



JULY 2003

MT1103A MT1103A-DC

# T3 Interface Converters

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# Chapter 1

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## Introduction

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### 1.1 Overview

MT1103A and MT1103A-DC are interface converters, which convert between unframed T3 data and 10/100BaseT Ethernet. MT1103A and MT1103A-DC offer simple and cost-effective interconnection between 10/100BaseT LANs and T3 services, making distant LANs operate as one local network.

#### Versions

##### Power Options

- MT1103A: 100 to 240 VAC
- MT1103A-DC: -48 VDC.

#### Applications

MT1103A and MT1103A-DC provide logical connection of the distant LANs, as shown in [Figure 1-1](#).

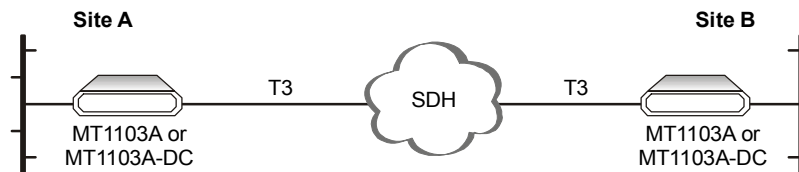


Figure 1-1. Logical Connection of Distant LANs

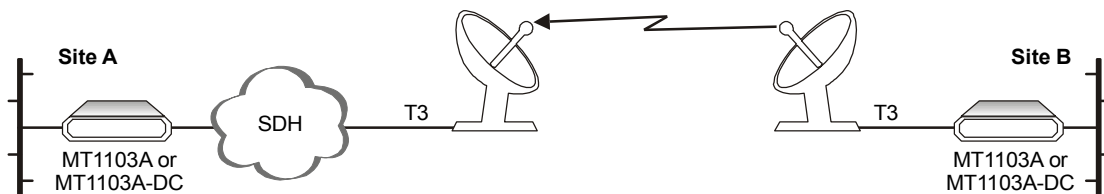


Figure 1-2. Connecting LAN to T3 Service over Wireless Link

[Figure 1-3](#) shows MT1103A and MT1103A-DC providing a cost-effective link to the Internet Service Provider (ISP) by using a low-cost or existing 10/100BT connection instead of expensive T3 router interface.

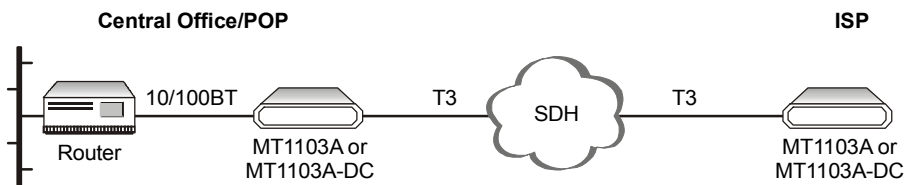


Figure 1-3. Cost-Effective Connection to ISP

## Features

MT1103A and MT1103A-DC transparently connect an unframed T3 link with a 10/100BaseT Ethernet system, utilizing the full T3 bandwidth without the heavy overhead associated with packet or cell-based technologies.

### T3 Interface

The T3 coax interface uses B3ZS line coding and fully complies with the requirements of ITU-T G.703 and G.824 standards. The T3 interface terminates in two shielded unbalanced BNC connectors.

### Ethernet Interface

The Ethernet interface of the MT1103A and MT1103A-DC converters is a high performance self-learning Ethernet bridge module, fully compatible with IEEE 802.3/Ethernet V.2 standards.

Ethernet interface provides one LAN connection, which can be either 10BaseT (UTP) or 100BaseT (UTP), both with VLAN tagging support.

The LAN link operates at a data rate of up to 10 Mbps for 10BaseT ports or up to 100 Mbps for 100BaseT ports.

Auto-negotiation allows plug-and-play Ethernet connection.

The Ethernet module is configured via an internal DIP switch.

## 1.2 Functional Description

Figure 1-4 illustrates the MT1103A and MT1103A-DC functional diagram.

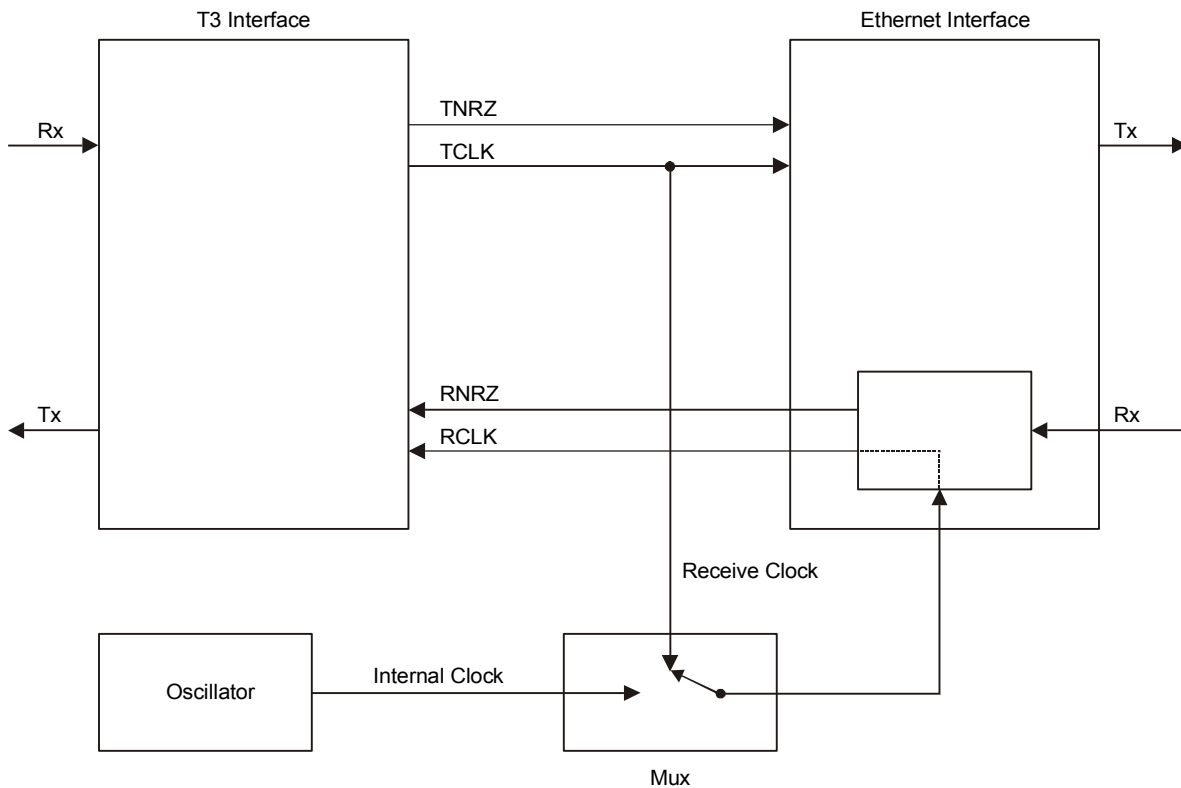


Figure 1-4. Functional Diagram

### T3 Interface

The T3 interface includes a line interface transceiver, which utilizes B3ZS encoding and decoding. The T3 interface operates at the 44.736 Mbps data rate. The line transceiver recovers clock and data from the incoming signals. The T3 cable length is user-selectable, and complies with ITU-T G.703 standards. The connectors are two shielded BNC connectors with 75Ω impedance.

## Ethernet Interface

The Ethernet interface includes a high performance self-learning Ethernet bridge, which is connected to the LAN via a single 10BaseT or 100BaseT port, operating in half or full duplex.

The module automatically learns MAC addresses of the LAN to which it is connected. Its LAN table stores up to 1,000 addresses with 5-minute automatic aging.

Filtering and forwarding is performed at the maximum theoretical rate of 150,000 frames per second (wire speed). The bridge has an internal buffer for frames that is 16Kx32 (64 KB). The forwarding of the broadcast and multicast messages from LAN to WAN can be disabled.

## Timing

*Figure 1-4* shows flow of the clock signals in the MT1103A and MT1103A-DC unit. Two timing modes are supported:

- Receive clock: the system timing is locked to the recovered receive clock signal coming from E3/T3 interface.
- Internal clock: an onboard crystal oscillator ( $\pm 25$  ppm) serves as the timing source for the system.

## Alarm Relay

MT1103A and MT1103A-DC feature an alarm port, used for the relay of the alarm conditions (AIS and LOW) by means of Normally Open and Normally Closed dry contacts, using different pins of the DB-9 port connector.

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## 1.3 Technical Specifications

<b>T3 Interface</b>	<i>Transmission Rate</i>	T3: 44.736 Mbps
	<i>Line Code</i>	T3: B3ZS
	<i>Impedance</i>	75 $\Omega$ , unbalanced
	<i>Connectors</i>	Two shielded BNC coax (unbalanced)
<b>Ethernet Interface</b>	<i>LAN Table</i>	1,000 MAC addresses
	<i>Aging</i>	5 minute, automatic
	<i>Filtering and Forwarding Rate</i>	150,000 frames per second
	<i>Buffer Size</i>	170 frames
	<i>Delay</i>	1 frame
	<i>LAN Standard</i>	IEEE 802.3/Ethernet V.2



	<i>LAN Data Rate</i>	<ul style="list-style-type: none"> <li>• 10BaseT: 10 Mbps (20 Mbps in full duplex)</li> <li>• 100BaseT: 100 Mbps (200 Mbps in full duplex)</li> </ul>
	<i>Transmission Line</i>	4-wire, Category 5 UTP, 19 AWG to 26 AWG
	<i>Line Code</i>	<ul style="list-style-type: none"> <li>• 10BaseT: Manchester</li> <li>• 100BaseT: MLT3</li> </ul>
	<i>WAN Protocol</i>	Point-to-point
	<i>Overhead</i>	30 bits per frame (added to the Ethernet frames when they are sent toward E3/T3 line)
	<i>Connector</i>	RJ-45
<b>Timing</b>	<i>Clock Source</i>	<ul style="list-style-type: none"> <li>• Receive clock: recovered from the receive clock signal coming from E3/T3 interface</li> <li>• Internal clock: provided by onboard crystal oscillator (<math>\pm 25</math> ppm)</li> </ul>
<b>Indicators</b>	<i>PWR</i>	ON – MT1103A and MT1103A-DC are powered up
	<i>ELECTRICAL LOW</i>	ON – T3 input is below G.703 level
	<i>ELECTRICAL AIS</i>	ON – T3 interface received Alarm Indication Signal
	<i>ETH LINK</i>	ON – LAN is connected to the Ethernet interface
	<i>ETH ACT</i>	Blinks – LAN is receiving/transmitting data
	<i>ETH 100</i>	ON – LAN is operating at 100 Mbps OFF – LAN is operating at 10 Mbps
<b>Alarm Relay</b>	<i>Connector</i>	9-pin, D-type female
	<i>Operation</i>	Normally Open and Normally Closed, using different pins
<b>Power</b>	<i>MT1103A</i>	100–240 VAC, 50 Hz–60 Hz, 15 VA
	<i>MT1103A-DC</i>	-48 VDC, 9W
<b>Physical</b>	<i>Height</i>	44 mm / 1.7 in
	<i>Width</i>	194 mm / 7.6 in
	<i>Depth</i>	243 mm / 9.6 in
	<i>Weight</i>	1.4 kg / 3.0 lb
<b>Environment</b>	<i>Temperature</i>	0 to 50°C (32 to 122°F)
	<i>Humidity</i>	Up to 90%, non-condensing



# Chapter 2

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## Installation and Setup

This chapter describes installation procedures for the standalone MT1103A and MT1103A-DC devices.

After installing the unit, refer to [Chapter 3](#) for the system operation information.

Refer to [Chapter 4](#) for troubleshooting and diagnostics information.



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**Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved.**

**Always observe standard safety precautions during installation, operation and maintenance of this product.**

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### 2.1 Site Requirements and Prerequisites

MT1103A units should be installed within 1.5m (5 ft) of an easily-accessible grounded AC outlet capable of furnishing the required supply voltage, in the range of 100 to 240 VAC.

MT1103A-DC units require a -48 VDC power source, which must be adequately isolated from the mains supply. In order to prevent a fire hazard, a suitable fuse must be installed in the -48 VDC line.

The maximum trunk current of the AC or DC supply must be limited to 16A.

Allow at least 90 cm (36 in) of frontal clearance for operator access and at least 10 cm (4 in) clearance at the rear of the unit for interface cable connections.

The ambient operating temperature of MT1103A and MT1103A-DC should be 0 to 50°C (32 to 122°F), at a relative humidity of up to 90%, non-condensing.

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### 2.2 Package Contents

The MT1103A and MT1103A-DC package includes the following items:

- MT1103A or MT1103A-DC unit
- Installation and operation manual on CD-ROM
- AC power cord or DC power supply connector kit

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## 2.3 Installation and Setup

MT1103A and MT1103A-DC are standalone devices intended for tabletop or 19-inch rack installation. They are delivered completely assembled. No provision is made for bolting the unit on the tabletop.

- ▶ **To install MT1103A and MT1103A-DC:**
  1. Determine the required configuration of MT1103A or MT1103A-DC according to your application, and set the internal jumpers and switches accordingly.
  2. Connect the T3 lines and the LAN.
  3. Connect power to the unit.

### Setting the Internal Jumpers

This section provides information on the functions of the MT1103A and MT1103A-DC jumpers, and gives step-by-step instructions for performing the internal settings. The default settings are also listed.

#### Locations of Jumpers and Switches

MT1103A and MT1103A-DC include three printed circuit boards (PCBs): the main board, T3 interface board, and Ethernet interface board (see [Figure 2-1](#), [Figure 2-2](#) and [Figure 2-3](#)).

The **main board** contains the common signal processing circuits. Two jumpers, JP1 and JP2, are provided for user settings.

The **T3 interface boards** provide connection to the E3/T3 links. The E3/T3 boards contain jumpers for selecting the E3/T3 cable length.

The **Ethernet interface board** provides LAN connection. The Ethernet board contains an 8-section DIP switch for the interface configuration.

#### Opening the Case

To reach the internal jumpers and switch of MT1103A and MT1103A-DC, it is necessary to open its case.



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**Access to the inside of MT1103A and MT1103A-DC is permitted only to authorized and qualified service personnel.**

**To avoid accidental electric shock, always disconnect the interface cables and the power cord before removing the units from their casing.**

**Line voltages are present inside MT1103A and MT1103A-DC when they are connected to power and/or to the lines. Moreover, under external fault conditions dangerous voltages may appear on the lines connected to the units.**

**Any adjustment, maintenance, and repair of the opened equipment under voltage should be avoided as much as possible and, when absolutely necessary, should be carried out only by a skilled technician who is aware of the hazard involved. Capacitors inside the instruments may still be charged even after the instruments have been disconnected from their power source.**

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**Caution** MT1103A and MT1103A-DC contain components sensitive to electrostatic discharge (ESD). To prevent ESD damage, avoid touching the internal components. Before moving jumpers, touch the MT1103A or MT1103A-DC frame.

► **To open the MT1103A or MT1103A-DC case:**

1. Disconnect all the cables connected to MT1103A or MT1103A-DC.
2. Release the two rear panel screws and use them as levers to slide out the PCB interior of the unit.

**Setting the Main Board Internal Jumpers**

The internal jumpers located on the MT1103A and MT1103A-DC main board are identified in *Figure 2-1*. The jumper settings are described in *Table 2-1*.

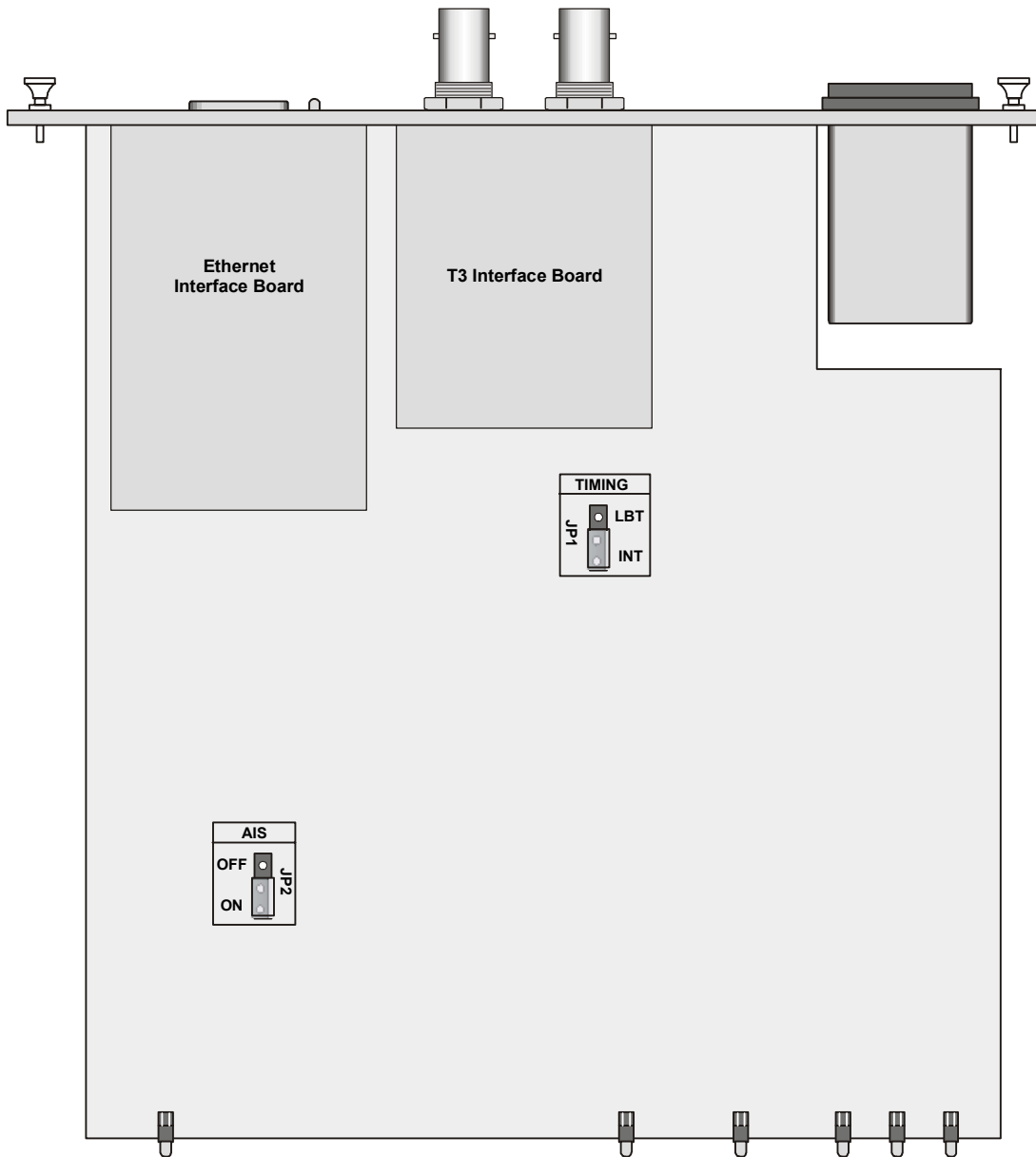


Figure 2-1. Main Board Layout

Table 2-1. Main Board Jumper Settings

Jumper	Description	Values	Factory Setting
TIMING, JP1	Selects the clock source	LBT – Receive clock	
		INT – Internal clock	INT
AIS, JP2	Controls the AIS transmission	ON – AIS is transmitted	ON
		OFF – AIS is not transmitted	

The JP1, JP2 and JP3 jumpers, which are used for selection of the T3 cable length are located on the T3 interface board (see [Figure 2-2](#) and [Table 2-2](#)).

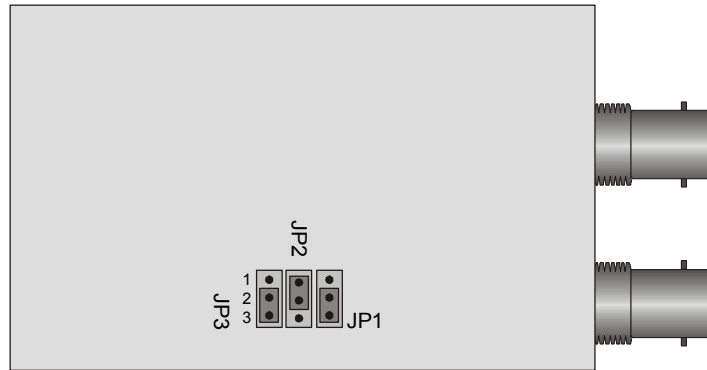


Figure 2-2. T3 Interface Board Layout

Table 2-2. Selecting the T3 Interface Cable

T3 Cable Length	Jumper Positions		
	JP1	JP2	JP3
0 ft – 225 ft	Pins 2, 3*	Pins 1, 2*	Pins 2, 3*
225 ft – 300 ft	Pins 1, 2	Pins 1, 2	Pins 1, 2
More than 300 ft	Pins 1, 2	Pins 2, 3	Pins 1, 2

**Note:** The maximum cable length complies with ITU-T G.703.

\* – Factory settings

### Configuring the Ethernet Interface

The Ethernet interface board of MT1103A and MT1103A-DC contains a DIP switch, which is used for the bridge and LAN interface configuration (see [Figure 2-3](#) and [Table 2-3](#)).

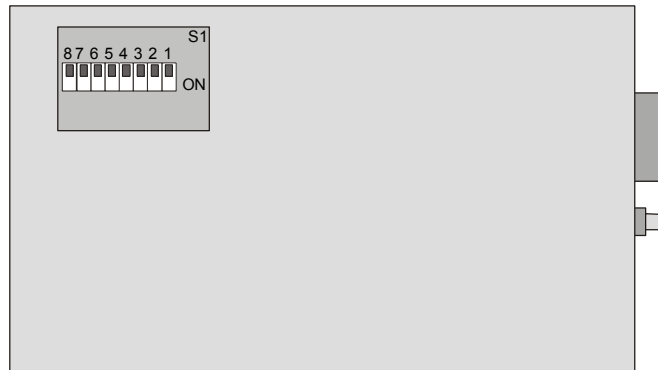


Figure 2-3. Ethernet Interface Board Layout

► **To configure the Ethernet interface:**

1. Set the DIP switch located on the Ethernet interface board according to your application requirements (see [Table 2-3](#)).
2. Reset MT1103A or MT1103A-DC by turning it off and back on.

Table 2-3. Ethernet Interface DIP Switch Settings

Section	Name	Description	Possible Settings	Factory Setting
1	NC			OFF
2	FLC	Enables or disables flow control	<b>ON</b> – Flow control is enabled <b>OFF</b> – Flow control is disabled	OFF
3	10/100	Selects the LAN speed	<b>ON</b> – LAN speed is set to 100 Mbps <b>OFF</b> – LAN speed is set to 10 Mbps	OFF
4	AN1	Controls the LAN autonegotiation	<b>ON</b> – LAN autonegotiation is disabled <b>OFF</b> – LAN autonegotiation is enabled	OFF
5	HF1	Selects the LAN mode	<b>ON</b> – LAN full duplex mode <b>OFF</b> – LAN half duplex mode	OFF
6	BPR	Controls the backpressure	<b>ON</b> – Backpressure is enabled <b>OFF</b> – Backpressure is disabled	OFF
7	MUL	Controls LAN to WAN multicasting	<b>ON</b> – Multicast messages from LAN to WAN are blocked <b>OFF</b> – Multicast messages from LAN to WAN are not blocked	OFF
8	SCR	Controls the scrambling of Ethernet frames	<b>ON</b> – Ethernet frames are scrambled <b>OFF</b> – Ethernet frames are left unchanged	OFF

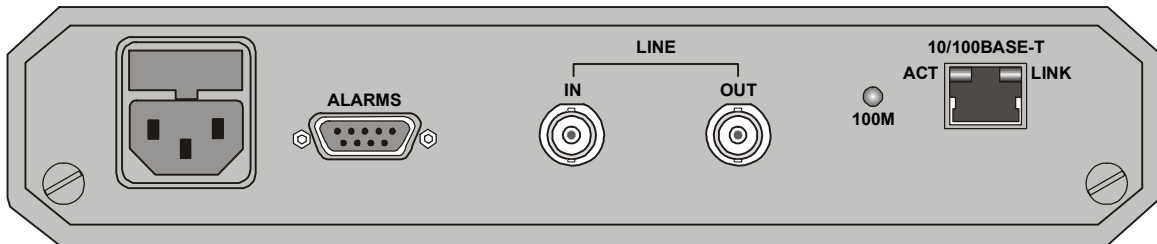
**Closing the Case**

Once you finish the internal settings, you have to close the MT1103A and MT1103A-DC case.

- **To close the MT1103A or MT1103A-DC case:**
  1. Slide the unit's interior back into the case.
  2. Screw in the two rear panel screws to fasten the main board in the case.

## Connecting the Interfaces

*Figure 2-4* shows a typical rear panel of a standard MT1103A unit. The MT1103A and MT1103A-DC rear panels contain also LAN status indicators, which duplicate the front panel LAN LEDs. The LINK and ACT indicators are located on the Ethernet interface connector.



*Figure 2-4. MT1103A Rear Panel*

### Connecting the T3 Interface

The T3 interface of MT1103A and MT1103A-DC terminates in two BNC coax connectors, designated IN and OUT.

- **To connect T3 interface:**
  1. Connect the receive line, using a 75Ω coaxial cable to the BNC connector labeled IN.
  2. Connect the transmit line, using a 75Ω coaxial cable to the BNC connector labeled OUT.

### Connecting the Ethernet Interface

The Ethernet interface of MT1103A and MT1103A-DC terminates in an RJ-45 connector, designated 10/100BASE-T. *Table 2-4* lists the RJ-45 connector pinout.

- **To connect the Ethernet interface:**
  - Connect the LAN to the MT1103A or MT1103A-DC port, labeled 10/100BASE-T.

*Table 2-4. RJ-45 Connector Pinout*

Pin	Name	Function
1	RD (+)	Receive Data Positive
2	RD (-)	Receive Data Negative
3	TD (+)	Transmit Data Positive
6	TD (-)	Transmit Data Negative



## Connecting the Power

To connect MT1103A or MT1103A-DC to the power source, refer to the appropriate section below, depending on your version of the unit (AC or DC).



**Warning**

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**The units have no power switch. Operation starts when the power is applied to the rear panel POWER connector.**

**Before switching on this unit and connecting or disconnecting any other cable, the protective earth terminals of this unit must be connected to the protective ground conductor of the mains power cord. If you are using an extension cord (power cable) make sure it is grounded as well.**

**Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting of the protective earth terminal can make this unit dangerous. Intentional interruption is prohibited.**

**For the MT1103A version, make sure that only fuses of the required rating, as marked on the rear panel, are used for replacement. Do not use repaired fuses or short-circuit the fuse holder. Always disconnect the mains cable before removing or replacing the fuse. Whenever it is likely that the fuse protection has been damaged, make the unit inoperative and secure it against unintended operation.**

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### Connecting the AC Power to MT1103A

AC power should be supplied to MT1103A through the 1.5m (5 ft) standard power cable terminated by a standard 3-prong plug (see [Figure 2-4](#)). The cable is provided with the unit.

➤ **To connect AC power to MT1103A:**

- Connect the power cable first to the connector on the MT1103A rear panel, and then to the mains outlet.

MT1103A will be turned on automatically upon connection to the mains.

### Connecting the DC Power to MT1103A-DC

➤ **To connect DC power to MT1103A-DC:**

- Refer to DC power supply connection supplement.



# Chapter 3

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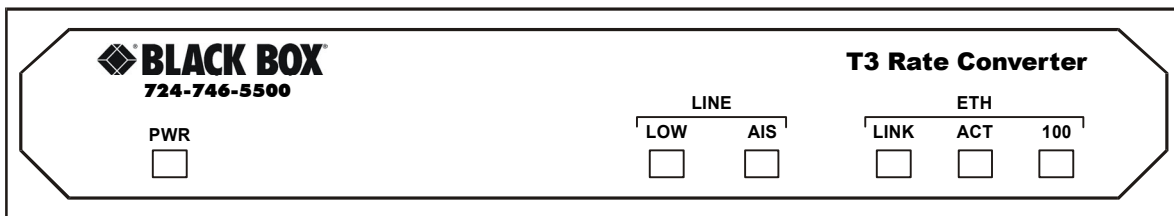
## Operation

This chapter describes the MT1103A and MT1103A-DC controls and indicators, and their functions, explains the units' operating procedures.

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### 3.1 Front Panel Indicators and Controls

*Figure 3-1* shows the front panel of MT1103A or MT1103A-DC. *Table 3-1* lists the functions of the LED indicators, located on the front panel.



*Figure 3-1. Front Panel*

*Table 3-1. MT1103A and MT1103A-DC Controls and Indicators*

Name	Type	Function
PWR	Green LED	ON – Unit is powered up
ELECTRICAL LOW	Red LED	ON – T3 input signal is below the minimum level required (G.703)
ELECTRICAL AIS	Yellow LED	ON – T3 interface received "All 1s" string
ETH LINK	Green LED	ON – LAN is connected to the Ethernet interface
ETH ACT	Yellow LED	ON – LAN is receiving/transmitting data
ETH 100	Green LED	ON – LAN is operating at 100 Mbps OFF – LAN is operating at 10 Mbps

## 3.2 Operating Instructions

### Turning On

MT1103A and MT1103A-DC start operating as soon as they are connected to the power source. The PWR LED turns ON and remains lit as long as the units are connected to the mains.

### Normal Operating Instructions

The following LEDs conditions are observed during the normal operation:

- PWR is ON.
- LINK and ACT are ON to indicate data transfer over the Ethernet link.
- ETH 100 turns ON when MT1103A and MT1103A-DC operate in Fast Ethernet (100 Mbps) mode.

The rest of the front panel LEDs are OFF.

### Turning Off

Turn MT1103A and MT1103A-DC off by disconnecting the power cord from the mains.

# Chapter 4

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## Diagnostics and Troubleshooting

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### 4.1 Alarm Relay

MT1103A and MT1103A-DC include a dry contact alarm relay port supported via 9-pin connector for major and minor alarms.

- Major alarms are generated when T3 electrical low levels are detected or Fast Ethernet port loses link integrity.
- Minor alarms occur when an Alarm Indication Signal is received at the T3 electrical interface.

The dry contact port operates as Normally Open or Normally Closed, using different pins of the alarm relay port connector (see [Figure 4-1](#)).

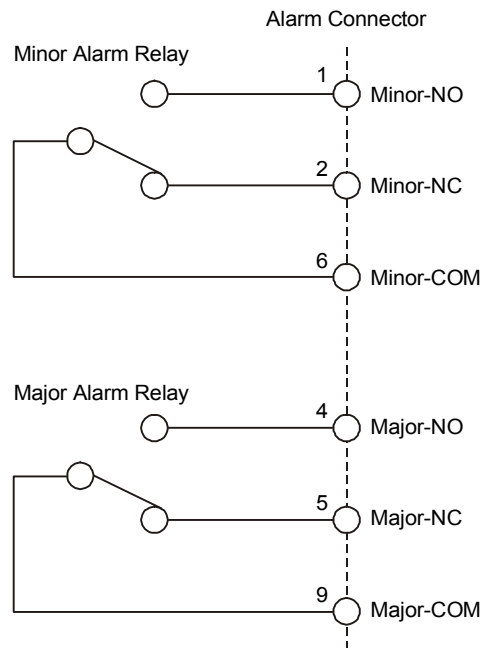


Figure 4-1. Alarm Relay Connector Pinout

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**Note** The relay positions are shown in the non-energized state (alarm active).

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## 4.2 Troubleshooting Instructions

In case a problem occurs, refer to [Table 4-1](#) for the troubleshooting procedures. Perform the actions listed under [Corrective Measures](#) in the order given in the table, until the problem is corrected.

*Table 4-1. Troubleshooting Chart*

<b>Trouble Symptoms</b>	<b>Probable Cause</b>	<b>Corrective Measures</b>
PWR indicator is OFF	No AC power	<ul style="list-style-type: none"> <li>• Verify that the power outlet is providing the required power.</li> <li>• Ensure that the both ends of the power cable are connected properly.</li> </ul>
	Blown fuse	Replace with a fuse of correct rating
ELECTRICAL LOW indicator is ON	One of the T3 coaxial cables is defective or disconnected	Ensure that both ends of the T3 coaxial cables are connected correctly and that the cables function properly.
	Attached equipment outputs do not comply with G.703 electrical levels	Check that the output levels of the equipment attached to the T3 interface comply with G.703.
	JP2 is set incorrectly	Correct the JP2 settings according to <a href="#">Table 2-1</a> .
ELECTRICAL AIS indicator is ON	Attached equipment transmits "All 1s" string	Check the equipment attached to T3 interface, ensure that it transmits real data.