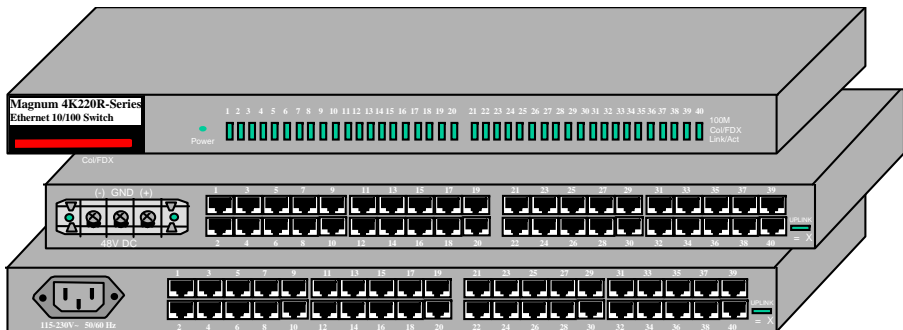




GarrettCom™

Ethernet at Its Best™

Magnum 4K-Series 4K Switches



Installation and User Guide

Magnum™ 4K-Series

4K220 Switches

Installation and User Guide

Part #: 84-000094 (Rev D)

Trademarks

Ethernet is a trademark of Xerox Corporation

NEBS is a trademark of Telcordia Technologies

UL is a registered trademark of Underwriters Laboratories

GarrettCom, Magnum and **Personal Switch** are trademarks and **Personal Hub** is a registered trademark of GarrettCom, Inc.

Important: The Magnum 4K220 Switches contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void. If problems are experienced with the Magnum 4K Switches, consult Section 6, Troubleshooting, of this User Guide.

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Federal Communications Commission

Radio Frequency Interference Statement

This equipment generates, uses and can radiate frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

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REVISIONS

Rev D 10/04: edited minor update

Rev D 04/02: Updated Rack-mounting and Appendix B & C with 24VDC and 125VDC Power Supply option

Rev C 05/01: Modify for 4K220CR specifications

REV B 04/01 : Change the company name to GarrettCom, Inc. (Formerly it was Garrett Communications). There are no changes to the content of the material at this time.

Rev A 03/00 : This revision is the initial release of the 4K Switch user manual.

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.

4K-Series Switches, 100 & 10Mbps, 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 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

Fan-Outs, 10Mb series

2, 4 and 8 Port Models

Transceivers, 10Mb and 100Mb series 10Mb Mini-Transceivers and Coax Models, All Types

Oct, 04

1.0 SPECIFICATIONS

1.1 Technical Specifications

Performance

Aggregate Filtering Rate: 3M pps within each 20 port bank (all ports 100Mbps speed), 298K pps between port banks, 6M pps for all 40 ports (all ports are wire speed)

Aggregate Forwarding Rate:(for Magnum 4K-Series Fast Ethernet ports) (all ports are wire speed) 14.4M frames per second, 40-port units

Data Rate: 10 Mbps and 100Mbps

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

Packet buffer size : 2 MB dynamic

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

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

PDV: 50BT

Network Standards

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

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

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 100Mb 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)

Connectors for copper wiring

Twisted Pair at 10/100Mb: RJ-45 shielded, female, front mounted
(for Magnum 4K-Series Fast Ethernet copper ports, use Cat 5 cable)

Manual switch-selections and jumpers

Fiber default: Full-duplex (Manual DIP switch settings inside of the chassis can select each of fiber ports to HDX mode. DIP switch SW4 controls fiber port # 2, whereas DIP switch SW6 controls fiber port #4. Down position will sets half-duplex, up position (default) sets full-duplex).

Copper default: Auto-negotiation

LEDs: Per Port

LK/Act: Steady ON for Link with no traffic, blinking indicates port is transmitting and receiving

FDX/Col: ON = Full-Duplex Mode

BLINKING = Half-Duplex Collision

100/10: ON = 100Mbps speed

OFF = 10 Mbps

Operating Environment

Ambient Temperature: 32° to 120° F (0° to 50°C)
Storage Temperature: -40°to 160°F (-40°to 70°C)
Ambient Relative Humidity: 5% to 95% (non-condensing)
Altitude: -200 to 13000ft (-60 to 4000m)
Conformal coating option: Request quote

Packaging

Enclosure: Rugged High strength metal. Suitable for stand-alone or rack-mounting
Dimensions: 1.75 in H x 17.0 in W x 9.0 in D
4.45cm H x 43.2cm W x 22.9cm D
Weight: 7.1 lb. (3.2 Kg) rack-mount models
Cooling method: Fan cooled, @ 7 cfm

Power Supply (Internal)

AC Power Connector: IEC-type, male recessed at rear of chassis, with adjacent manual ON-OFF switch (on AC models only)
Input Voltage: 110 to 240 VAC (auto-ranging)
Input Frequency: 47 to 63 Hz (auto-ranging)
Power Consumption: 28 watts typical
35 watts max
Power Supply Rating: 3Amps at 5VDC

DC Power Supply (Options)

-48VDC Power Input Voltage : 36 to 72 VDC (auto ranging)
24VDC Power Input Voltage : 20 to 40VDC
125VDC Power Input Voltage : 120 to 160VDC
Std. Terminal Block : “ -, GND, + ”
Power Consumption: same as for AC models, see above

For Dual Source and Redundant DC for -48VDC, 24VDC Power & 125VDC supply options (Optional), see Appendices.

Agency Approvals

UL listed (UL1950), cUL, CE
Emissions meet FCC Part 15 Class A

Warranty

Three years, return to factory Made in USA

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 4K220CR Switch
- 1 AC Power Cord (U.S. and other 115 VAC only)
- 1 Set of metal “Ears” for standard 19” rack mounting
- 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 4K220CR Switches

Magnum 4K220CR Switches boost the performance of large Ethernet LANs, with economical solution per switched port. The Magnum 4K220's provide the switching speed and the reliability to support multiple workgroups, each with its own switched 100Mbps or 10Mbps domain, for increased network performance.

Designed specifically for the vertical rack space environment, the Magnum 4K220CR used in departments with multiple workgroups, in remote offices and in network traffic centers or multi-system power users, the Magnum 4K220CR switches are easy to install and use. Addresses of attached nodes are automatically learned and maintained, adapting the switching services to network changes and expansions. Front-mounted LEDs provide status information on each port. The Magnum 4K-Series Switches provide high performance plug-and-play operation in convenient rack-mount packages.

The reverse port enclosure of Magnum 4K220CR switches are designed to provide ease of maintainability to the larger network. The 40-port density in a 1U rack mount "reverse" package is obtained by dedicating the front of the unit to the LED indicators, and the rear side of the unit to wiring and power supply connection.

The Magnum 4K220CR switches are non-blocking on all ports and include 2MB dynamic packet buffers and a 4K-node address table for advanced performance as well as to support large networks. The Magnum 4K-Series Switches, with store-and-forward switching, filter all faulty packets to minimize traffic congestion.

The Magnum 4K220CR switches comes along in a rugged metal enclosure with an auto-ranging power supply for operation with standard AC power worldwide.

2.2.1 Magnum 4K220 Switch chassis

Magnum 4K220 Switches come with a 40-switched RJ-45 ports enclosed in a rack-mountable chassis and ready to install in any of the ETSI (19") and TELCO (23") environments by the available brackets.

The LED status indicators and the manual switches are located on the front panel of Magnum 4K220 Switches. There are Full-duplex/Collision (FDX/COL), Link/Activity (LINK/ACT) and (100/10) LED indicators for each 10Mbps and 100Mbps domain, for visual indication of the operating status of each domain. The IEC standard AC power connector (and a manual ON - OFF power switch) is located at the

rear. Fan-driven cooling air flows left to right.

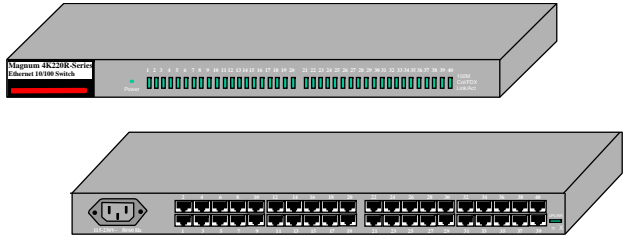
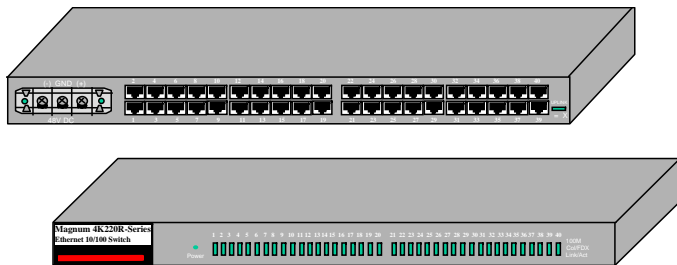


Fig. 2.2.1: Magnum 4K220CR “Reverse” model, front LEDs and connections in Rear , AC power supply version

2.2.2: Magnum 4K220CR “Reverse” model, front LEDs and connections in Rear , -48VDC optional power supply version



The Magnum 4K220CR-48VDC has the LEDs on the front panel, and all the connecting ports and power feeds are in the back. This is convenient for rack-mounting where cabling is accessed from the rear of the rack while the operating status LEDs are monitored from the front. Typically such arrangements are found in telco rack installations.

The Magnum 4K220CR-48VDC is a dual-speed 10/100Mbps switch. The switching capability allow the Magnum 4K220CR to support multiple workgroups smoothly, each with its own switched 100Mbps or 10Mbps domain.

The 4K220CR may be equipped with an optional internal -48VDC power supply (See Appendix A). There is an additional option of a dual-source -48V input (See Appendix B). The DC power feed options and the high quality and versatility make the Magnum 4K220CR a good high-availability choice for network traffic center

applications telcos, ISPs, broadcast equipment, medical, brokerage firm and financial facilities.

2.2.3 Up-link port #39 for Cascading

The 4K220CR unit has an Up-link switch, located next to the port# (39). The thumb-operated slide switch enables the port's RJ-45 cable to either connect to a user station or to be cascaded to another hub, when in the cross-over position. (See Section 4.4 for more details about Up-link). Like all 4K220C ports, Port # 39 is a dual-speed switched port which will sense the speed of the connected device. Use port # 39 in x-position on one 4K220CR and port 1 (or any port) on the second, i.e., use only one crossover port for a cascaded connection.

When the Up-link port is used to cascade two 4K220C together, the auto-sensing feature will cause the connecting up-link to operate at 100Mb FDX speed.

2.2.4 4K220C, 10/100 F/H dual-speed switched ports, RJ-45 (copper only)

The Magnum 4K220CR has 40 switched RJ-45 ports that are dual speed 10/100Mbps and Auto-negotiating. The 10/100Mb switched ports are independently N-way auto-negotiating for operation at 10 or 100Mb speed in full- or half-duplex mode (as a default setting). They independently move to half-duplex mode at 10 Mb or at 100Mb speed if the device at the other end of the twisted pair cable is half-duplex or is not an auto-negotiating device.

There are three LED's for each port. The LK/Act (Link/Activity) steady ON indicates Link with no traffic, and blinking indicates the port is receiving and transmitting. The Speed LED indicates operation at 100Mb speed when ON and at 10 Mb speed when OFF (when auto-negotiation is enabled). The Fdx/Col LED is ON to indicate full-duplex operation and OFF to indicate half-duplex mode and collisions. A twisted pair cable must be connected into each RJ-45 10/100Mb port and a proper Link (LK lit) must be made with the device at the other end of the cable in order for the LEDs to provide valid indications of operating conditions.

2.2.5 Frame Buffering and Latency

The Magnum 4K220CR is a store-and-forward switch. 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 to 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.

To minimize the possibility of dropping frames on congested ports, each Magnum 4K220 Switch dynamically allocates buffer space from a 1MB memory pool, ensuring that heavily used ports receive very large buffer space for packet storage. (Many other switches have their packet buffer storage space divided evenly across all ports, resulting in a small, fixed number of packets to be stored per port. When the port buffer fills up, dropped packets may result.) This dynamic buffer allocation provides the capability for the maximum resources of the Magnum 4K220 unit to be applied to all traffic loads, even when the traffic activity is unbalanced across the ports. Since the traffic on an operating network is constantly varying in packet density per port and in aggregate density, the Magnum 4K220 Switches are constantly adapting internally to provide maximum network performance with the least dropped packets.

When the 4K220 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. See Section 4.6 for additional details.

Another feature implemented in Magnum 4K220 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.

The latency (the time the frame spends in the Switch before it is sent along or forwarded to its destination) of the 4K220 Switches varies with the port-speed types, and the length of the frame is a variable here as it is with all store-and-forward switches. The 4K220 Switch's latency is 5 microseconds plus the packet time. See Section 1.1, Specifications.

2.3 Features and Benefits

- **100Mb switching services for large, high performance Ethernet LANs**

Magnum 4K220 Switches provide Fast Ethernet switching on all ports. They perform high speed filter/forward operations on the traffic, giving each port's segment a full 100Mb (or 10 Mb) of bandwidth.

- **RJ-45 (copper) ports with N-way auto-negotiation**

RJ-45 ports provide twisted pair segment connections with N-way auto-negotiation and switching capability per port.

- **Full-duplex or half-duplex operation, auto-sensing**

All fiber and RJ-45 (copper) ports are capable of half- or full-duplex, individually selected. All RJ-45 ports support 10/100 auto-negotiation.

- **Reverse (ports in rear) rack mounting**

Magnum 4K220 Switches are in a "reverse" package with LEDs in front and all wiring and cables in the rear.

- **Plug-and-Play installation for high performance switching**

Magnum 4K220 Switches are self-learning for node addresses. They can be placed into operation without complex set-up procedures, even in large networks. They operate transparent to system software.

- **World-wide AC power supply, DC optional**

An internal auto-ranging AC power supply allows any Magnum 4K220 Switches to be used throughout the world. (A special -48VDC power supply is optional, see Appendices B and C).

- **Non-blocking performance supports multiple workgroups**

The 40 ports switching capability of Magnum 4K220s allows them to support multiple workgroups smoothly, with non-blocking performance across all segments under any traffic conditions.

- **Provide economical solution for larger network and ready to use in ETSI and Telco environments**

The economical Magnum 4K220's are designed specifically for easy to use and provide reliability to ETSI and Telco environments.

2.4 Applications

Magnum 4K220 Switches offer high performance flexibility, and are easily used in a variety of applications including client/server computing, performance upgrades of departmental networks, and collapsed backbone applications. The Dual-Speed characteristic of the 4K220 Switches enables them to inter-connect a series of subnets (one subnet per 4K-Series Switch port) in a LAN traffic center. The subnet connections may be 100Mbps or 10 Mbps speed and full-or half-duplex mode. The 40-ports non-blocking switching capability of Magnum 4K220's support larger networks with multiple workgroups.

Example1: In a setup for a typical small office, a central Switch is needed to provide for a 40-segment 100Mb Fast Ethernet LAN with switched copper support for 3 high speed local servers for different departments, and with 15 segmented users and three printers. In addition, the router and extra ports are for future expansion.

The Magnum 4K220 Switch fits nicely in this environment, and offers future backbone expansion. The 40 switched copper ports are provided by a Magnum 4K220. Should the number of servers expand, more than one server can be accessed at full speed from any switched 4K220 port by any of the users simultaneously.

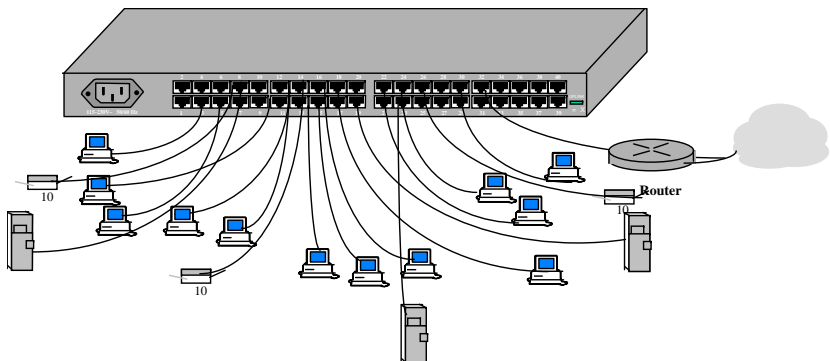


Fig 2.4c: Magnum 4K220 provides a 10/100Mb Switch with non-blocking performance for a small office

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.
- 6.) If the intra-building wiring (cabling) is involved with this product, then it is recommended to have shielded cable and the shield is grounded at both ends.

Installation: This section describes installation of the Magnum 4K-Series Switches, as well as connection of the various Ethernet media types.

3.1 Locating Magnum 4K220 Switches

The location of a Magnum 4K-Series Switch is dependent on the physical layout of the network. Typically the Switch is placed in a central wiring location where groups of network devices need to be connected in order to communicate with each other. These Switches are typically rack mounted in a wiring closet (see Section 3.3.2 below), but they have rubber feet and can also be installed on a shelf or table top.

Locate an AC receptacle that is within six feet (2 meters) of the intended Magnum 4K-Series site. The rugged metal case of the Magnum 4K-Series 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 the small fan on the left side, while the unit is in operation. See figure below.

Figure 3.1: Location of Magnum 4K220's cooling fan exhaust



3.2 Connecting Ethernet Media

The Magnum 4K220 Switches are specifically designed to support twisted pair Ethernet media. The media types supported along with the corresponding IEEE 802.3 and 802.3u standards are as follows:

<u>IEEE Standard</u>	<u>Media Type</u>	<u>Max. Distance</u>	<u>Port Module</u>
Copper:			
10BASE-T & 100BASE-TX	twisted pair	100m (328 ft)	RJ45

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

The RJ-45 ports of the Magnum 4K-Series 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.

3.3 Powering the Magnum 4K220CR Switch



Figure 3.5: Magnum 4K220 AC power connector

Magnum 4K-Series 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 AC power ON-OFF switch is adjacent. A six-foot 115 VAC 60 Hz standard power cord is supplied with each unit shipped within North America.

For DC power options, see Appendices.

3.4 Rack-mounting

Installation of a Magnum 4K220 Switch in a 19" rack or a 23" rack is a simple procedure. The units are 1U (1.75") high. When properly installed, the front-mounted LED status indicators should be in plain view and easy to read. Rack-mount installation requires special rack-mounted



brackets and screws (included with each 4K220 unit). The brackets attach to the front sides of the Switch, and then fastened into a standard 19" rack or 23" rack.

The 23" brackets and ETSI brackets are also available (optional) for Rack-mounting purpose with Magnum 4K Series Switches. The 23" brackets are more popular in TELCO Industry and consider as a standard for Rack-mounting purpose. The 23" brackets are mainly being used for Huge rack-mounting frame to provide more secure and stability to the unit in the TELCO industry.

The ETSI (European standard) brackets are moreover looks similar to the 23"

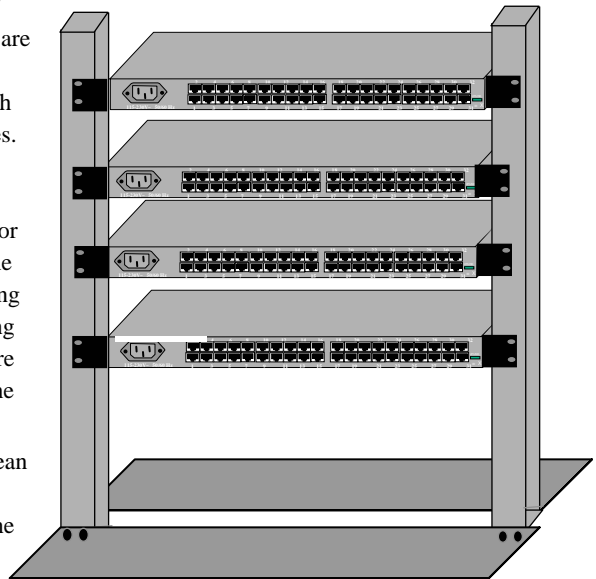


Fig 3.3 Multiple Magnum 4K220 units rack-mounted in a 23" Rack-mount frame

brackets and mostly used in the ETSI standard industry.

The optional 23" brackets and the ETSI brackets come in a package along with the necessary screws for the convenient to the customer

4.0 OPERATION

This chapter describes the functions and operation of the 4K-Series.

4.1 Switching Functionality

Magnum 4K-Series units provide switched connectivity at Ethernet wire-speed among all of its ports simultaneously. They support 10/100Mbps for copper media and 100Mb for fiber ports to maximize bandwidth utilization and network performance. All ports can communicate to all other ports in a Magnum 4K-Series, but local segment traffic on a port will not consume any of the bandwidth on any other port.

Magnum 4K-Series units are plug-and-play devices. There is no software configuring to be done at installation or for maintenance. The only hardware configuration settings are user options for UP-LINK on RJ-45 port. 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 processing 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) is forwarded to all ports.

The Magnum 4K-Series 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 40-port Magnum 4K-Series units have address table capacity of 4K node addresses, suitable for use in large networks. They are self-learning, so that as nodes are added or removed or moved from one port / segment to another, the 4K220 Switch automatically keeps up with node locations.

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

4.2 Status LEDs

For Magnum 4K220 models :

- PWR** : Power LED, ON when external power is applied to the unit.
- Link/Act** : Steady ON for link with no traffic, blinking indicates port is transmitting and receiving.
- FDX/Col** : Full / Half duplex LED, steady ON when the port is running full duplex, blinking for collisions
- 100/10** : Speed LED, ON when the speed is 100Mbps , OFF when the speed is 10 Mbps

4.3 Up-link Port, for RJ-45 Port #39 (only)

Magnum 4K220's each have one Up-link port, port # 39, with a thumb operated slide switch for regular (=) or crossover (X) connections. The Up-link port allows non-node (switch-to-repeater, switch-to-switch, etc.) connections without a special cross-over cable. It works the same for 10Mb or 100Mb connections.

Use port #39 in the = position (or ports 1 thru 40) for straight-through twisted pair cabling from the 4K220 switched port to a user device. Use port #39 in the "X" port for cross-over or up-link segment connections to a repeater or hub or switch. Verify proper port connection by noting the port's LINK/ACT status, which is illuminated when a proper link is made, and is blinking when there is activity.

4.4 Auto-negotiation for RJ-45 (copper) ports

The 4K220CR Switch's RJ-45 copper ports are N-way auto-negotiation. There are 4 different speed and F/H modes selection 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 4K220-Switch'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 . . .

-- when the second of the two connected devices is powered up*, i.e., when LINK is established for a port, or

-- when 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 4K-Series switched ports operating at 100Mb half-duplex, the bit time delay is 50BT.

4.5 Auto-negotiation, full-duplex mode

Full-duplex Ethernet provides separate Transmit and Receive data paths, enabling simultaneous bi-directional collision-free data movements on a port. The network topology must be a “star” type, not a “bus” type. With full-duplex mode, the cable distance is only limited by the physical layer line driver and cable attenuation. There are no collision-domain restrictions or limitations.

The Magnum 4K-Series Switches perform half- or full-duplex mode auto-negotiation independently on all switched ports. If the device or node on the other end of a port’s attached cable supports F/H mode, auto-negotiation or is set to operate as full-duplex, the Magnum 4K220 Switch will negotiate to run full-duplex. If the attached device or node doesn’t support F/H mode, auto-negotiation (for example, if it is a 10 Mb repeater or a standard 100Mb hub), the 4K220-Switch’s RJ-45 ports will default to operate at half-duplex.

4.6 Flow-control, IEEE 802.3x standard

Magnum 4K- Series 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 speed difference makes the 10Mb port 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 4K-Series 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 switched 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 indicate 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 4K220-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.

5.0 TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of Magnum 4K220 Series Switches 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 4K220 Series Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

5.1 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 4K220 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 4K220 product, it is recommended that the problem device is 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 4K220 Series Switches and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 4K220 unit or if unknown, contact GarrettCom, Inc. by fax, phone or email (*support@garrettcom.com*) for assistance.

5.2 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.

5.3 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.

5.4 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 Option

B1.0 SPECIFICATIONS - FOR MAGNUM 4K-SERIES SWITCHES

Power Supply (Internal -48VDC Option)

DC Power Connector: 3 terminals: “-“, “GND”, “+”

Input Voltage: 36 - 70 VDC (auto-ranging)

Power Consumption: Model 4K24: 28 watt typical, 35 watts max.

Power Supply (Internal 24 VDC Option) Industrial Application

DC Power Connector: 3 terminals: “-“, “GND”, “+”

Input Voltage: 20 - 40 VDC (auto-ranging)

Power Consumption: Model 4K24: 28 watt typical, 35 watts max.

Power Supply (Internal 125 VDC Option) Industrial Application

DC Power Connector: 3 terminals: “-“, “GND”, “+”

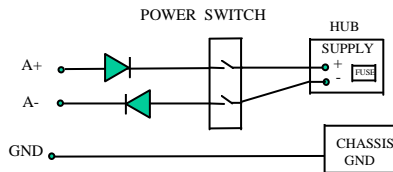
Input Voltage: 120 - 160 VDC (auto-ranging)

Power Consumption: Model 4K24: 28 watt typical, 35 watts max.

With the exception of the power supply, all specifications and functions of Magnum 4K-Series-48VDC, 24VDC and 125VDC models are identical to those listed in the main manual.

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

The -48VDC, 24VDC & 125VDC power option 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 effect the Switch, nor its power supply internally, 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

Magnum 4K-Series Fiber Switches are easily installed in a variety of applications where -48VDC, 24VDC & 125VDC power is used as the primary power source. The -48VDC, 24VDC & 125VDC power configuration provides an Ethernet

networking solution utilizing a special power supply in hubs with a proven track record.

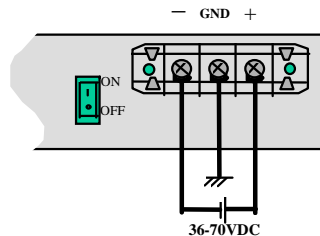
The -48VDC solution is particularly useful in the telecommunication industry, where it is common for facilities to operate on -48VDC power. Such companies include regular and wireless telephone service providers, Internet Service Providers (ISPs) and other communication companies. In addition, many high 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 24VDC & 125VDC solution are particularly useful in the Industrial environment, where it is common facilities to operate on 24VDC & 125VDC power. The 125VDC solution is mainly used in Utilities Industries, such as Electric substation, Electrical generating plant etc. Whereas 24VDC application is mainly in the Industrial environment, such as chemical plants, paper mill, stone quarrying plant, wastewater treatment Plant etc.

B4.0 INSTALLATION

This section describes the installation of the -48 VDC, 24VDC & 125VDC power source leads to the -48 VDC, 24VDC & 125VDC power terminal block on the Magnum 4Ks. (see figure below).

Figure B4.1: -48VDC Terminal Block on Magnum 4Ks-48VDC



The -48VDC terminal block on the Magnum Ks is located on the rear of the unit and

is equipped with three (3) screw-down lead posts and it is similar for 24VDC and 125VDC Magnum 4Ks too. The leads are identified as negative (-), positive (+), and chassis ground (GND). The actual connection procedure is very straightforward.

Simply connect the leads to the Magnum unit, beginning with ground. Ensure that each lead is securely tightened.

Note: Before connecting to 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 Lead”. The more “+ve” voltage terminal lead from 48V or -48V Power supply must be connected to the post labeled “+”.

The GND can be hooked at the last.

An ON-OFF manual switch is included, located in the rear at the DC power input. This can be used in conjunction with power connections, and as a RESET for the 4K-Series Switch.

B4.1 UL Requirements

1. *Minimum 14 AWG cable for connection to a Centralized DC power source.*
2. *Fastening torque of the lugs on the terminal block: 9 inch pound max.*
3. *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 the Magnum 4Ks with the optional -48VDC, 24VDC & 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 4K220-48VDC.

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 4K220-24VDC or Magnum 4K220- 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 4K-SERIES 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 (auto-ranging)
Power Consumption: Model -4K220: 28 watt typical, 35 watts max.

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 - 40 VDC (auto-ranging)
Power Consumption: Model -4K220: 28 watt typical, 35 watts max.

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 120 - 160 VDC (auto-ranging)
Power Consumption: Model -4K220: 28 watt typical, 35 watts max.

With the exception of the dual DC input power connections and the power supply, all specifications and configuration options for the Magnum 4K220 -48VDC with this Dual-Source option are identical to those listed in the *Magnum 4K-Series Fiber Switches Installation and User Guide*, including Appendix B “Internal DC Power Supply Option”

C2.0 MAGNUM 4K-SERIES , with -48VDC, 24VDC & 125VDC Dual-Source option

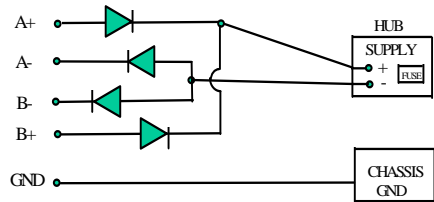
The 4K220-Switch models with the internal -48VDC, 24VDC & 125VDC Dual-Source power supply are designed for installations where a battery plant is the power source, and where two separate power sources are utilized in order to increase operational uptime and to simplify maintenance.

The functionality of the Magnum 4K-Series -48VDC, 24VDC & 125VDC Dual-Source Option units are 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 4K-Series 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

- a) 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.
- b) 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.
- c) 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.
- d) 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.
- e) 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 & 125VDC dual source leads to the -48VDC power terminal block on the Magnum 4K-Series Switch (shown in Figure)

The -48VDC terminal block on the Magnum 4K-Series 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. The primary terminals are identified as positive (A+), negative (A-), and the secondary power terminals as negative (B-), positive(B+), and the chassis “earth” or ground (GND), #6 nut.

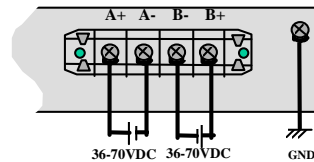


Figure C5.0: -48VDC Dual-Source, wiring connections to the External Terminal Block on a Magnum 48VDC with Dual-Source option

Note: Before connecting to 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 Lead”. The more “+ve” voltage terminal lead from 48V or -48V Power supply must be connected to the post labeled “+”.

The GND can be hooked at the last.

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 4K-Series Switch also has everything similar to -48VDC info. Described above.

C5.1 UL Requirements

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

1. *Minimum 14 AWG cable for connection to a Centralized DC power source.*
2. *Fastening torque of the lugs on the terminal block: 9 inch pound max.*
3. *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 4K220-48VDC**

Dual-Src-48V for regular dual-source model w/ ON-OFF switch or **Dual-Src48V-NOSWITCH**

Similarly to order the optional Dual-source 24VDC power supply factory installed, order "Dual-Src24V", and for Dual-source 125VDC power supply factory installed, order "Dual-Src125V" as a separate line item following the product model. Also order for Regular, or No Switch as mentioned above.

C7.0 OPERATION

Operation of the Dual-Source Magnum 4K-Series-48VDC, 24VDC & 125VDC Switch models are identical to that of the standard models.