper port and 2@10Mbps multi-mode FL-ST-type, “twist-lock” connector

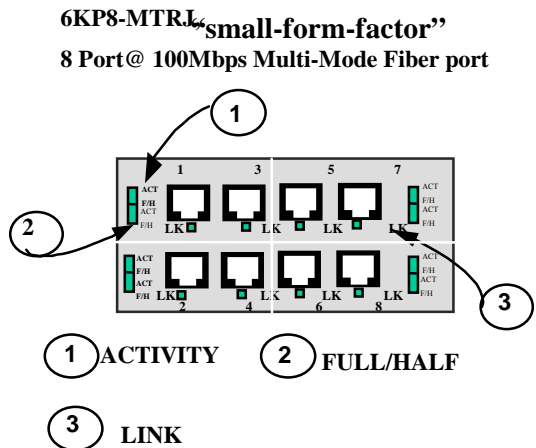
The Magnum 6KP6-RJ10ST is also a Combo module equipped with 4 dual speed copper ports and 2 multi-mode 10 Mb fiber ST-type connectors. It provides a combination of copper and Fiber functions in one module to the 6K16V Switches, supporting four Copper and two 10Mb of ST fiber network segments.

The 6KP6-RJ10ST, when installed in a Magnum 6K16V Switch has copper supporting the 100m distance and Fiber supporting multi-mode fiber cable allow to connect the legacy network of 10Mb requirement in the network. Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with the remote device when lit, and a FDX/HDX LED indicating full-duplex mode when lit (or half-duplex when off). The 10/100 LED indicates the speed for the copper port, which is 10Mbps when the LED is ON and 10 Mb when the

LED is OFF.

5.2.5 6KP8-MTRJ, 8 @100Mb multi-mode FX , MTRJ Small-Form-factor

Magnum 6KP8-MTRJ is a multi-mode fiber optic 8-port module equipped with a small-form-factor MTRJ-type connector. It looks almost like an RJ-45 port, but it is black in color. The MT-RJ's small size and ease of connection make it a good choice for 100Mbps "fiber-to-the-desktop" Ethernet connectivity. When installed in a Magnum 6K16V Switch, it supports fiber optic cable distances up the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.



The functionality of this 100BASE-FX multi-mode 8 Port module is essentially the same as the ST and SC-types. It has the same LEDs per port indicating port activity (ACT), Link (LK), and FDX or HDX operation.

5.2.5a 6KP6-MT10ST, 4 @100Mb multi-mode FX , MTRJ Small-Form-Factor and 2@ 10Mb Multi-mode ST-Fiber port

The 6KP6-RJ10ST is a combo module with two different kinds of fiber flavor with two different speeds. The top four ports of MTRJ Small form factor fiber support at 100Mb full-duplex, whereas the bottom two ports multi-mode ST-Fiber support 10Mb half-duplex. This combo module provides more flexibility to the user to connect their legacy 10Mb fiber as well as 100Mb to the Magnum 6K16V Switch.

When installed in a Magnum 6K16V Switch, the 100Mb MTRJ connector supports fiber optic cable distances up to the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex. The 10Mb Multi-mode ST-Fiber connector supports the standard fiber optic distance limit of 2Km at Full and Half-duplex both.

The functionality of this 100BASE-FX multi-mode 4 port module is

essentially the same as the ST and SC-types. It has the same LEDs per port indicating port activity (ACT), Link (LK), and FDX or HDX operation

5.2.6 6KP8-45MT, 4@ 10/100Mbps RJ-45 and 4@ 100Mb multi-mode FX ,

MTRJ Small-Form-Factor

The Magnum 6KP8-45MT

Module is a combo module with copper and fiber (Small Form Factor) MTRJ type ports. The small size of MTRJ connectors give an advantage of placing more ports on one module. The 6KP8-45MT is equipped with 4 10/100 RJ-45 ports and 4 MTRJ fiber ports.

When installed in a Magnum 6K16V

Switch, it supports the standard

5.2.7 6KP8-MLC, 8 ports @ 100Mbps multi-mode LC connector Small-Form Factor

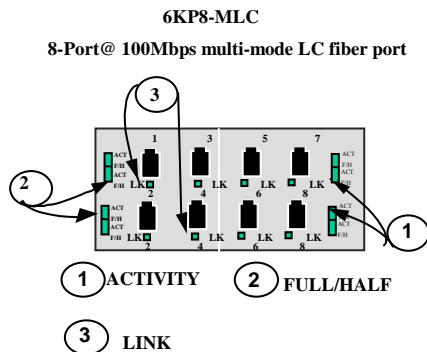
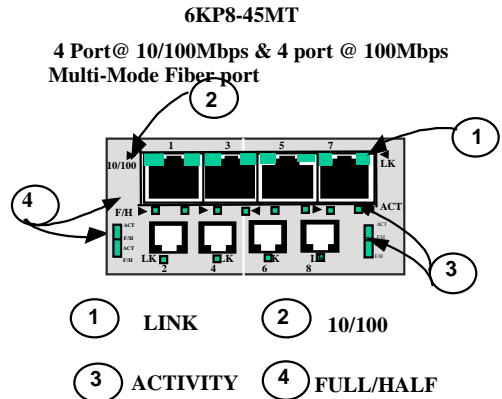
Magnum 6KP8-MLC is a eight-port multi-mode fiber LC connector “small-form-factor” used primarily in 100Mbps fiber-to-the-desktop links.

When installed in a Magnum 6K16V Switch, it supports fiber optic cable distances up to the IEEE-standard 100Mbps distance limits, i.e., typically 2km at full-duplex and 412m at half-duplex.

The compact size of the

LC Connector reduces the size of wiring panels in wiring closets while providing the advantage of “future-proof” fiber optic technology.

The cable end is a “plug-in” connector with both fiber strands terminated in one housing that cannot be improperly inserted. Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED indicating proper connectivity with



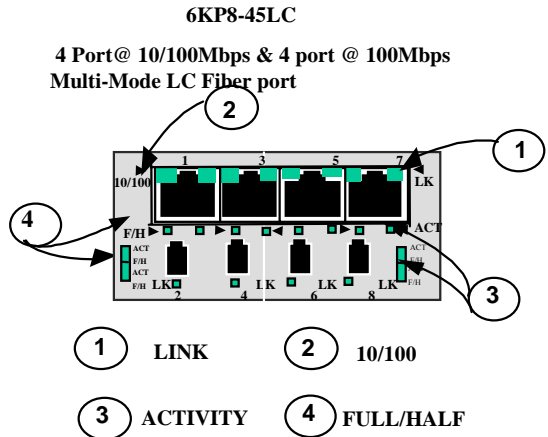
the remote device when lit, and a FDX/HDX LED indicating full-duplex mode when lit (or half-duplex when off).

5.2.8 6KP8-45LC, Combo 4@ 100Mbps multi-mode -LC small-form factor and 4@ 10/100 Mbps RJ-45 Connector

The Magnum 6KP8-45LC Module is a combo module with a combination of copper and Fiber (Small Form

Factor) LC type ports. The small size of LC connectors give an advantage of having more ports on one module. The 6KP8-45LC is equipped with 4 10/100 RJ-45 ports and 4 LC (Small form factor) multi-mode fiber ports.

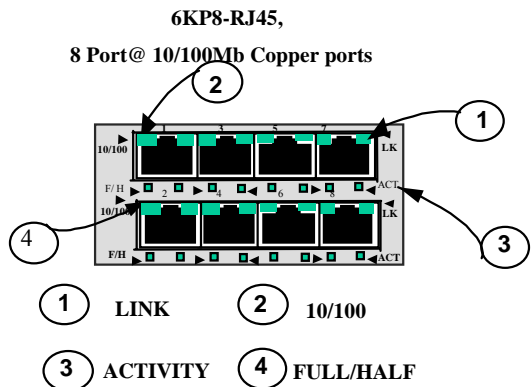
When installed in a Magnum 6K16V Switch, it supports the standard distances as per mentioned on 5.2.8. and the LEDs also acts similarly as mentioned above.



5.2.9 6KP8-RJ45 (Twisted Pair), 10/100Mb 8-Port

The 6KP8-RJ45 module supports Ethernet twisted pair segments of any standard length. It is equipped with an eight-port RJ-45 connector, and offers 10/100 full / half-duplex auto-negotiating capability on each port. The RJ-45 connector is shielded to minimize emissions and will allow both unshielded twisted pair (UTP) and shielded twisted pair (STP)

cable connections. The 6KP8-RJ45 module is equipped with a Media Dependent Interface-Crossover (MDI-X) switch, which controls port#1 for cascaded connection. This feature eliminates the need for a special twisted pair crossover cable when



connecting to a hub or another switch.

The switch is configured as (=) position by default settings from the factory, the left-most RJ-45 port is used for segments going to workstations and other user node device connections as other ports of the module. For cascaded and up-link connections (i.e.: a connection to another hub or switch typically), the uplink switch should be in the OUT (X) position.

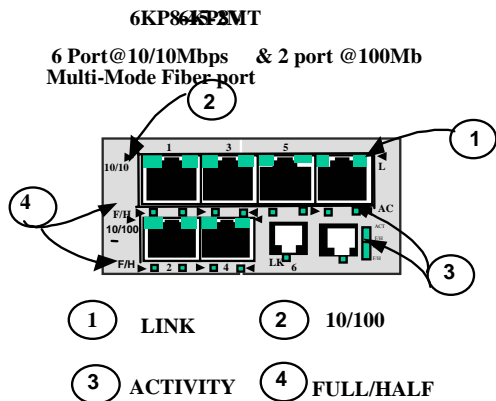
Each port has an Activity (ACT) LED indicating packets being received, a Link (LK) LED that indicates proper connectivity with the remote device when lit, a FDX/HDX LED to indicate full-duplex mode when lit (or half-duplex when off), and a "10/100" LED indicating 100Mb when lit (or 10 Mbps when off).

Important Note: For the 6KP8-RJ45 Crossover Switch-Inside is set for (=) by default from the factory for the Port # 1 and act similar as other user port. The location of cross-over switch can be seen in the fig 3.5.2.c (RJ-45 module) at page no 27.

The RJ-45 pins normally (TP crossover switch) are per the standard for hubs-to-users twisted pair wiring: 1 = receive+, 2 = receive-, 3 = transmit+, 6 = transmit-, other pins not used. When the TP crossover push-button is UP, the pins of the RJ-45 port are per the standard for up-links using twisted pair wiring, i.e., the transmit and the receive pairs are exchanged: 1 = transmit+, 2 = transmit-, 3 = receive+, 6 = receive-, other pins not used.

5.2.10 6KP8-45-2MT, 6@ 10/100Mbps RJ-45 and 2@100Mb multi-mode FX , MTRJ Small-Form-Factor

The Magnum 6KP8-45-2MT eight port Module is a combo module with copper and fiber (Small Form Factor) MTRJ type ports. The small sizes of MTRJ connectors give an advantage of placing more fiber ports on one module. The 6KP8-45-2MT is equipped with six 10/100 RJ-45 ports and two 100Mb MTRJ fiber ports. When installed in a Magnum 6K16V Switch, it supports the standard distances as mentioned on 5.2.3. and the LEDs also act similarly.

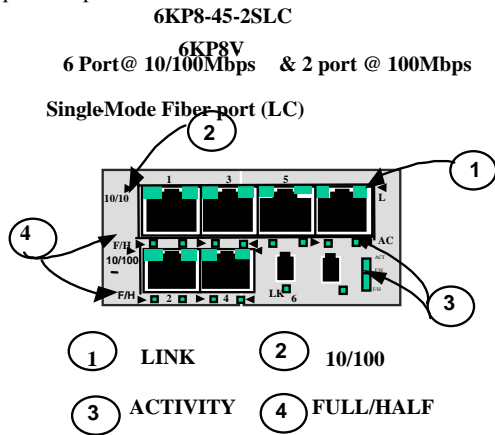


5.2.10a 6KP8-45-2LC, 6@ 10/100Mbps RJ-45 and 2@ 100Mb single-mode FX , LC Small-Form-Factor

The Magnum 6KP8-45SLC eight port Module is a combo module with copper and fiber (Small Form Factor) LC type fiber ports.

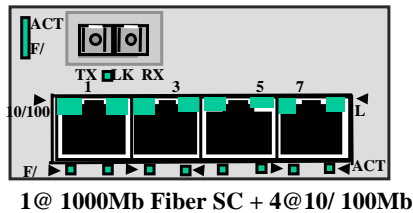
The small size of LC connectors give an advantage of placing more ports on one module. The 6KP8-45-2SLC is equipped with 6 10/100 RJ-45 ports and 2 Single-mode fiber ports.

When installed in a Magnum 6K16V Switch, it supports the standard distances as mentioned on 5.2.4. and the LEDs also act similarly.



5.2.11 GBIC-SXSC Gigabit fiber(1000Mb), multi-mode SC Connector

The Magnum GBIC-SXSC is a multi-mode Gigabit fiber connector equipped with SC type connectors and can be easily snapped in and out. The Gigabit fiber ports are most popular as server-to-switch and switch-to-switch applications. It supports cable distances up to the IEEE 802.3z standard 1000Mbps distance limits, i.e., 550m at full duplex.



The GBIC transceiver has been offered in the modular slot with multiple options as per the user requirement. The two Giga port has been offered as GBPM-2OTX (fiber or RJ-45), whereas the single Gigabit module comes in flavor of G+2 (100Mb fiber ports) or G+4(10/100 RJ-45 ports) as shown in the above figure.

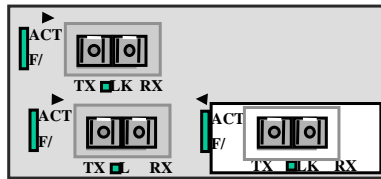
The GBIC transceiver is fastened using snap-in clips. Insert the transceiver (take care to insert it the right way up, arrows on top) until it clicks in space. While

removing the transceiver, press the clips on either side of the transceiver at the same time and pull the transceiver out.

Each port has an Activity (ACT) LED indicating packets being received and a Link (LK) LED indicating proper connectivity with the remote device when lit.

5.2.11a GBIC-LXSC Gigabit fiber (1000Mb), multi-mode SC Connector

The Magnum GBIC-LXSC is a single-mode Gigabit fiber connector equipped with SC type connectors and can be easily snapped in and out. The Gigabit fiber ports are most popular as server-to-switch and switch-to-switch applications. It supports cable distances up to the IEEE 802.3z standard 1000Mbps distance limits, i.e., 10,25, 40 or 70Km at full duplex, and depend upon the Gigabit modules used.



1 @ 1000Mb Fiber SC + 2 @ 100Mb SC

The two Giga port has been offered as GBPM-2OTX (fiber or RJ-45), whereas the single Gigabit module comes in flavor of G+4(10/100 RJ-45 ports) or G+2 (100Mb fiber ports) as shown below in the above figure.

Each port has an Activity (ACT) LED indicating packets being received and a link (LK) LED indicating proper connectivity with the remote device when lit.

5.2.12 6KM-BLNK

The 6K8-BLNK is a blank face plate or cover plate that must be installed in any empty 6K16V PM slot to maintain proper cooling air flow, safety, etc.

Two screws underneath the front panel hold the 6KM-BLNK in place.



6.0 TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of a Magnum 6K16V Switch is a straightforward procedure (see INSTALLATION, Section 2.6); the operation is also straightforward and is discussed in Section 4.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum 6K16V Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

6.1 Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.
2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)
3. Make sure that an AC power cord is properly attached to each Magnum 6K16V Switch unit. Be certain that each AC power cord is plugged into a functioning electrical outlet. Use the PWR LEDs to verify each unit is receiving power.
4. If the problem is isolated to a network device other than the Magnum 6K16V Switch product, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Magnum 6K16V Switch and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 6K16V Switch unit or if unknown, contact GarrettCom, Inc. by fax, phone or email (support@garrettcom.com) for assistance.

6.2 When Calling for Assistance

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:
 - a. The nature and duration of the problem;
 - b. Situations when the problem occurs;
 - c. The components involved in the problem;
 - d. Any particular application that, when used, appears to create the problem;
2. An accurate list of GarrettCom product model(s) involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.
3. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.
4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

6.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, call GarrettCom Customer Service at (510) 438-9071 during business hours in California or email to support@garrettcom.com). When calling, please have the following information readily available:

Name and phone number of your contact person.

Name of your company / institution

Your shipping address

Product name

Serial Number (or Invoice Number)

Packing List Number (or Sales Order Number)

Date of installation

Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

6.4 Shipping and Packaging Information

Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. GarrettCom is not responsible for your return shipping charges.
4. Ship the package to:

GarrettCom, Inc.

213 Hammond Ave.

Fremont, CA 94539

Attn.: Customer Service

APPENDIX A: WARRANTY INFORMATION

GarrettCom, Inc. warrants its products to be free from defects in materials and workmanship for a period of three (3) years from the date of shipment by GarrettCom.

During this warranty period, GarrettCom will repair or, at its option, replace components in the products that prove to be defective at no charge other than shipping and handling, provided that the product is returned pre-paid to GarrettCom.

This warranty will not be effective if, in the opinion of GarrettCom, the product has been damaged by misuse, misapplication, or as a result of service or modification other than by GarrettCom.

GarrettCom reserves the right to make a charge for handling and inspecting any product returned for warranty repair which turns out not to be faulty.

Please complete the warranty card as this acts as a product registration, and mail it to GarrettCom within two weeks of your purchase.

APPENDIX B : Internal DC Power Supply Options**B1.0 SPECIFICATIONS FOR MAGNUM 6K16V SWITCHES, DC POWER**

Power Magnum 6K16V models, for -48V and 24V DC & 125VDC and 5V

Power input

Each Magnum Model 6K16V Managed Switch (DC option) requires a DC power source, from for 24VDC, -48VDC and 125VDC option or 5VDC input. The wide range of power input qualifies this product for use in 24VDC, -48VDC as well as 125VDC or 5VDC environments. The 24VDC, -48VDC or 125VDC or 5VDC power input provides an Ethernet networking product utilizing a special type of power supply with a proven high-reliability record to fulfill the DC requirement.

DC Power Terminals: “+”, “-”, internally floating

GND: Terminal for “earth” or ground wire connection to the 6K16V chassis

Input Voltage: 18 to 36 VDC (24VDC)

Input current: 1.2Amps max.(for all RJ-45 ports)

Input current: 2.4Amps max.(for all Fiber ports)

Input Voltage: -36 to -70 VDC (-48VDC)

Input current: 0.8Amps max.(for all RJ-45 ports)

Input current: 1.2Amps max.(for all Fiber ports)

Input Voltage: 115 to 150 VDC (125VDC)

Input current: 0.3Amps max.(for all RJ-45 ports)

Input current: 0.35Amps max.(for all Fiber ports)

Power Consumption: 50 watts max., for fully loaded (fiber ports)

(24V, -48V, 125V)DC 30 watts typical for all (RJ-45 Ports)

Input Voltage: 5VDC (+) or (-) 5% (5VDC)

Input current: 3.5Amps max.(for all RJ-45 ports)

Input current: 8.0Amps max.(for all Fiber ports)

Power Consumption: 20 watts max., for fully loaded (fiber ports)

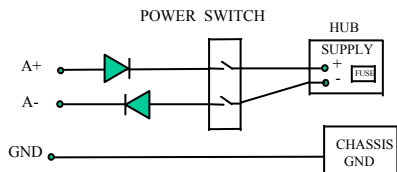
17 watts typical for all (RJ-45 Ports)

B2.0 -48VDC, 24VDC and 125VDC POWER, THEORY OF OPERATION

The -48VDC, 24VDC and

125VDC power options are designed using diodes inside on each DC power input line behind the two external power connection terminals, so that the power from an external source can only flow

into the hub. This allows the Switch to operate only whenever DC power is correctly



applied to the two inputs. It protects the Switch from incorrect DC input connections. An incorrect polarity connection, for example, will neither affect the Switch, its internal power supply, nor will it blow the fuse in the internal power supply.

The manual power “On-Off” Switch (optional) is used for powering the unit on and off when it is placed into or taken out of service.

B3.0 APPLICATIONS FOR DC POWERED ETHERNET SWITCHES

Magnum 6K16-Series Switches are easily installed in a variety of applications where -48VDC, 24, or 125VDC or 5VDC power is used as the primary power source. The DC power configuration capability provides an Ethernet networking solution utilizing a special power supply in switches with a proven track record.

The -48VDC solution is particularly useful in the telecommunication industry, where it is common for facilities to operate on -48VDC power. Such companies include regular and wireless telephone service providers, Internet Service Providers (ISPs) and other communication companies. In addition, many high availability equipment services, such as broadcasters, publishers, newspaper operations, brokerage firms and other facilities often use a battery backup system to maintain operations in the event of a power failure. It is also frequently used for computer system backup, management and operations monitoring equipment.

The 24V and 125VDC options are particularly useful in the Industrial environment, where it is common for facilities to operate on 24VDC or 125VDC power. The 125VDC options are mainly used in power utilities, such as electrical substations, electrical generating plants, etc. The 24VDC applications are mainly in the Industrial environment, such as factory floor, HVAC equipment, military equipment, etc. The 5VDC options are mainly used for military or Industrial factory floor applications.

B4.0 6K16V'S -48V, 24, 125 OR 5VDC INSTALLATION

This section describes the proper connection of the -48VDC leads (or 24VDC/125VDC/5VDC leads) to the DC power terminal block on the Magnum 6K16V Switch. The DC terminal block on the Magnum 6K16V Managed Switch is located on the left front of the unit and is equipped with three (3) screw-down lead posts. The power terminals are identified as positive (+) and negative (-), and they are floating inside the unit so that either may be grounded by the user if desired. The chassis is “earth” or ground (GND).

The connection procedure is straightforward. Simply insert the DC leads to the Switch’s power terminals, positive (+) and negative (-) screws. The use of Ground (GND) is optional; it connects to the Switch chassis. Ensure that each lead is securely tightened.

NOTE: Always use a voltmeter to measure the voltage of the incoming power supply and figure out the +ve potential lead or -ve potential lead. The more +ve potential lead will connect to the post labeled “+ve” and the rest to the “-ve”. The GND can be

hooked up at the last.

When power is applied, the green PWR LED will illuminate.

Note: The GND should be hooked up first. The 6K16V unit has a floating ground, so the user may elect to Ground either + or = terminal to suit the customer's use.

Before connecting hot lines to the Terminal Block of -48VDC, 24VDC or 125VDC, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more "+ve potential". The more "+ve" voltage lead from 48V or -48V supply must be connected to the post labeled "+".

An ON-OFF manual switch is optional for DC power. This can be used to cut off power connections and as a RESET for the Magnum 6K16V Switch.

B4.1 UL Requirements for DC-powered units

1. *Minimum 18AWG cable for connection to a Centralized DC power source.*
2. *Minimum 14AWG cable for connection to a earthing wiring.*
3. *Use only with Listed 10 A circuit breaker provided in building installation.*
4. *"Complies with FDA radiation performance standards, 21 CFR subchapter J." or equivalent.*
5. *Fastening torque of the lugs on the terminal block: 9 inch-pound max.*
6. *Centralized DC Power Source cable securement, use at least four cable ties to secure the cable to the rack at least 4 inches apart, with the first one located within 6 inches of the terminal block.*

B5.0 OPERATION

Operation of Magnum 6K16V Switches with the optional -48VDC, 24VDC and 125VDC power supply is identical to that of the standard AC-powered models.

B6.0 ORDERING INFORMATION

To order the optional -48VDC power supply factory installed, add a suffix of "-48VDC" after the product's standard model # Example: **Magnum 6K16VR-48VDC**.

Similarly to order the optional 24VDC or 125VDC industrial specific power supply factory installed, add a suffix of "24VDC" or "125VDC" after the product's standard model #. Example: Magnum 6K16V-24VDC, Magnum 6K16V-125VDC.

B7.0 TROUBLESHOOTING

Please refer to Section 6.0 for troubleshooting

APPENDIX C: Internal DC Dual-Source Power Option**C1.0 SPECIFICATIONS - FOR MAGNUM 6K16V FIBER SWITCH****Power Supply (Internal, -48VDC Dual-Source, model # Dual-Src-48V)**

DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"

GND: Terminal for "earth" or ground wire connection to the hub chassis

Input: Two separate sources, each at 36 - 70 VDC

Power Supply (Internal, 24VDC Dual-Source, model # Dual-Src-24V)

DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"

GND: Terminal for "earth" or ground wire connection to the hub chassis

Input: Two separate sources, each at 20 - 36 VDC

Power Supply (Internal, 125VDC Dual-Source, model # Dual-Src-125V)

DC Power Connector: First Source: "A+", "A-", 2nd Source "B-", "B+"

GND: Terminal for "earth" or ground wire connection to the hub chassis

Input: Two separate sources, each at 115 - 150 VDC

With the exception of the dual DC input power connections and the power supply, all specifications and configuration options for the Magnum 6K16V -48VDC, 24VDC and 125VDC models with this Dual-Source option are identical to those listed in the *Magnum 6K16V Fiber Switches Installation and User Guide*, including Appendix B "Internal DC Power Supply Option"

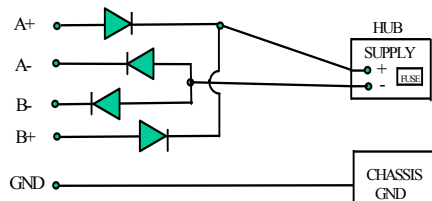
C2.0 MAGNUM 6K16V, with -48VDC, 24VDC and 125VDC Dual-Source option

The 6K16V-Switch models with the internal -48VDC, 24VDC and 125VDC Dual-Source power supply are designed for installations where a battery plant is the power source, and where two separate power sources are utilized in order to increase operational uptime and to simplify maintenance.

The functionality of the Magnum 6K16V Switch -48VDC, 24VDC and 125VDC Dual-Source Option units is identical to the standard AC-powered models. Refer to the main sections of this *Installation and User Guide* for a detailed description of the Magnum 6K16V Switches.

C3.0 DUAL-SOURCE OPTION, THEORY OF OPERATION

The Dual-Source DC power option is designed using diodes inside of the chassis on each DC power input line. A diode is placed in each of the four input lines (behind the four external power connection terminals) so that power from an external source can only flow into the unit. This allows the unit to operate whenever DC power is correctly applied to either or both of the two inputs



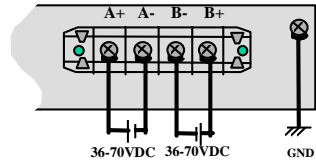
C4.0 FEATURES AND BENEFITS OF THE DUAL-SOURCE DESIGN

- The Switch unit can receive power from either input, “A” or “B”. The hub will normally draw its power from the DC source with the highest voltage at a given time.
- The Switch unit will not allow power to flow from a higher voltage input to a lower voltage input, i.e. the two DC power sources are not mixed together by the hub.
- When one correct DC input is present, the Switch will receive power if the other DC input is absent, or even if it is connected with reverse polarity or shorted or grounded.
- Reverse polarity connections, if they should accidentally occur on either input, will not damage the Switch or power supply internally (nor will it blow the fuse in the internal power supply) because of the blocking action of the diodes. This is true even if one input connection is reversed while the Switch is operating from the other source.
- The Switch will not receive power (and will not work) when both inputs are simultaneously absent or are both incorrectly connected.

C5.0 INSTALLATION

This section describes the proper connection of the -48VDC, 24VDC and 125VDC dual source leads to the -48VDC, 24VDC & 125VDC power terminal block on the Magnum 6Ks Switch (shown in Figure)

The -48VDC terminal block on the Magnum 6K16V Switch, as shown in Fig C5.0 is located on the right rear of the unit and is equipped with five (5) screw-down lead posts. If it is the reverse model it is located on the left rear. The primary terminals are identified as positive (A+), negative (A-), and the secondary power terminals as negative (B-), positive (B+).



positive(B+). The chassis “earth” or ground (GND) is a threaded post with a #6 nut. The Dual Source terminal block for the 24VDC and 125VDC are similar.

Figure C5.0: -48VDC Dual-Source, wiring connections to the External Terminal Block on a Magnum 48VDC with Dual-Source option

Note: The GND should be hooked up first. The 6K16V unit has a floating ground, so the user may elect to Ground either + or = terminal to suit the customer’s use.

Before connecting hot lines to the Terminal Block of -48VDC, 24VDC or 125VDC, always use a digital voltmeter to measure the output voltage of the power supply and determine the lead which is more “+ve potential”. The more “+ve” voltage lead from 48V or -48V supply must be connected to the post labeled “+”.

The connection procedure is straightforward. Simply connect the DC leads to the Switch’s power terminals, positive (+) and negative (-) screws. The use of Ground (GND) is optional; it connects to the Switch chassis. Ensure that each lead is securely tightened.

The 24VDC & 125VDC terminal block on Magnum 6K16V’s is similar to that described in the -48VDC information above.

C5.1 UL Requirements

The following must be adhered to in order to conform to UL requirements:

1. *Minimum 18 AWG cable for connection to a Centralized DC power source.*
2. *Minimum 14 AWG cable for connection to earthing wiring.*
3. *Use only with Listed 10 A circuit breaker provided in building installation.*
4. *“Complies with FDA radiation performance standards, 21 CFR subchapter J.” or equivalent.*
5. *Fastening torque of the lugs on the terminal block: 9 inch pound max.*
6. *Centralized DC Power Source cable securement, use at least four cable ties to secure the cable to the rack at least 4 inches apart with the first one located within 6 inches of the terminal block.*

C6.0 ORDERING INFORMATION

To order the optional Dual-Source -48VDC power supply factory installed, order “Dual-Src48V” as a separate line item following the product model.

Example: **Magnum 6K16VR-48VDC**

Dual-Src-48V for the regular DS model with no ON-OFF switch
or **Dual-Src48V-SWITCH** with the ON-OFF manual switch.

Similarly, order the “Dual –source 24VDC” or “Dual-source 125VDC” as a separate line item following the product model.

Example: **Magnum 6K16VR-24VDC** or **Magnum 6K16VR-125VDC**

Dual-Src24V for regular models with no ON-OFF switch

Or **Dual-Src125V-Switch** for models with the ON-OFF switch

C7.0 OPERATION

Operation of the Dual-Source Magnum 6Ks-48VDC, 24VDC and 125VDC Switch models are identical to that of the standard models.

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