MC102

Media Converters

MC102F, MC102FR, MC102FRC, MC102G, MC102T, MC102TH, MC102/P

User Manual

Standards Compliance

This equipment is certified to UL 1950; CSA 22.2 No 950; FCC Part 15 Class B; CE-89/336/EEC, 73/23/EEC.

FCC Notice

WARNING: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct for the interference at his/her own expense.

The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment.

It is suggested that the user use only shielded and grounded cables when appropriate to ensure compliance with FCC Rules.

CE Mark

The CE mark symbolizes compliance with the EMC directive of the European Community. Such marking is indicative that the specified equipment meets or exceeds the following technical standards:

- EN 55022 – Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment

- EN 50081-1 – Electromagnetic compatibility of Radio Interference Characteristics of Information Technology Equipment – Generic Emission standard Part 1: Residential commercial and light industry environment

- EN 50082-1 – Electromagnetic compatibility – Generic immunity standard Part 1: Residential, commercial and light industry environment

- EN61000-4-2 (previously IEC 1000-4-2) – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 2: Electrostatic discharge requirements

- EN61000-4-3 (previously IEC 1000-4-3) – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 3: Radiated electromagnetic field requirements

- EN61000-4-4 (previously IEC 1000-4-4) – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 4: Electrical fast transient/burst requirements

- EN61000-4-5 – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 5: Surge Immunity requirements

- EN61000-4-6 – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 6: Immunity to conducted disturbances induced by radio frequency fields

- EN61000-4-8 – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 8: Power frequency magnetic field immunity requirements

- EN61000-4-11 – Electromagnetic compatibility for industrial-process measurement and control equipment – Part 4, Section 11: Voltage dips short interruptions and voltage variations immunity requirements

- EN61000-3-2 – Harmonic standard

- EN61000-3-3 – Voltage Fluctuation and Flicker standard

- CISPR 22 – Radiated and Line-conducted Class B

- EN 60950 – ITE Safety

A 'Declaration of Conformity', in accordance with the above standards, has been made and is on file at *MRV* $^{®}$.

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MRV reserves the right to modify the equipment at any time and in any way it sees fit in order to improve it.

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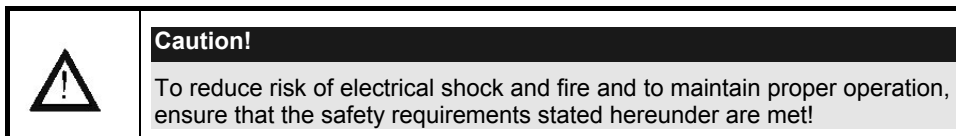| Contact Information |
| --- |
| For customer support, you can:

• Contact your local MRV representative

• E-mail us at InternationalSupport@mrv.com

• Visit our MRV Web site at http://www.mrv.com |

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About this Manual

This manual is intended for the user who wishes to install, operate, and troubleshoot any of the MC102 Media Converters.

The latest revision of the user manual can be found at:

ftp.international.mrv.com/support/tech_data

Safety Requirements

⚠	**Caution!**
	To reduce risk of electrical shock and fire and to maintain proper operation, ensure that the safety requirements stated hereunder are met!

Before Installing

Power   Ensure that *all* power to the MC102 is cut off. Specifically, disconnect the MC102 power cord from the power line (mains).

Inspection   Ensure by visual inspection that no part of the MC102 is damaged.

Before Powering On

Temperature   Operate the MC102 only at a location where the ambient temperature is in the range 0 to 40 ^{o}C (32 to 104 ^{o}F).

Humidity   Operate MC102 only at a location where the ambient humidity is non-condensing and less than 85 %.

Cooling Air   Ensure that the air-flow around the MC102 and through the air vents is not obstructed. In addition, ensure that there is a clearance of at least 25 mm (1 inch) between the air vents and nearby objects.

Line Power   Ensure that the line (mains) power is as specified on the label on the MC102.

Power Cord   The AC power cord of the OptiSwitch must have either of the following specifications:

The power cord to be used with a 115 Volt AC configurationmust be a minimum type SJT (SVT) 18/3, rated 250 Volts AC, 10 Amps with a maximum length of 15 feet. One end is terminated in an IEC 320 attachment plug, the other in a NEMA 5-15P plug.

The power cord to be used with a 230 Volt AC configuration must be a minimum type SJT (SVT) 18/3, rated 250 Volts AC, 10 Amps with a maximum length of 15 feet. One end is terminated in an IEC 320 attachment plug. The other end is terminated as required by/ the country where it will be installed.

During Operation

Do not connect or disconnect cables and/or power cords during lightning strikes and thunderstorms.

Ensure that the MC102 is mounted on a wall or desktop that is flat, stable, non-conductive and static-free.

Servicing

All servicing must be carried out only by *qualified* service personnel.

Before servicing, ensure that *all* power to the MC102 is cut off!

Overview

General

The MC102 is a series of media converters, each having the basic function of connecting an electrical *or* fiberoptic interface of one device with a fiberoptic interface of another device, and extending the operating distance between them.

Certain models of the series are based on switching technology and, in addition to the basic function described above, switch packets, separate the networks connected to their two ports into separate collision domains, and filter error packets. Others perform, instead, 3R[1] repeater functions so that they can be concatenated to further extend the operating distance without appreciably compromising signal quality. Still others function as ideal (protocol transparent) repeaters; capable of transferring data of a wide range of protocols.

Each model is available in a variety of configurations that are characterized by port protocol[2], operating distance, carrier wavelength, fiber/cable type, and port connector. This menu of configurations enables interconnection of two interfaces that are the same or differ in at most one or more of these characterizations.

Models MC102FR, MC102FRC, and MC102/P have the Link-Integrity Notification (LIN) and Far-End Fault (FEF) mechanisms, described in the section *Features*, page *7*.

Using the MC102 to convert an electrical interface into a fiberoptic interface provides the added benefits of fiberoptic cabling, such as, increased operating distance, EMI/RFI immunity, protection against intrusion and eavesdropping, safety from electrical shock, etc.

Features

Key features of the MC102 are as follows:

- Plug-and-play
- Regular, VLAN, and jumbo packets support
- 3R repeater functionality
- Protocol transparency
- Concatenation to further extend operating distance
- Auto-negotiation (auto-sensing) for 10/100Base-TX port
- Protective Link Integrity Notification (LIN) mechanism – for details, refer to *Appendix D: LIN and FEF*, page *23*
- Protective Far-End Fault (FEF) mechanism – for details, refer to *Appendix D: LIN and FEF*, page *23*
- Wall mount
- Universal (wide-range) internal power supply (except for MC102F)

Models

The MC102 is available in a series of models, each providing one or more unique operation functions so that a model that tailor-fits an application can be selected. The models and their description are given in *Table 1*. Each model is available in various configurations described in *Appendix C: MC102 Configurations.*

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[1] 3R is Reshape, Retime, Retransmit.

[2] Protocol examples are 10/100Base-TX and 100Base-FX.

Table 1: Models of the MC102

Model	Description
MC102F	− Switching technology. − 10/100Base-TX ←→ 100Base-FX protocol conversion. − Packet Length: up to 1522 bytes to support VLANs as well. − 3R functionality. − Single-fiber connectivity option. − Collision domain per port. − Data buffering. − Error filtering. − Auto-negotiation or forced speed/duplexity mode. − External DC power supply.
MC102FI	− Same as model MC102F except that it has an internal AC power supply.
MC102FR	− Fast Ethernet Repeater technology. − 100Base-TX, Full/Half-Duplex ←→ 100Base-FX, Full/Half-Duplex protocol conversion. (The duplexity at both ends of the MC102 must be the same!) − Multimode ←→ Singlemode conversion. − Packet Length: unlimited to support VLANs and inter-router communication (e.g., MPLS, "jumbo" frames, etc.). − 3R functionality. − Single-fiber connectivity option. − Protective Link Integrity Notification (LIN) mechanism. − Internal AC power supply.
MC102FRC	− Fast Ethernet Repeater technology. − 100Base-TX, Full/Half-Duplex ←→ 100Base-FX, Full/Half-Duplex protocol conversion. (The duplexity at both ends of the MC102 must be the same!) − Packet Length: unlimited to support VLANs and inter-router communication (e.g., MPLS, "jumbo" frames, etc.). − 3R functionality. − Single-fiber connectivity option. − Protective Link Integrity Notification (LIN) mechanism. − Internal AC power supply.
MC102G	− Gigabit Ethernet Repeater technology. − Multimode ←→ Singlemode conversion. − Packet Length: unlimited to support VLANs and inter-router communication (e.g., MPLS, "jumbo" frames, etc.). − 3R functionality. − 850nm → 1550nm wavelength conversion to increase transmission distances. − Internal AC power supply.
MC102T	− Protocol transparency technology for protocols of **up to 200 Mbps** (e.g., T3, E3, DS3, FE, FDDI, STM-1, ESCON, etc.) − Multimode ←→ Singlemode conversion. − Packet Length: unlimited to support VLANs and inter-router communication (e.g. VLAN, MPLS, "jumbo" frames, etc.). − Wavelength conversion to increase transmission distances. − Internal AC power supply.
MC102TH	Same as model MC102T except that it is transparent to protocols **above 200 Mbps and up to 1.25 Gbps** (e.g., FC, STM-4, GE, etc.)
MC102/P	− Fast Ethernet Repeater technology. − 100Base-TX, Full/Half-Duplex ←→ 100Base-FX, Full/Half-Duplex protocol conversion. (The duplexity at both ends of the MC102 must be the same!) − Packet Length: unlimited to support VLANs and inter-router communication (e.g., MPLS, "jumbo" frames, etc.). − 3R functionality. − Protective Link Integrity Notification (LIN) mechanism. − Used to connect a TereScope 1 link to a non-MRV switch with special fiberoptic cables provided by MRV. − Internal AC power supply.

Applications

Figure 1 shows the range of applications of the MC102.
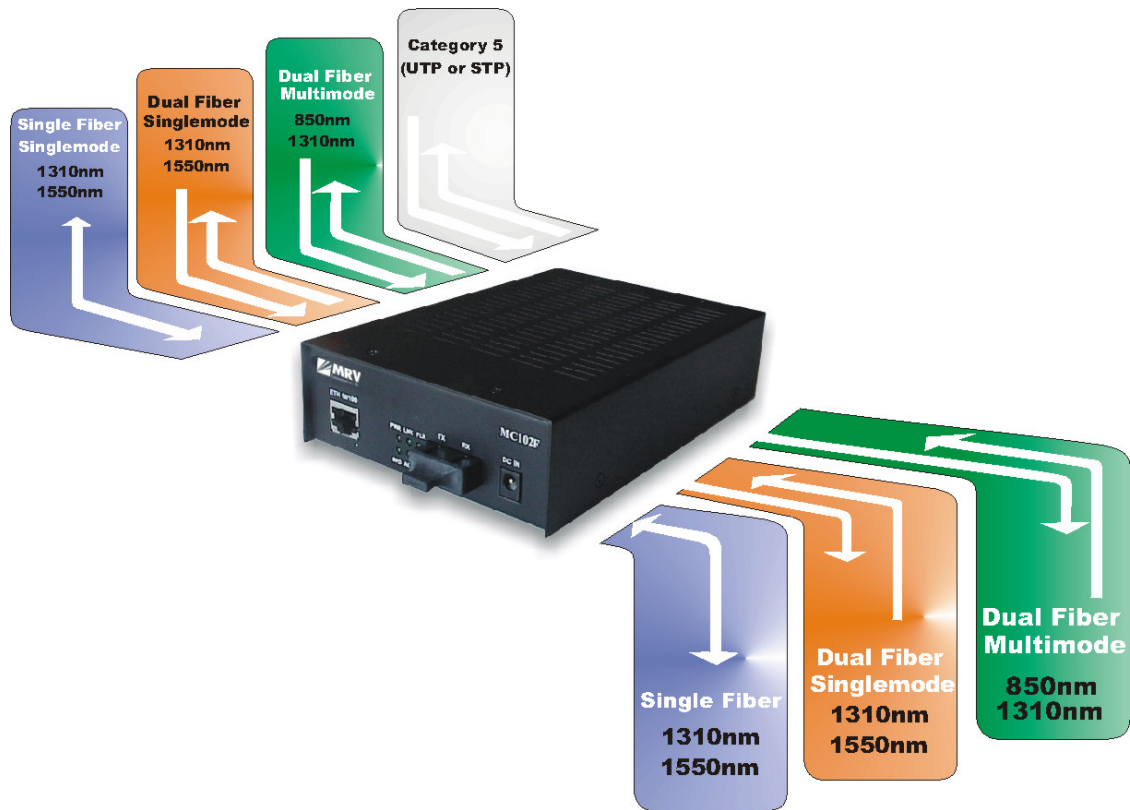
Figure 1: Applications Range of MC102

Layout

Ports

Power Port

<u>AC</u>

3-prong receptacle for 96 to 264Vac, 60/50Hz line (mains) power input.

<u>DC (only in MC102F)</u>

Male pin connector **DC IN** for 6.5 to 7.5V, 1A dc power input.

The voltage polarities are:

Data Ports

For a functional description, refer to the section *Models*. For additional information, refer to *Appendix C: MC102 Configurations.*

Slide Switch (only in MC102F and MC102FI H/W rev. L03 or *lower*[3])

One internal 6-toggle slide switch for setting the 10/100Base-TX port to operate in the modes described in *Table 2*, below.

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[3] For H/W rev., see label on MC102FI.

Table 2: MC102F and MC102FI Slide Switch Setting

Slide Switch Toggles Position	Function
FDC ⊠6 HDC ⊠5 D-F ⊠4 100M ⊠3 A.N ⊠2 / ☐1	Set Port **ETH10/100** to operate in **auto-negotiation** mode. If the toggle is set to the left (ON side), auto-negotiation is disabled. In such case, the port's speed and duplexity is according to the setting of toggles **100M** and **D-F**.
FDC ⊠6 HDC ⊠5 D-F ⊠4 100M ⊠3 / ☐2 A.N ☐1	Set Port **ETH10/100** to operate at **100 Mbps**. If the toggle is set to the left (ON side), the port operates at **10 Mbps**.
FDC ⊠6 HDC ⊠5 D-F ⊠4 100M ☐3 A.N ⊠2 / ☐1	Set Port **ETH10/100** to operate in **full-duplex** mode. If the toggle is set to the left (ON side), the port operates in **half-duplex** mode.
FDC ⊠6 HDC ⊠5 D-F ☐4 100M ⊠3 A.N ⊠2 / ⊠1	Disable **half-duplex flow control** for **ETH10/100** port. If the toggle is set to the left position (ON side), the port operates in **flow control** mode.
FDC ⊠6 HDC ☐5 D-F ⊠4 100M ⊠3 A.N ⊠2 / ⊠1	Disable **full-duplex flow control** for **ETH10/100** port. If the toggle is set to the left position (ON side), the port operates in IEEE 802.3x **flow control** mode.

⊠ means that the toggle position does not affect the function of the toggles shown in specific positions.

Jumpers (only in MC102FI H/W rev. L04 or *higher*[4])

Eight internal 3-pin jumpers for setting the 10/100Base-TX port to operate in the modes described in *Table 3*, below.

Figure 2, below, shows the location of jumpers J1 to J8.

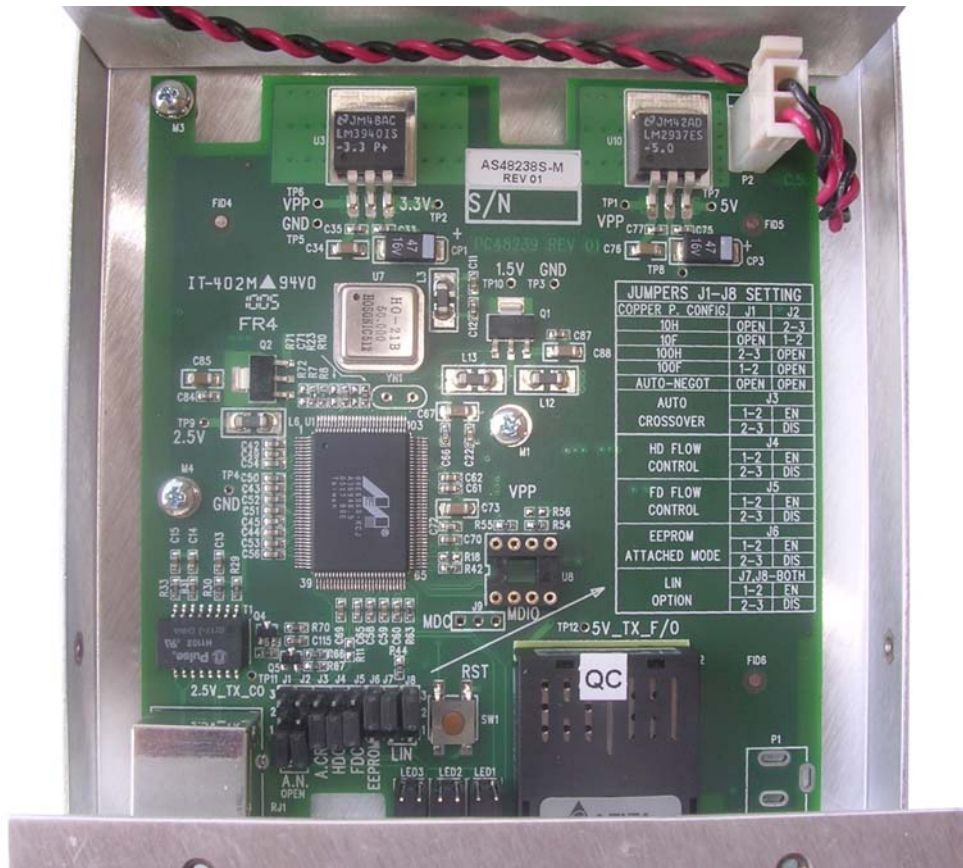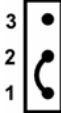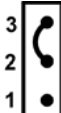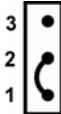[4] For H/W rev., see label on MC102FI.
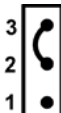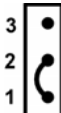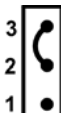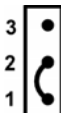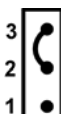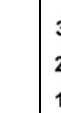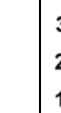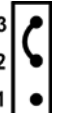
Figure 2: Location of Jumpers

Table 3, below, shows the operation modes for different jumper positions.

Table 3: J1, J2 Jumper Positioning for 10/100Base-T Port

Jumper Position		Function
J1	**J2**	
J1: pins open	J2: 2-3 connected	Set Port **ETH10/100** to operate at **10 Mbps** in **Half-Duplex** mode.
J1: pins open	J2: 1-2 connected	Set Port **ETH10/100** to operate at **10 Mbps** in **Full-Duplex** mode.
J1: 2-3 connected	J2: pins open	Set Port **ETH10/100** to operate at **100 Mbps** in **Half-Duplex** mode.
J1: 1-2 connected	J2: pins open	Set Port **ETH10/100** to operate at **100 Mbps** in **Full-Duplex** mode.
J1: pins open	J2: pins open	Set Port **ETH10/100** to operate in **Auto-Negotiation** mode.
J3		

	3 • / 2 (/ 1	*Enable* Auto-Crossover (Auto-MDI/MDIX) – The 10/100Base-T port can be connected to an Ethernet MDI or MDIX port with a straight or cross-over cable since the port automatically configures itself to suit the cable type and co-port interface.
	3 (/ 2 / 1 •	*Disable* auto-MDI/MDIX.
J4		
	3 • / 2 (/ 1	*Enable Half*-Duplex (Backpressure) Flow Control.
	3 (/ 2 / 1 •	*Disable Half*-Duplex Flow Control.
J5		
	3 • / 2 (/ 1	*Enable Full*-Duplex Flow Control (IEEE 802.3x).
	3 (/ 2 / 1 •	*Disable Full*-Duplex Flow Control.
J6		(Future Implementation)
	3 • / 2 (/ 1	*Enable* Layer 2 switching functions.
	3 (/ 2 / 1 •	*Disable* Layer 2 switching functions.
J7	**J8**	
3 • / 2 (/ 1	3 • / 2 (/ 1	Enable LIN – see *Link Integrity Notification (LIN)*, page *23*. LIN can function only if Auto-Negotiation and Auto-Crossover are disabled, i.e., jumpers 1 and 2 must be unconnected and jumper J3 pins 2 and 3 must be connected.
3 (/ 2 / 1 •	3 (/ 2 / 1 •	Disable LIN.

DIP Switch (only in MC102FR, MC102FRC, and MC102/P)

2-toggle DIP switch for configuring the 100Base-TX port to operate either in auto-negotiation mode or in forced 100 Mbps/full-duplex mode.

Table 4: MC102FR, MC102FRC, and MC102/P DIP Switch Setting

DIP Switch Toggles Position		Function
FULL 100 HALF	OFF LIN ON	Set ports to operate at 100 Mbps in *full*-duplex mode *without* LIN[5] and *with* FEF[6] .
FULL 100 HALF	OFF LIN ON	Set ports to operate at 100 Mbps in *full*-duplex mode *with* LIN and *without* FEF.
FULL 100 HALF	OFF LIN ON	Set ports to operate at 100 Mbps in *half*-duplex mode *without* LIN and *with* FEF.
FULL 100 HALF	OFF LIN ON	Set ports to operate at 100 Mbps in *half*-duplex mode *with* LIN and *without* FEF.

7-Segment Display (only in MC102/P)

Double 7-segment display at the front panel of the MC102/P. It shows the *coded* reading of the received optical signal power at the port of the MC102/P. *Figure 5* shows how to express the reading in dBm units.

LED Indicators

Described in *Operation*.

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[5] LIN (Link-Integrity Notification) is described in the section *Features*, page *7*.

[6] FEF (Far-End Fault) is described in the section, page.

Installation

Safety

Before installing the MC102, ensure that the requirements noted in the section *Safety Requirements* are met.

Package Contents

- MC102
- Power Cord
- CD containing User Manual

Requirements

Tools

– 6-in flat-tip screwdriver
– 6-in Philips screwdriver

Mounting

– Wall space (122 mm x 190 mm *or* $4^3/_4$ in x $7^1/_2$ in) and wall-mount kit (bracket + two screws), or
– Desktop

Power

– **AC**: 96 to 264Vac, 60/50Hz, *or*
– **DC**: (MC102F): 6.5 to 7.5V, 1A

Cabling

– **Electrical** (MC102F, MC102FI, and MC102FRC): Straight-wired (for connection to a DTE) or Cross-wired (for connection to a DCE), Category 5, STP or UTP, 2-pair, up to 100 m or 330 ft, RJ45 male 8-pin connector.
  The wiring of a *straight-* and *cross-wired* cable are shown in *Figure 3*.
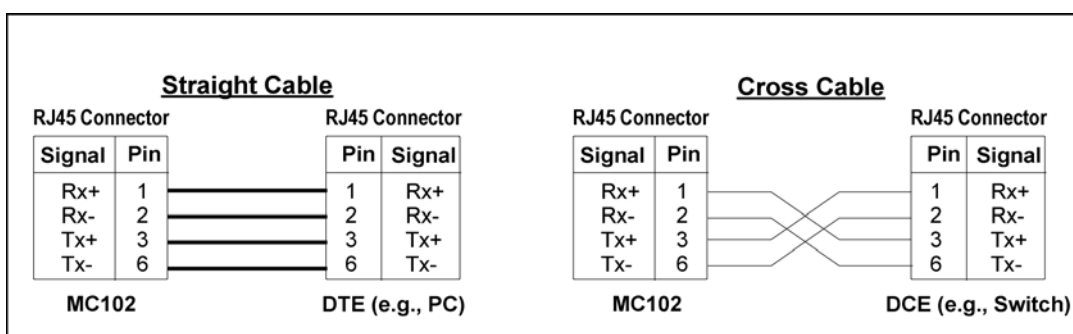

Figure 3: Cable Wiring

– **Fiberoptic**: Refer to *Appendix C: MC102 Configurations*.

Procedure

Install the MC102 as follows:

1. Make sure that power to the MC102 is cut off by disconnecting the power cord from the line (mains).

2. **DIP Switch (MC102FR, MC102FRC,** and **MC102/P)**: The MC102FR, MC102FRC, and MC102/P operation mode depends on the position of the toggles of the DIP switch (external). Determine the required positions for the toggles using *Table 4* and set the toggles accordingly. The factory setting is as shown on the *right*.

3. **Slide Switch (MC102F** and **MC102FI H/W rev. L03 or** *lower*[7]**)**: The MC102F and MC102FI operation mode depends on the position of the toggles of the slide switch (internal). The function of each toggle position is described in *Table 2*. The factory setting is as shown on the *right*.

   To change the position of a toggle:

   1) Undo the eight fastening screws (four on top and two on each side).

   2) Remove the cover to expose the slide switch.

   3) Set the toggles to the required positions.

   4) Refasten the cover with the eight screws.

4. Jumpers **(MC102F** and **MC102FI H/W rev. L04 or** *higher*[8]**)**: The MC102F and MC102FI operation mode depends on the position of the jumpers (internal). The function of each jumper position is described in *Table 3*, page *11*. Jumpers that are not to be used should be connected to just one pin.

   To change the position of a jumper:

   1) Undo the seven fastening screws (two on top front, three on top rear, two on left side, and two on right side).

   2) Remove the cover to expose the slide switch.

   3) Set the jumpers to the required positions with reference to *Figure 2*, page *11*. using *Table 3*, page *11*.

   4) Refasten the cover with the eight screws.

5. Place the MC102 on a desktop (flat stable non-conductive, static-free surface) or mount it on a wall after fastening the wall mount bracket with two screws as shown in *Figure 4*.

6. Connect the MC102 power input port to a power source (dc for MC102F and MC102FI).

7. Connect the MC102 electrical data port.
   For **MC102F** and **MC102FI**, if the device connected to the ETH 10/100 port does not have auto-negotiation capability, the MC102F and MC102FI operate in half-duplex mode and match the speed of the device.
   For **MC102FR, MC102FRC,** and **MC102/P**, make sure that the device connected to Port P1 is able to operate at 100 Mbps and in full-duplex mode.

8. Connect the MC102 fiberoptic data ports **TX**, **RX** to the device ports, ensuring each fiber connects TX to RX.
   For **MC102/P**, connect the yellow-sheathed fiber of a special MRV cable to the **TX** connector and the blue-sheathed fiber to the **RX** connector.

9. Power on the MC102 by connecting its power cord to the line (mains).

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[7] For H/W rev., see label on MC102FI.

[8] For H/W rev., see label on MC102FI.

10. Verify connectivity by sending data traffic.

	Note
	If the DIP Switch setting is changed while the MC102 is powered on, disconnect then reconnect the power cord to enable the MC102 to operate according to the new setting.
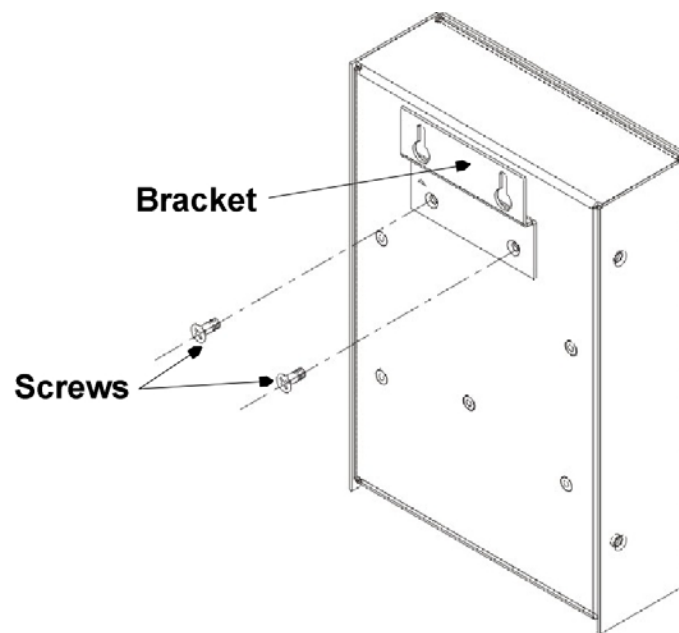
Figure 4: Fastening a Wall Mount Bracket to the MC102

Operation

The MC102 becomes fully operational within a few seconds after being powered on. Its operation can be monitored by interpreting the status of its LEDs with the aid of *Table 5* (MC102F and MC102FI), *Table 6* (MC102FR, MC102FRC, and MC102/P), or *Table 7* (MC102G and MC102T). If there is a problem, use the chapter *Appendix* A: Troubleshooting to resolve it.

LEDs

MC102F and MC102FI

Table 5: MC102F and MC102FI Front Panel LEDs

LED	Status	Significance
PWR	ON	Power to MC102 *OK*.
	OFF	Power to MC102 *faulty*.
SPD	ON	Port operating at *100* Mbps.
	OFF	Port operating at *10* Mbps.
LNK	ON	Port link *OK*.
	OFF	Port link *absent* or *faulty*.
ACT	ON	Port activity[9] *present*.
	OFF	Port activity *absent*.
FLK	ON	Fiberoptic port link *OK*.
	OFF	Fiberoptic port link *faulty*.
FRX	ON	Fiberoptic port *receiving*.
	OFF	Fiberoptic port *not* receiving.

MC102FR, MC102FRC, and MC102/P

Table 6: MC102FR, MC102FRC, and MC102/P Front Panel LEDs

LED	Status	Significance
P1 L	ON	Port **P 1** link *OK*.
	OFF	Port **P 1** link *absent* or *faulty*.
P2 L	ON	Port **P 2** link *OK*.
	OFF	Port **P 2** link *absent* or *faulty*.
P1 A	ON	Port **P 1** activity *present*.
	OFF	Port **P 1** activity *absent*.
P2 A	ON	Port **P 2** activity *present*.
	OFF	Port **P 2** activity *absent*.
LIN (for P1 and P2)	ON	LIN functionality enabled for ports **P1** and **P2**.
	OFF	LIN functionality disabled for ports **P1** and **P2**.

MC102G and MC102T

Table 7: MC102G and MC102T Front Panel LEDs

LED	Status	Significance
PWR	ON	Power to MC102 *OK*.
	OFF	Power to MC102 *faulty*.

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[9] transmission/reception

P1 SD	ON	Light signal at port **P1** detected.
	OFF	*No* light signal at port **P1** detected.
P2 SD	ON	Light signal at port **P2** detected.
	OFF	*No* light signal at port **P2** detected.
P1 LCK (only in MC102G)	ON	Data lock-on at port **P1** *successful*.
	OFF	Data lock-on at port **P1** *failed*.
P2 LCK (only in MC102G)	ON	Data lock-on at port **P2** *successful*.
	OFF	Data lock-on at port **P2** *failed*.
P1 RX (only in MC102T)	ON	Data being received at port **P1**.
	OFF	Data *not* being received at port **P1**.
P2 RX (only in MC102T)	ON	Data being received at port **P2**.
	OFF	Data *not* being received at port **P2**.

7-Segment Display

MC102/P

Figure 5 shows how to convert the received optical signal power *reading* obtained on the double 7-segment display. The vertical axis shows the reading and the horizontal axis shows its value in dBm. The reading is accurate to ± 1 dB.
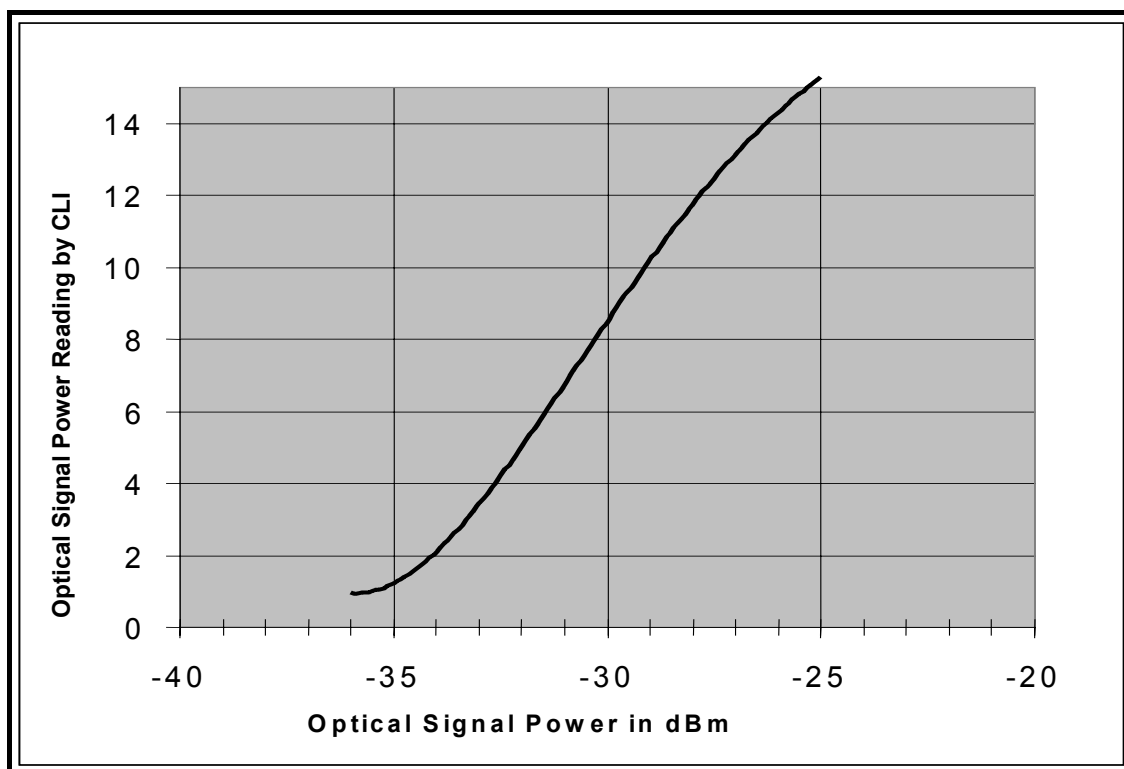

Figure 5: Conversion of Optical Signal Power Reading on MC102/P Front Panel to dBm

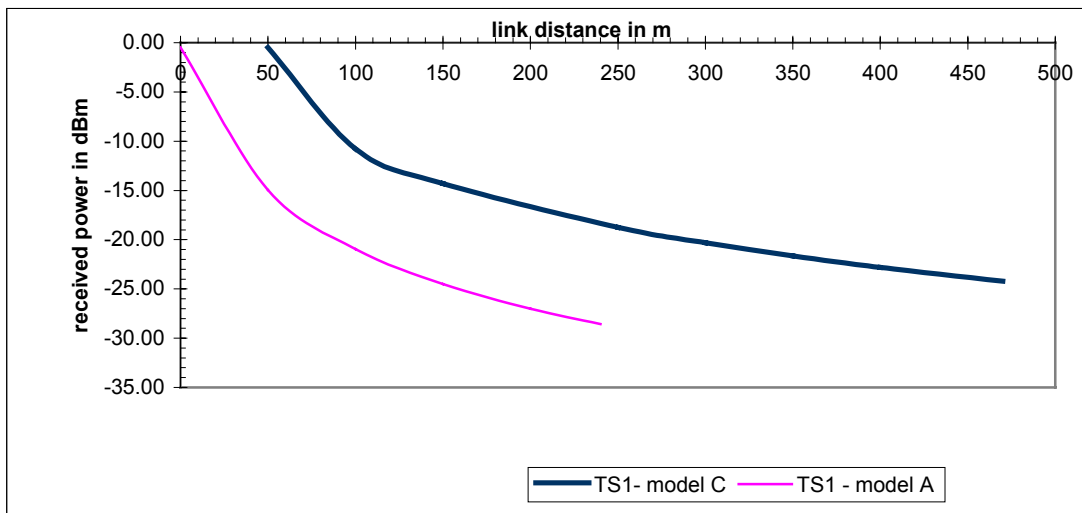This dBm value is required to be about equal to the expected dBm value for the link distance shown in *Figure 6*.

Figure 6: Air Link Distance vs Expected Received Signal Power

Appendix A: Troubleshooting

No.	Problem	Probable Cause	Corrective Action
1	Power LED (**PWR**) OFF.	No power.	1. Check power cord connection. 2. Check source of power. 3. Check power cord.
2	Electrical data port Link LED (**LNK** or **P1 L**) OFF.	Link between network and port absent or faulty.	1. Check electrical cable connections. 2. Check device at other end of electrical cable. 3. Check that the electrical cable *is* as follows: cross-wired if connected to a DCE (e.g., switch) and straight wired if connected to a DTE (e.g., PC), Category 5, STP or UTP, 2-pair, up to 100 m or 330 ft, RJ45 male 8-pin connector.
3	Fiberoptic data port Link LED (**FLK** or **L**).	Link between network and port absent or faulty.	1. Check fiberoptic cable connections. 2. Check device at other end of fiberoptic cable. 3. Check fiberoptic cable. 4. Clean connectors as described in *Appendix B: Cleaning Optical Connectors*.
4	Data port Activity LED (**ACT**, **FRX**, **A**, or **RX**) OFF.	DTE (e.g., PC) not transmitting data.	Check DTE.
5	Line Integrity signal LED **LIN** ON or **SD** OFF.	Fiberoptic link between the MC102 and device faulty.	**MC102FR**, **MC102FRC**, or **MC102/P**: Check if the device connected to the MC102 via the fiberoptic cable is transmitting.
6	Data Signal Detection LED **SD** OFF.	Data invalid.	**MC102G**: Check that the protocol is Gigabit Ethernet. **MC102T**: Check that the protocol speed is in the range 0-200 Mbps. **MC102TH**: Check that the protocol speed is over 200 Mbps and less than 1.25 Gbps.
7	Electrical data port performance lower than expected.	Device connected to this port is not auto-negotiating.	**MC102F** or **MC102FI**: Set DIP switch toggle **A.N** to the right position (away from ON). Also, set DIP switch toggles **100M** and **D-F** so that the speed and duplexity of the MC102F or MC102FI match those of the attached device. The factory setting of the toggles and the procedure for accessing the DIP switch is given in the section *Procedure*. **MC102FR, MC102FRC,** or **MC102/P**: Make sure that the device attached to the MC102FR, MC102FRC, or MC102/P is operating at 100 Mbps and in full-duplex mode. Set DIP switch toggles to the position **100FULL**.
8	Fiberoptic data port performance lower than expected.	Duplexity mismatch	Insure that the port of the device connected to the MC102 is set to operate in full-duplex mode.
9	Ethernet network communication collapse.	Network configuration invalid	Insure that the Spanning Tree Protocol is enabled or that no loops are present in the network.

Appendix B: Cleaning Optical Connectors

General

Intrusions (e.g., dust, grease, etc.) at the interface of two optical fibers, such as at a pair of coupled connectors, attenuate the signal through the fiber. Consequently, optical connectors must be cleaned before they are coupled with other connectors.

Tools and Equipment

Following are tools and equipment required for cleaning connectors.

- **Dust caps**
  Caps for protecting the connector from intrusions. A cap is usually made from flexible plastic. When placing a cap over a connector, avoid pressing it against the fiber ferula surface in the connector so as to prevent contamination.

- **Isopropyl alcohol**
  Solvent for contaminants.

- **Tissues**
  Soft multi-layered fabric made from non-recycled cellulose.

Procedure

The procedure for cleaning connectors is as follows:

1. If no stains are present, using a new clean dry tissue, gently rub, in small circular motions, the exposed fiber surface and surrounding area in the connector to remove dust.

2. If stains are present,

   A. Moisten a new clean dry tissue with isopropyl alcohol and gently rub, in small circular motions, the exposed fiber surface and surrounding area in the connector to remove the stains.

   B. Using a new clean *dry* tissue, gently rub, in small circular motions, the exposed fiber surface and surrounding area in the connector to remove the dissolved stains and excess isopropyl alcohol.

   C. If a connector is *not* to be coupled with another immediately, cover it with a dust cap.

Appendix C: MC102 Configurations

Models/Configurations	Description
MC102F/x	10/100BaseTX to 100BaseFX converter with external power supply.
MC102F/MT/x	10/100BaseTX to 100BaseFX converter with external power supply and MTRJ connector
MC102FI/x	10/100BaseTX to 100BaseFX converter
MC102FI/MT/x	10/100BaseTX to 100BaseFX converter with MTRJ connector
MC102FR/x	100BaseFX repeater
MC102FRC/x	100BaseTX to 100BaseFX repeater
MC102FSF13/S1	10/100BaseTX to 100BaseFX single fiber converter with external power supply (SM; 1310nm transmitter; 0-30 km; SC)
MC102FSF15/S1	10/100BaseTX to 100BaseFX single fiber converter with external power supply (SM; 1550nm transmitter; 0-30 km; SC)
MC102FSFI13/S1	10/100BaseTX to 100BaseFX single fiber converter (SM; 1310nm transmitter; 0-30 km; SC)
MC102FSFI15/S1	10/100BaseTX to 100BaseFX single fiber converter (SM; 1550nm transmitter; 0-30 km; SC)
MC102FSFR13/M	100BaseFX MM to single fiber repeater (SM; 1310nm transmitter; 0-30 km; SC)
MC102FSFR15/M	100BaseFX MM to single fiber repeater (SM; 1550nm transmitter; 0-30 km; SC)
MC102FSSFR13/S1	100BaseFX SM to single fiber repeater (SM;1310nm transmitter; 0-30 km; SC)
MC102FSSFR15/S1	100BaseFX SM to single fiber repeater (SM; 1550nm transmitter; 0-30 km; SC)
MC102FSFR/S1	100BaseFX single fiber repeater (SM; 1310&1550nm transmitters; 0-30 km; SC)
MC102T/x/x	0-200Mbps Protocol Transparent F/O Repeater
MC102TH/y/y	Above 200-1250Mbps Protocol Transparent F/O Repeater
MC102G/y/y	Gigabit Repeater
MC102/P	Used to interconnect a TereScope 1 link and a non-MRV switch. MC102/P/A is used with TereScope 1 Model A. MC102/P/C is used with TereScope 1 Model B.

x and **y** represent two groups of codes. Below, the left column shows the codes and the right column shows the meanings.

x = M	MM, 1310nm, 0-2 km, DSC
x = S1	SM, 1310nm, 0-35 km, DSC
x = S2	SM, 1310nm, 25-45 km, DSC
x = S3	SM, 1550nm, 35-90 km, DSC
x = S4	SM, 1550nm, 35-115 km, DSC
x = S5	SM, 1550nm, 35-135 km, DSC
y = SX	MM, 850nm, 0-0.5 km, DSC
y = LX	MM, 1310nm, 0-2 km, DSC
y = S1	SM,1310nm, 0-6 km, DSC
y = S2	SM, 1550nm, 0-32 km, DSC
y = S3	SM, 1550nm, 30-60 km, DSC
y = S4	SM,1550nm, 35-80 km, DSC
y = S5	SM, 1550nm, 35-100 km, DSC

	Note
	All models have an internal power supply except those specifically mentioned in the above table as having an external power supply.

Appendix D: LIN and FEF

Link Integrity Notification (LIN)

LIN can operate on ports with fiberoptic as well as electrical interfaces.

Following is a description of the operation of the protective LIN mechanism in an MC102 that is LIN-enabled (FEF-disabled).
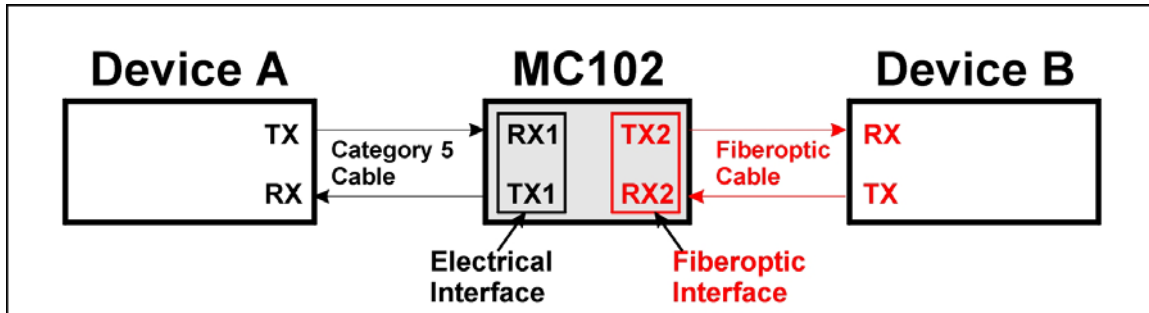

Figure 7: Data Path

Referring to *Figure 7*, if the MC102 does not receive a link integrity signal at RX1, it cuts off transmission from TX2. Similarly, if it does not receive a link integrity signal at RX2, it cuts off transmission from TX1. When it receives a link integrity signal, it resumes transmission.

Far-End Fault (FEF)

FEF can operate on ports with fiberoptic interfaces only.

Following is a description of the operation of the protective FEF mechanism in an MC102 that is FEF-enabled (LIN-disabled).

Referring to *Figure 7*, if the MC102 does not receive a link integrity signal at RX2, it transmits an FEF pattern signal from TX2 that notifies Device B about this problem. When RX2 receives the link-integrity signal, TX2 returns to normal operation. If the MC102 is *not* configured to operate in FEF mode, an incoming FEF pattern is ignored.

Appendix E: Product Specification

Function	Media converter
Protocol Conversion:	
MC102F, MC102FI	10/100Base-TX $\leftrightarrow$ 100Base-FX
MC102FRC, MC102/P	100Base-TX $\leftrightarrow$ 100Base-FX
MC102FR	100Base-FX $\leftrightarrow$ 100Base-FX
MC102G	Gigabit Ethernet $\leftrightarrow$ Gigabit Ethernet
MC102T	Any protocol up to 200Mbps $\leftrightarrow$ Any protocol up to 200Mbps
MC102TH	Any protocol from above 200 Mbps to 1.25Gbps $\leftrightarrow$ Any protocol from above 200 Mbps to 1.25Gbps
Frame size (Max):	
MC102F, MC102FI	1522 bytes
MC102FRC, MC102/P	Up to "jumbo" frames (e.g., VLAN, MPLS, etc.)
MC102FR	Up to "jumbo" frames (e.g., VLAN, MPLS, etc.)
MC102G	Up to "jumbo" frames (e.g., VLAN, MPLS, etc.)
MC102T	Up to "jumbo" frames (e.g., VLAN, MPLS, etc.)
Configurations:	
MC102/P/A	Used with TereScope 1 Model A.
MC102/P/C	Used with TereScope 1 Model B.
Others	Refer to *Appendix C: MC102 Configurations.*
Fiberoptic Data Port:	
MC102/P	*MC102/P/**A**:* *MC102/P/C*
Operating Distance	*240 m (800 ft) at 17 dB/km 470 m (1540 ft) at 17 dB/km*
Beam Divergence	*Model A: 6 mrad; Model C: 3.65 mrad*
Fiber Core/Cladding Diameters	*400/430 μm* *600/630 μm*
Operating Wavelength	*850 nm* *850 nm*
Connector Type	*ST* *ST*
Others	Refer to *Appendix C: MC102 Configurations.*
Electrical Data Port (MC102F, MC102FI, MC102FRC, MC102/P):	
Supported Speeds:	
MC102F and MC102FI	10 and 100 Mbps
MC102FR, MC102FRC, MC102/P	100 Mbps
MC102G	1 Gbps
MC102T	Up to 200 Mbps
MC102TH	Above 200 Mbps to 1.25 Gbps
Cable Length (max)	100 m (330 ft)
Cable Type	Cross-wired (see *Figure 3*), Category 5 (UTP or STP), 2-pair
Connector Type	RJ45 8-pin shielded female
Connector Pinout:	MDI-X (**1**$\rightarrow$Rx+; **2**$\rightarrow$Rx-; **3**$\rightarrow$Tx+; **6**$\rightarrow$Tx-)
Power Input	
AC	96 to 264Vac, 60/50Hz
DC (MC102F and MC102FI only)	6.5 to 7.5V, 1A
Power Consumption (max)	Less than 12 W
Temperature:	
Operating	0 to 40 $^\mathrm{O}$C (32 to 104 $^\mathrm{O}$F)
Storage	-10 to 50$^\mathrm{O}$C (14 to 122 $^\mathrm{O}$F)
Humidity (non-condensing)	Less than 85%
Dimensions (W x H x D)	122 mm x 45 mm x 190 mm ($4^3/_4$ in x 1U in x $7^1/_2$ in)
Weight	Less than 500 g (1 lb)
Compliance	Certified to comply with UL 1950; CSA 22.2 No 950; FCC Part 15 Class B; CE-89/336/EEC, 73/23/EEC

1U = $1^3/_4$ in.