GarrettCom®

Industrial Networking at Its Best™

Magnum 15E Fast Ethernet Media Converters

(Including SC and ST ports, full/half duplex, mm and sgl. mode, standard and Link Pass-through models)

Magnum™ 15E Media Converters

Installation and User Guide

Part #: 84-00041 Rev C

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Important: Magnum 15E Media Converters contain no user serviceable parts. Attempted service by unauthorized personnel shall render any and all warranties null and void. If problems are experienced with a Magnum 15E Media Converters, consult Section 5, 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 C 07/01 : 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 B 08/00: Changed the Power Budged calculations for Fiber Media.

Rev A 2/00 : This revision is the initial release of the 15E Media Converters user manual.

1.0 SPECIFICATIONS

1.1. Technical Specifications

Performance:

Data Rate: 100 Mb/s

Half- or Full-Duplex, auto-sensing

800ns (80 bit-times) Path Delay Value (PDV) for conversion delay

Network Standards:

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

Operating Environment:

Ambient Temperature: 32°F to 122°F (0°C to 50°C)
Storage Temperature: -20°C to 60°C
Ambient Relative Humidity: 10% to 95% (non-condensing)

Maximum Standard Fast Ethernet Segment Lengths:

100BASE-TX (twisted pair):	100 m (328 ft)
100BASE-FX Fiber optic, half-duplex: (multi-mode)	412 m (1350 ft)
100BASE-FX Fiber optic, full duplex: (multi-mode)	2.0 km (6,562 ft)
100BASE-FX Fiber optic, half-duplex: (single-mode)	412 m (1350 ft)
100BASE-FX Fiber optic, full duplex: (single-mode)	18.0^{+} km (49,215 ft)
100BASE-FX Long Reach: Fiber optic, full duplex: (single -mode)	40.0 km (132k ft)

Note: Magnum 15E Media Converters DO NOT *support full length shared Fast Ethernet segments. See Section 3.2 of this manual for media lengths and shared segment distance calculations.*

Power Supply (External):

Power Input: 95 - 125 vac at 60 Hz for "-d" Models,
100 - 240 vac at 50-60 Hz for "-i" Models which have
IEC power cable connector.

Power Consumption: 5 watts max. for the unit

Connectors:

RJ-45 Port: Modular 8-Pin female, with "cross-over" up-link switch

Multi-mode:

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

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

Single-mode:

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

Packaging:

Enclosure: High strength sheet metal.

Dimensions: 3.0 in H x 3.5 in W x 1.0 in D (7.6 cm x 8.9 cm x 2.5 cm)

Power Supply: 2.0 in x 2.0 in x 1.5 in (5.1 cm x 5.1 cm x 3.8 cm)

Weight: 9.5 oz.(275 gr); Power Supply 16 oz (455 gr)

LED Indicators for the Magnum 15E:

LED	TX port	FX port	Description
PWR			Indicates unit is receiving DC power.
LINK	TP	Fiber	Steady ON when proper link is established at both ends of the media segment, i.e., when both end's connections are properly made and when power is applied to the devices on both ends of the segment.

Except - For Link Pass-through models, see Section 4.4 for interpreting LINK LEDS

Agency Approvals:

115v 60 Hz Power Supply is UL Listed (UL 1310), CSA Certified

230v 50 Hz Power Supply is same, also TUV and GS approved

Emissions: Meets FCC Part 15 Class A, cUL, CE

Warranty: Three years, return to factory Made in USA

1.2 Ordering Information

Model Number	Description
Magnum 15E-SC-d	Twisted pair to mm fiber SC, ext. 115 vac, 60Hz power supply
Magnum 15E-SC-i	Twisted pair to mm fiber SC, ext. 230 vac, 50Hz power supply
Magnum 15E-ST-d	Twisted pair to mm fiber ST, ext. 115 vac, 60Hz power supply
Magnum 15E-ST-i	Twisted pair to mm fiber ST, ext. 230 vac, 50Hz power supply
Magnum 15E-sglm-d	Twisted pair to fiber SC, single mode, ext. 115 vac, 60 Hz PS
Magnum 15E-sglm-i	Twisted pair to fiber SC, single mode, ext. 230 vac, 50 Hz PS
Magnum 15E-smst-d	Twisted pair to fiber ST, single mode, ext. 115 vac, 60 Hz PS
Magnum 15E-smst-i	Twisted pair to fiber ST, single mode, ext. 230 vac, 50 Hz PS
Magnum 14E-SSCL-d	Twisted pair to fiber ST, single mode 40km "Long Reach", external 115vac, 60 Hz Power Supply
Magnum 15E-lpst-d	TP to mm fiber ST w/ Link Pass-through, ext.115vac, 60Hz PS
Magnum 15E-lpst-i	TP to mm fiber ST w/ Link Pass-through, ext.230vac, 50Hz PS

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

2.0 INTRODUCTION

This section describes the Magnum 15E Fast Ethernet Media Converters, including appearance, features and possible applications.

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 which 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 15E Media Converter unit

1 External Power Supply, either 115 vac 60 Hz or 230 vac 50 Hz

1	Set of two (2) metal mounting clips with screws
1	Velcro® Tape section, approximately 3 inches in length
1	User Guide (this manual) and Product Registration Card

Remove the Magnum 15E Media Converter from the shipping container. Be sure to keep the shipping container should you need to ship the unit at a later date. To validate the product warranty please complete and return the enclosed Product Registration Card to GarrettCom, Inc. within two weeks of purchase.

In the event there are items missing or damaged contact your supplier. If you need to return the unit use the original shipping container. Refer to Section 5, Troubleshooting, for specific return procedures.

2.2 Product Description

Magnum 15E Fast Ethernet Media Converters offer a convenient and graceful way to convert and transmit data among twisted pair and fiber network cabling environments. They allow the use of fiber media with full-duplex devices such as Fast Ethernet Switching Hubs (managed and unmanaged), and may sometimes be used with shared (half-duplex) Fast Ethernet segments as well. They offer a compact, cost-effective way to adapt a pre-existing Ethernet cabling configuration as network requirements change.

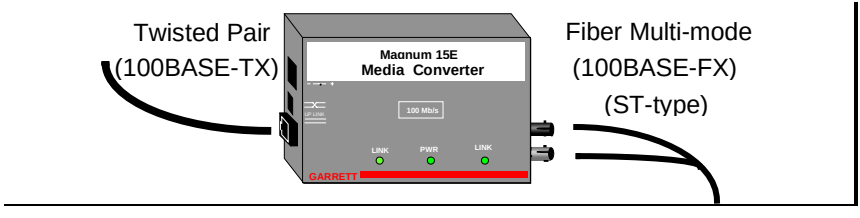
Magnum 15E Media Converters are designed for quick and easy installation even in very tight spaces. Media cables are easily attached. Magnum 15E Media Converters feature an up-link switch on the TX port to eliminate the need for a special cross-over cable when connecting the TX port to a hub or concentrator. Because of their compact size, Magnum Media Converters can be Velcro®-mounted on an office wall or the side of a desk or cabinet. The external power supply plugs into a nearby AC wall

socket or power strip. Each converter features a full set of LEDs that convey essential diagnostic and status information. See Section 4.1, LED Indicators, for specific LED function information.

Magnum 15E Media Converters are designed to provide low-temperature operation over an extended period to make them some of the most reliable in the industry. Their high-strength fabricated metal packaging shields against Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI), avoiding interference with other nearby electronic devices.

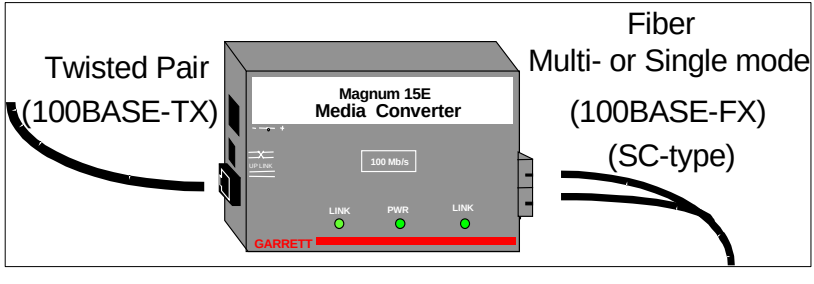
The Magnum 15E units comply with the IEEE 802.3u (100BASE-TX and 100BASE-FX) specification for 100 Mb/sec traffic via shielded (STP) or unshielded twisted pair (UTP) segments.

The Magnum 15E-ST and 15E-lpst (Link Pass-through) models are equipped with one multi-mode fiber-ST and one RJ-45 connector for connection to 100BASE-FX compliant Fast Ethernet network segments.



15Es with ST integrates 100BASE-TX and FX networks, with fiber ST connectors.

The Magnum 15E-SC and 15E-sglm (single-mode) are equipped with one fiber-SC and one RJ-45 connector for connection to 100BASE-FX compliant Fast Ethernet network segments.



15Es with SC integrate 100BASE-TX and FX networks, with fiber SC connectors.

2.3 Features and Benefits

- **Reduces Network Costs**

  Magnum 15E Media Converters offer an ideal solution to quickly and inexpensively connect Twisted-Pair TX with Fiber FX segments.

- **Full-duplex or Half-duplex transparent operation**

  15Es can be used in full-duplex fiber segments for distances up to 2Km for the multi-mode model and up to 15Km for the single mode model.

- **Low PDV for Maximum Cable Lengths in Shared Segments**

  Magnum 15E Media Converters add signal timing delays of only 80 Bit Times in a shared half-duplex segment, less than a Class II Fast Ethernet Repeater (90 to 95 BT typical), and can be used to attach fiber cables to TX ports with minimum distance loss in the overall collision domain.

- **Small, Compact, Lightweight Design**

  Featuring a compact and lightweight metal case with an external power supply, Magnum 15E Media Converters can be conveniently installed in minimal space, on horizontal or vertical surfaces.

- **Full Complement of LEDs.**

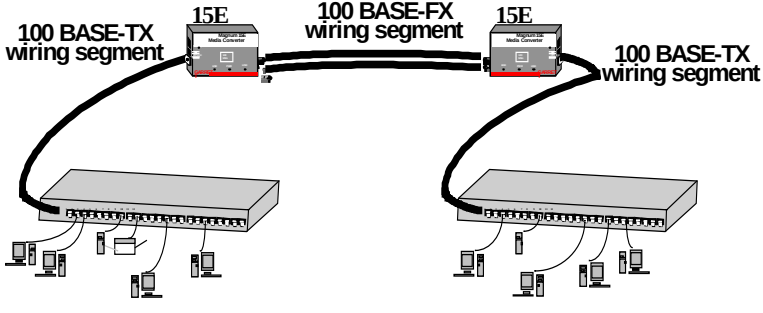
  Each 15E Media Converter is equipped with a full complement of LEDs to provide network LINK status on each port separately, and to indicate power on the unit.

- **Highly Reliable and Dependable**

  Magnum 15E Media Converters are based on a robust design and are packaged in a metal enclosures to ensure high reliability and durability.

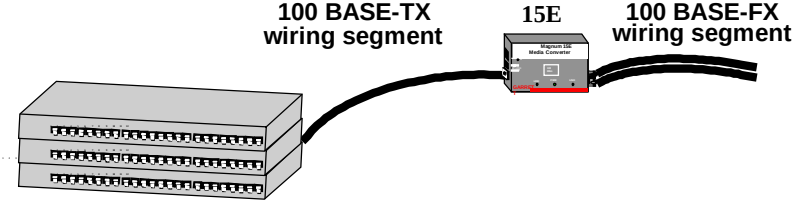
2.4 Applications

The primary function of a Magnum 15E Media Converter is to permit two different media types to coexist within the same network by allowing data to be transmitted and received between different media types. Magnum 15Es are typically used where new 100MB switching hubs with RJ-45 ports are being installed, and where full-duplex fiber segments (of up to 2Km for multi-mode or 15Km for single mode) are needed to interconnect them with other 100Mb switching hubs in distant wiring closets. Alternatively, a server with a full-duplex NIC needs to be connected via fiber to a 100Mb switching hub with RJ-45 ports. In these and similar situations, the Magnum 15E conveniently converts the twisted pair cable to fiber, allowing use of any available RJ-45 Fast Ethernet switched port with a new or existing fiber cable. See Section 3.2.1 for cable distance calculation information.



Two Magnum 15E's provide connectivity for switched 100Mb hubs via fiber.

Where shared Fast Ethernet segments are used, such as with Fast Ethernet hubs with RJ-45 ports, it may be desirable to connect one or more servers or users via fiber cable. It is necessary to calculate the PDV of the overall collision domain (see Section 3.2.2) for proper operation when the 15E is used in shared half-duplex applications.



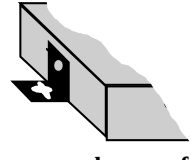
Magnum 15E provides connectivity to servers or users via fiber.

3.0 INSTALLATION

This section describes the installation of the Magnum 15E Media Converters, including location, segment distance calculation and media connection.

3.1 Locating the Media Converter Unit

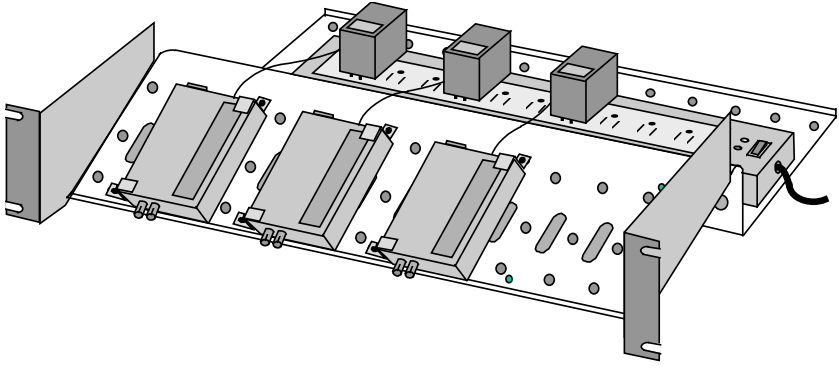
The compact and lightweight design of the Magnum 15E Media Converter allows it to be easily installed in most any location. A Velcro strip and a set of two metal clips and screws are included (either may be used) for mounting the unit on a vertical surface such as a wall or cabinet, or for securing the unit on a table-top or shelf. The installation location is dependent upon the physical layout of the Ethernet network and associated cabling. Make sure the unit is



Secure attachment of mounting clips for wall mounting

installed in a location that is easily accessible to an AC power outlet or power strip, and where convection cooling is not inhibited.

For rack-mounting of media converters, the Magnum **MC-TRAY** is available.



3.2 Calculating Segment Distances

The media distance considerations are quite different for full-duplex and for half-duplex (standard Fast Ethernet) installations. Each of these situations are covered below in a separate section.

3.2.1 Segment Distances, Full-duplex

Full-duplex ports, such as are found in switching hubs and some NICs, can receive and transmit signals simultaneously and do not experience collisions accordingly. There may be only two nodes present on a full-duplex segment. Media distance rules are not the same as for standard (half-duplex) Fast Ethernet because collision distance limitations are not a factor. Specifically, fiber segments can be up to 2Km for multi-mode and up to 15Km for single mode.

The Magnum 15E, with full-duplex operation as a standard feature, can be used in these applications. When installing the Magnum 15E in a full-duplex segment, it is important to consider the combined overall segment length of both of the attached media types. The overall segment length is calculated by adding together the segment lengths on both sides of the Magnum 15E Media Converters. The figure below illustrates how a Magnum Media Converter is used to connect a multi-mode fiber (100BASE-FX) with a twisted pair (100BASE-T) segment.

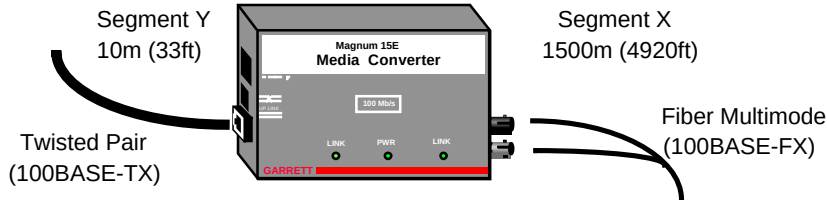
Segment length on each side of the 15E Media Converter is measured as a percentage of the maximum allowable standard media distance for the given media type. The percentages, when added together, must not exceed 100%.

Media Distance Formula for Magnum 15E, full-duplex:

X% + Y% ≤ 100%

Where **X** = The segment distance on one side of the Magnum 15E Media Converter divided by the Standard Maximum Media Distance for that media type, x 100%

Where **Y** = The segment length on the other side of the Magnum 15E Media Converter divided by the Standard Maximum Media Distance for that media cabling type, x 100%



Connectivity between 100BASE-TX and 100BASE-FX Ethernet Media.

In the example figure shown above, the length of fiber Segment X is 1500m (4920 ft). This is 75% of the maximum allowable distance for multi-mode 100BASE-FX fiber full-duplex media (2000 m) [75/2000 x 100% = 75%]. The length of twisted pair Segment Y is 10m (33 ft). This is 10% of the maximum allowable distance for

100BASE-TX full-duplex twisted-pair media (100 m) [10/100 x 100% = 10%]. The total of the two percentages (75% + 10%) is 85%, which is allowable.

> ***Note 1***: Where more than one media converter is used in one segment run, the percentages for all of the cabling lengths in the run must be added together and must not exceed 100%.

In another instance, a Magnum Media Converter is used to connect a ***single*** mode fiber (100BASE-FX) with a twisted pair (100BASE-T) segment. In this example, the length of fiber Segment X is 8500m (27,880 ft). This is 57% of the maximum allowable distance for single mode 100BASE-FX fiber full-duplex media (15,000 m) [57/15,000 x 100% = 57%]. The length of twisted pair Segment Y is 12m (40 ft).

This is 12% of the maximum allowable distance for 100BASE-TX full-duplex twisted-pair media (100 m) [12/100 x 100% = 12%]. The total of the two percentages (57% + 12%) is 69%, which is allowable.

3.2.2 Segment Distances, Half-duplex

Fast Ethernet shared bandwidth devices operate with multiple nodes in a traffic domain. When a node attempts to send a packet, it may hit another packet passing by, i.e., a collision may occur. This is normal and does not cause a problem because the Ethernet protocol provides for this situation and requires that the sender wait and try again. When installing the Magnum 15E in a half-duplex segment, it is important to consider the collision domain of the segment, including the 15E itself, repeaters and hubs present, and the lengths of both of the attached media types.

Collision Domain

A collision domain is defined in the IEEE 802.3u standard as a cluster of network devices that, regardless of topology, must be less than 512 BT (Bit Times) of signal delay (PDV or Path Delay Value) in diameter between any two nodes. Nodes in a collision domain are connected by means of a repeater or repeaters such that no bridging or switching devices are present between any two nodes in the cluster. A Magnum 15E has a PDV of about eighty Bit Times (80 BT), and this value must be included in the overall collision domain diameter PDV calculations as applicable for the placement of the 15E in the topology of the collision domain.

Collision Domain Diameter

The Collision Domain Diameter is the length of the longest path between any two devices in a single collision domain. Regardless of the actual network topology, the

Collision Domain Diameter must be less than 512 BT (Bit Times). Bit Times are related to media type as shown in Table 3.2.2a.

Table 3.2.2a: Worst case round-trip delay for Fast Ethernet media*

Media Type	Round-trip delay in Bit Time per Meter (BT/m)
Fiber Optic	1.000
Shielded TP cable	1.112
Category 5 Cable	1.112
Category 4 Cable	1.140
Category 3 Cable	1.140

*Worst case delays taken from IEEE Std 802.3u-1995, actual delays may be less for a particular cable. Contact your cable supplier for exact cable specifications.

Each shared Fast Ethernet network device also has an associated BT delay. Table 3.2.2b shows typical Fast Ethernet device components and the associated BT delay. Note that there is only one DTE pair associated with any device-to-device path.

Table 3.2.2b: Worst case round-trip delay for Fast Ethernet device components*

Component	Round-trip delay in Bit Times (BT)
2 TX DTEs	100
2 FX DTEs	100
1 FX and 1 TX DTE	100
2 T4 DTEs	138
1 T4 and 1 TX or FX DTE	127
Class I Repeater	140
Class II Repeater with any combination of TX and FX ports	92
Class II Repeater with T4 ports	67

*Worst case delays taken from IEEE Std 802.3u-1995.

To determine whether a prospective network topology adheres to the collision domain diameter specification, the following formula should be applied to the worst case

path through the network. The worst case path is the path between the two Fast Ethernet devices (DTEs) which have the longest round trip delay time.

PDV = (sum of cabling delays) + (sum of repeater & media converter delays) + (DTE pair delays) + (safety margin)

PDV is the Path Delay Value of the worst case path. For the network to adhere to IEEE 802.3u standard, this value must be less than 512 BT. The safety margin is specified in BT and may be a value between 0 and 5. This margin can be used to accommodate unexpected delays, such as an extra long patch cable. A safety margin of at least 4 BT is recommended.

"Rules-of-thumb" Collision Domain Calculations

Rules-of-thumb, while inexact, may be helpful in planning network topology. As a rule-of-thumb, a Class II Repeater has a PDV of about 90 to 95 BTs, and twisted-pair or fiber media has a PDV of about 1 BT per meter of length. The Magnum 15E has a PDV of 80 BT. Therefore, in shared Fast Ethernet applications, the 15E uses about 80 meters of equivalent cable distance to convert from TX media to fiber FX media, i.e., it consumes almost as much of the available PDV as a Class II repeater. Since a 512BT collision domain will almost always include at least one repeater and two media segments, the remaining amount of Bit Times left after allowing for a 15E and a length of fiber media indicates that the available fiber length will be much less than the 412 meters that is the known maximum for fiber. Therefore, in shared environments, Magnum 15E

Media Converters will be of benefit when they allow the use of fiber media, but not to gain distance by facilitating use of fiber media instead of twisted pair.

As a sample calculation, consider the question of what fiber cable distance (connected by a pair of Magnum 15Es on each end) can be obtained that will interconnect two 100Mb hubs where the twisted pair cables to the user nodes are 10 meters in length. The solution is :

512 = total available Bit Times in a collision domain diameter,

minus 100 BT for two DTEs on each end leaves 412 BTs,

minus 180 BT for two Class II repeaters leaves 232 BTs,

minus 20 BT for two 10-meter TP cables for hubs to users leaves 212 BTs,

minus 10 BT for two short TP cables from the hubs to 15E's leaves 202 BTs,

minus 160 BT for two Magnum 15Es leaves 42 BTs for fiber cable,

which indicates a fiber cable length of about 40 meters.

It is obvious that using twisted pair wiring to connect the hubs would enable the interconnect length to be the 100 meters maximum for twisted pair media, and this would still leave about a hundred BTs as a safety margin. In other words, use of 15Es and fiber in this case did not gain allowable maximum cable distance vs. TP cable without the 15Es.

Consider a more typical use of Magnum 15Es in a shared Fast Ethernet segment. A stack of Fast Ethernet hubs comprises the only repeater in the collision domain, and the users and servers in the local workgroup are each connected via Category 5 twisted pair cable, a maximum of 30 meters (100 ft.) in length. It is desired to connect one remote user with a fiber NIC via fiber cable, using a Magnum 15Es in the circuit. How long can the fiber cable be?

The solution is :

512 = total available Bit Times in a collision domain diameter,

minus 100 BT for two DTEs on each end leaves 412 BTs,

minus 90 BT for one Class II stackable repeater leaves 322 BTs,

minus 30 BT for one 30-meter TP cable from hub to user node leaves 292 BTs,

minus 5 BT for a short TP cable from the hub to 15E leaves 287 BTs,

minus 80 BT for one Magnum 15E leaves 207 BTs for fiber cable,

which indicates a fiber cable length of about 200 meters.

3.3 Connecting Ethernet Media

Connecting Ethernet media to the Magnum 15E Media Converter is very simple and straightforward. Using a properly terminated media segment, simply attach the cable end to the appropriate connector.

See Sections 4.2 and 4.3 for a description of the LEDs.

3.3.1 Connecting Twisted Pair (RJ-45, standard and Link Pass-through models)

The following procedure describes how to connect a 100BASE-TX twisted pair segment to the RJ-45 port on the Magnum 15E Media Converters. The procedure is the same for both unshielded and shielded twisted pair segments.

1. Using standard 100BASE-TX media, insert either end of the cable with an RJ-45 plug into the RJ-45 connector of the Magnum 15E Media Converter.
2. Connect the other end of the cable to the corresponding device.

3. Use the LINK LED (non-Link pass-through models) to ensure proper connectivity by noting that the LED will be illuminated when the units are powered and proper connections established. If the LINK LED is not illuminated, change the setting of the up-link switch (See Section 4.4 for up-link switch information.) If this does not help, ensure that the cable is connected properly at both ends and is not defective.
4. For the 15E-lpst model with the Link-Pass-through feature, the two LINK LEDs operate together, and either both LEDs are lit or neither is lit. Both of the attached cables must be operable for LINK to be indicated. Absence of LINK does not point to the problem cable segment, and the fault may be in either.

3.3.2 Connecting Fiber Optic 100BASE-FX, Type ST and SC

The following procedure applies to 100BASE-FX applications using the Magnum 15E Media Converter with ST-type (twist-lock) and SC-type (snap-in) fiber connectors.

1. Before connecting the fiber optic cable, remove the protective dust caps from the tips of the connectors on the Magnum 15E. 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 15E to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first "Transmit-to-Receive" connection.
4. Connect the Receive (RX) port (dark colored post) on the 15E to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.

5. The LINK LED corresponding to the fiber port, on the front of the product, will illuminate (for standard non-Link-Pass-through models) when a proper connection has been established at both ends (and when power is ON in the units at each end). If LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables on the product connector to remedy this situation.
6. For the Link Pass-through model 15E-lpst, connection is the same except that the LINK indication will not be present unless LINK is made for the cables on both sides.

3.3.3 Power Budget Calculations for 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, the following equations should be used:

OPB (Optical Power Budget) = P_T(min) - P_R(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 50/125μm (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

The following data has been collected from component manufacturer's (HP's and Siemens') 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
15E-MST, MSC	**100Mb FX**	Multi-mode	2 (0.4)	1300	62.5/125	-20	-31	9.0	2.5	14	5
					50/125	-23.5	-31	5.5	2.0	12	4
15E-SSC	**100Mb FX**	Single-mode	18+ (0.4)	1300	9/125	-15	-31	14	28	17.5	35
15E-SSCL Long Reach	**100Mb FX**	Single-mode	40 (0.4)	1300	9/125	-5	-34	27	54	32.5	65

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

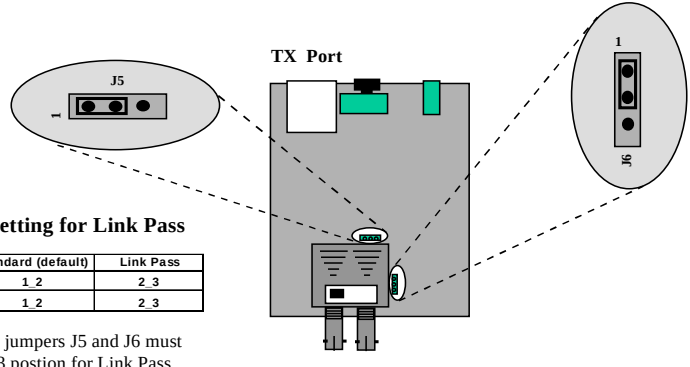
- *The 100Mb fiber segment must operate in full-duplex (FDX) mode, i.e. a switch (or equal external unit such as a FDX NIC) must be used, and*
- *The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.*
- *(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)*

3.4 Link Pass-through models

The Link Pass-through feature is normally factory-installed and tested, and available on model 15E-lpst. For information, the internal selection and configuration of the Link Pass-through feature is shown in Figure 3.4, below.

For a description of operation of the Link Pass-through feature, see Section 4.4 of this manual.

Jumper Settings for Link Pass-through (see Section 4.4 for description)



Jumper setting for Link Pass

Jumper	Standard (default)	Link Pass
J5	1_2	2_3
J6	1_2	2_3

Note : Both jumpers J5 and J6 must be set to 2_3 postion for Link Pass.

Figure 3.4 : Internal jumper settings on 15E for Link Pass-through operation

4.0 OPERATION

This section describes the operation of the Magnum 15E Media Converters including power supply requirements, up-link switch functionality, and a description of all LEDs.

4.1 Power Requirements, Power Supply Types

Magnum 15E Media Converters require 5 watts of power and are designed to be used with an external power supply. The external power supply unit supplied is one of two types; one version ("-d" models) for AC input power of 115 vac 60 Hz, and one version for 230 vac 50 Hz. The 115 vac version has a small transformer integral with a convenience power outlet plug. The 230 vac version ("-i" models) has a small transformer integral with an IEC-type power plug for a user-supplied AC power cord with a convenience power outlet plug. Both types include a lightweight DC power cord to the applicable power jack on the Media Converter unit.

4.2 Front Panel LEDs

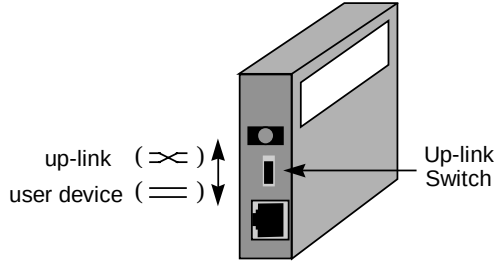
LED	Description
PWR	Illuminates GREEN to indicate the unit is receiving DC power.
LINK*	(RJ-45 port) Illuminates GREEN, to indicate proper connectivity on the 100BASE-TX network segment. LINK will turn off in the event connectivity is lost between the ends of the twisted pair segment or a loss of power occurs in the unit or remote device.
LINK*	(Fiber port) Illuminates GREEN, to indicate proper connectivity on the 100BASE-FX network segment. LINK will turn off in the event connectivity is lost between the ends of the fiber segment or a loss of power occurs in the unit or remote device.

* for “LINK Pass-Through” models, see section 4.4

4.3 Up-Link or "Cross-over" Switch (On TX port)

Magnum 15E Media Converters are equipped with an up-link slide switch to accommodate switch- or repeater-to-converter connections without a special cross-over cable. When set to the UP position (=), the Magnum 15E Media Converter is wired for normal twisted pair connection to a user node device. When set to the DOWN position (X), the Media Converter is wired with cross-over functionality for direct up-link to a network hub or concentrator.

Switch ports may be of either polarity, and this feature is very convenient with switches accordingly.



End view - Magnum 15E

4.4 LINK Pass-through feature, models 15E-lpst:

The LINK Pass-through feature is implemented in Magnum 15E's as a factory configuration option. It is factory-enabled and tested on models 15E-lpst. When enabled, it allows network devices to sense the LINK status from one end of the attached cables to the other.

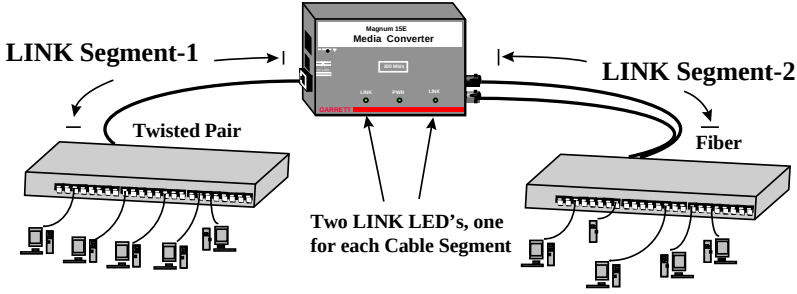
Without the LINK Pass-through option, the two cable segments shown in the first figure are treated as two separate segments, each with its own LINK status. There are two LINK LED's, one for the twisted pair status and the other for the fiber segment.

With LINK Pass-through, as shown in the second figure, the two attached cables (one TP and one fiber) are treated as one "link" segment. The Magnum 15E is transparent, and devices at both ends of the cables see through the 15E for LINK status. The 15E passes the same LINK status from one side to the other. Two LINK LED's represent end-to-end connection and are both ON (LINK ready) or both OFF

.

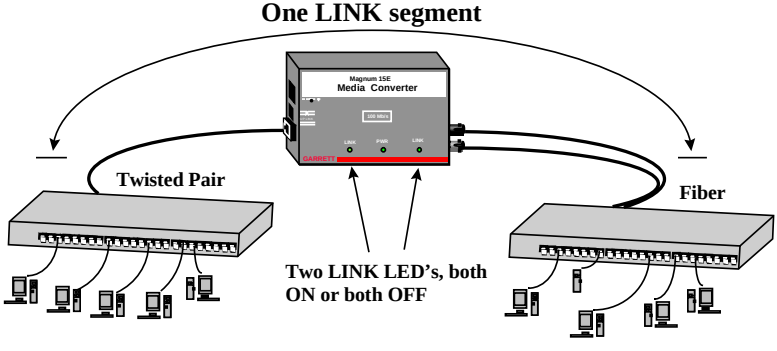
NOTE : See Section 3.4 for jumper settings for LINK Pass-through, in case there is a need to check the settings to confirm the operating configuration.

Without LINK Pass-Through (normal configuration :



Without LINK Pass-through, the 15E treats both link segments separately, wih LINK LED info for each.

With LINK Pass-through : (Model 15E-lpst, sometimes used with managed networks)



With LINK Pass-Through, the unit treats both link segments as one, with common LINK LED status. The Media Converter is transparent.

5.0 TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of Magnum 15E Media Converter is a straightforward procedure (see INSTALLATION, Section 3); 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 15E Media Converter product 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 15E-Series Media Converter 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 Magnum 15E-Series Media Converter 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 15E-Series Media Converter and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 15E-Series Media Converter 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.
47823 Westinghouse Drive
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.