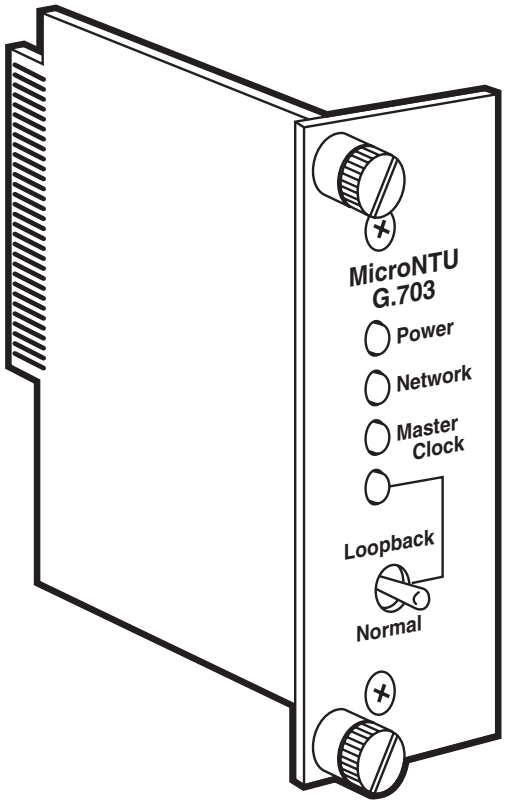
BLACK BOX®
NETWORK SERVICES

JUNE 1999
MT245A
MT246A

MicroNTU G.703 Card (120 ohm)
MicroNTU G.703 Card (75 ohm)



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This equipment generates, uses, and can radiate radio 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 the equipment is 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 necessary to correct the interference.

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This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

Contents

1. Specifications

Network Interface	G.703
Network Rate	2.048 Mbps
Network Connectors	MT245A: One modular RJ-45 connector (120-ohm); MT246A: Two BNC (75-ohm)
Terminal Interface	MT245A: EIA-530 (RS-422) on DB25 female; MT246A: CCITT X.21 on DB15 female
Internal Interface	Connection to MicroRack 2, 4, 8, or 16 (RM202, RM204, RM208, or RM216) midplane architecture chassis via (2) 50-pin male card edge connectors
Terminal Rate	2.048 Mbps
Diagnostics	Loopback Test
Indicators	LEDs for power, network, master clock, and loopback test
Clocking	Internal, external (network receive loop)
Fuse	400 mA for 120V applications; 200 mA for 240V applications
Receiver Sensitivity	-10 dB (0 dB = 2.4V)
Operating Temperature	32° to 140°F (0° to 60°C)
Humidity	0 to 95%, noncondensing
Altitude	Up to 15,000 feet (4570 m)
Power Supply	Rackmount power supply is switchable between 120 and 240 VAC; chassis supplies 10 VAC to the MT245A/MT246A, typical consumption is 1 watt
Size	3.1"H x 0.95"W x 5.4"D (7.9 x 2.4 x 13.7 cm)

2. Introduction

The MicroNTU G.703 Card receives unstructured, synchronous 2.048-Mbps data from a G.703 network and sends it to a router, bridge, multiplexor, or other device. The Card is available in two interface options: 120-ohm twisted pair to the network and EIA-530 (RS-422) to the terminal (part number MT245A), or 75-ohm dual coax to the network and X.21 to the terminal (MT246A). The EIA-530 terminal interface can also be adapted to X.21 using an EIA RS-530 to CCITT X.21 adapter cable (call Black Box).

The MicroNTU G.703 Card is designed to mount in the MicroRack 2, 4, 8, or 16 (RM202, RM204, RM208, RM216). These operate with a switchable 120/240-VAC power supply or optional 48-VDC power supply. (The power supply is included with the MicroRack 16. MicroRacks 2, 4, and 8 do not include the power supply. You must purchase PS460A, the 120/240-VAC unit, or PS461A, the 48-VDC unit, separately.) The Cards are mounted in a mid-plane architecture: Front "function" cards and rear "interface" cards can be hot-swapped independently, providing great flexibility.

The MicroNTU G.703 Card supports internal or external network (receive loop) clocking. Loopback test is Local Analog Loop (LAL) via front-panel mounted switch, and front-panel LEDs monitor power, network, master clock, and test loop.

3. Configuration

The MicroNTU G.703 Card (MT245A) uses seven jumpers (or four for MT246A), which allow the unit to be configured for a wide range of applications. Designed around a mid-plane architecture, the MicroNTU G.703 Card incorporates both front and rear cards. Configuration of both may be necessary. The jumpers are accessible when the cards are slid out of the rack chassis. Once configured, the MicroNTU G.703 Card is designed to operate transparently, without need for frequent re-configuration: Just set it and forget it.

3.1 Front-Card Configuration

The MicroNTU G.703 Card front card has two jumpers (LK6 and LK7), which are mounted on the PC board (see Figure 3-1). These jumpers set clocking and data inversion.

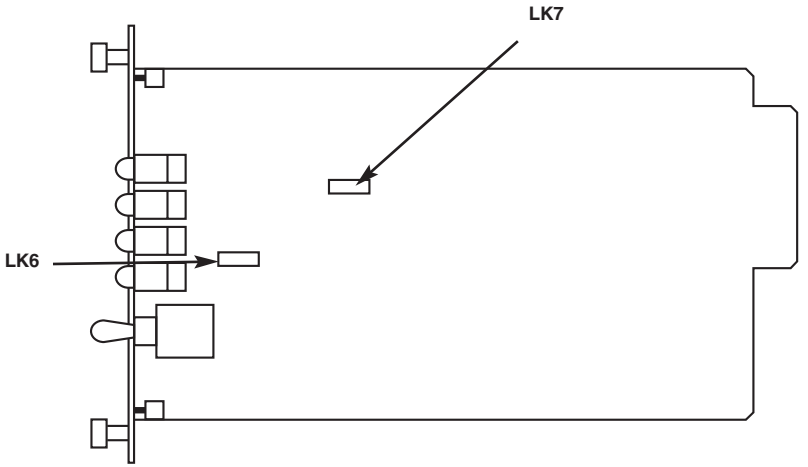


Figure 3-1. Jumper locations.

LK6: Tx Clock Source

Jumper LK6 is a three-post jumper. Figure 3-2 shows the three possible orientations of this jumper.

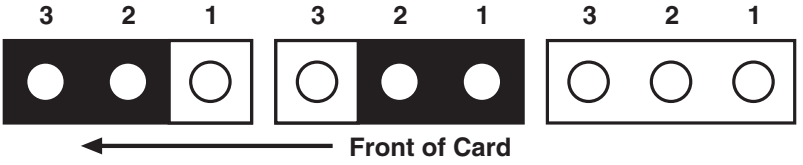


Figure 3-2. Possible strap positions for jumper LK6.

The setting for jumper LK6 determines whether the MicroNTU G.703 Card will provide an internal clock, or will be receiving a clock from an external device.

LK6	Setting
Position 1 and 2	Internal/Master Clock (Default) [Master]
Position 2 and 3	Network Clock - Slave - Network
NC	Not a valid setting

LK7: Data Inversion

The setting for jumper LK7 determines whether data will be inverted or not inverted.

LK7	Setting
Strap Installed	Data Inverted
Strap Omitted	Data Not Inverted (Default)

3.2 Rear-Card Configuration

The MicroNTU G.703 Card has two rear interface card options: for the MT245A, 120-ohm (modular) network and EIA-530 (DB25) terminal, or, for the MT246A, 75-ohm (dual BNC) network and X.21 (DB15) terminal. Each is configured differently.

3.2.1 Configuring the 120-Ohm Rear Card

The 120-ohm rear card has five configuration jumpers (LK1 through LK5). Figure 3-3 shows the locations of the jumpers on the 120-ohm rear card.

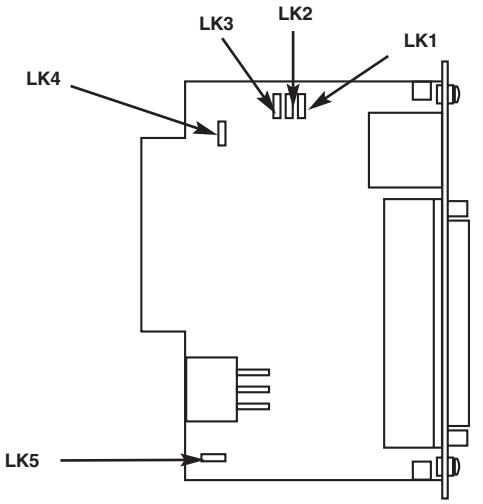


Figure 3-3. 120-ohm rear card jumper locations.

Table 3-1 shows the factory-default jumper settings for the 120-ohm rear card. Following Table 3-1 is a description of each jumper's function and possible settings. When configuring the jumpers, take care not to lose the individual straps.

Table 3-1. Summary of default jumper settings for 120-ohm rear card

120-Ohm Rear Card Jumpers		
Jumper	**Function**	**Factory Default**
LK1	TX Pin 4 to GND	Strap Off*
LK2	RX Shield (Pin 3) to GND	Strap Off
LK3	RX Pin 2 to GND	Strap Off*
LK4	Clock Synchronization	Strap Off
LK5	(DTE) SGND to FGND	Strap On
*Mandatory setting. All others are up to user's discretion.		

LK1: (Transmit Pair) Pin 4-to-Ground Connection

This setting determines whether or not pin 4 of the transmit pair is sent to earth ground. This connection should *not* be made in most cases.

LK1	Setting
Strap On	Pin 4-to-GND Connection Made
Strap Off	Pin 4-to-GND Connection Broken

LK2: (Receive Shield) Pin 3-to-Ground Connection

This setting determines whether or not the RX shield (pin 3) is connected to earth ground. This connection may help EMC performance in some cases.

LK2	Setting
Strap On	Pin 3-to-GND Connection Made
Strap Off	Pin 3-to-GND Connection Broken

LK3: (Receive Pair) Pin 2-to-Ground Connection

This setting determines whether or not pin 2 of the receive pair is sent to earth ground. This connection should *not* be made in most cases.

LK3	Setting
Strap On	Pin 2-to-GND Connection Made
Strap Off	Pin 2-to-GND Connection Broken

LK4: Clock Synchronization (EIA-530 versus X.21)

This setting determines whether clocks are common or separate. Separate (non-synchronized) clocks are used for the EIA-530 terminal interface. Common (synchronized) clocks are used for the X.21 terminal interface. If clocks are synchronized, a DB25-to-DB15 adapter cable should be used between the MicroNTU G.703 Card and the X.21 terminal device (see the **Appendix** for pinning).

LK4	Setting
Strap On	Clocks Synchronized (X.21)
Strap Off	Clocks Not Synchronized (EIA-530)

LK5: DTE Signal Ground-to-Frame Ground (with Resistor)

This setting determines whether or not the DTE signal ground (DB25 pin 7) is connected to frame ground (pin 1) by way of a 100-ohm resistor. This connection is recommended in the EIA-530 specification as a current limiter for ground-fault events.

LK5	Setting
Strap On	SGND-to-FGND Connection Made (via 100-ohm resistor)
Strap Off	SGND-to-FGND Connection Broken

3.2.2 Configuring the 75-Ohm Rear Card

The 75-ohm rear card has two configuration jumpers (LK1 and LK2). Figure 3-4 shows the locations of the jumpers on the 75-ohm rear card.

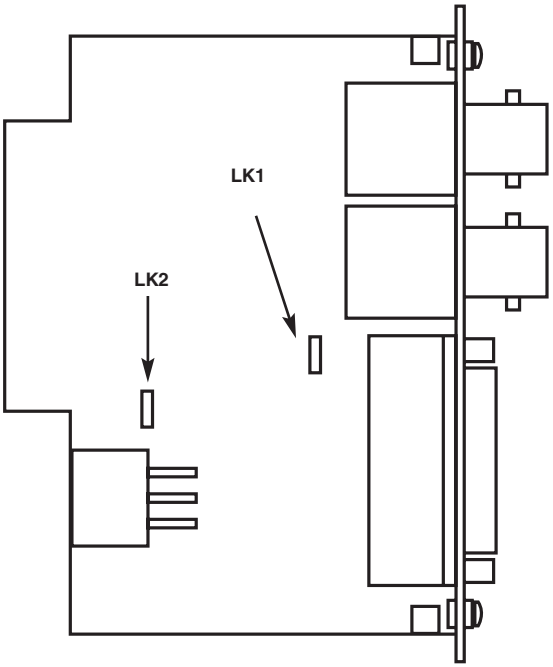


Figure 3-4. 75-ohm rear card jumper locations.

Table 3-2 shows the factory-default jumper settings for the 75-ohm rear card. Following the table is a description of each jumper's function and possible settings. When configuring the jumpers, take care not to lose the individual straps.

Table 3-2. Summary of default jumper settings for 75-ohm rear card

75-Ohm Rear Card Jumpers		
Jumper	**Function**	**Factory Default**
LK1	RX Shield to GND	Strap Off
LK2	(DTE) SGND to FGND	Strap On

LKI: Receive Shield-to-Ground Connection

This setting determines whether or not the RX shield is connected to earth ground. This connection may help EMC performance in some cases.

LK1	Setting
Strap On	RX Shield-to-GND Connection Made
Strap Off	RX Shield-to-GND Connection Broken

NOTE

TX shield is always tied directly to GND (no resistor).

LK2: DTE Signal Ground-to-Frame Ground (with Resistor)

This setting determines whether or not the DTE signal ground (DB15 pin 8) is connected to frame ground (pin 1) by way of a 100-ohm resistor. This connection is recommended as a current limiter for ground-fault events.

LK2	Setting
Strap On	SGND-to-FGND Connection Made
Strap Off	SGND-to-FGND Connection Broken

4. Installation

This chapter describes the functions of the MicroRack 2, 4, 8, and 16 chassis, tells how to install front and rear MicroNTU G.703 Cards in the chassis, and provides diagrams for wiring the interface connections correctly.

4.1 The MicroRack and Power Supplies

The MicroRack comes with two, four, eight, or sixteen card slots. The MicroRack 16 includes its own power supply. If you will be using the MicroRack 2, 4, or 8, you must order a power supply (see the next page for more information on PS460A and PS461A). Measuring only 3.5 inches high, the MicroRack is designed to occupy only 2U in a 19-inch rack. Sturdy front handles allow the MicroRack 16 to be extracted and transported conveniently.

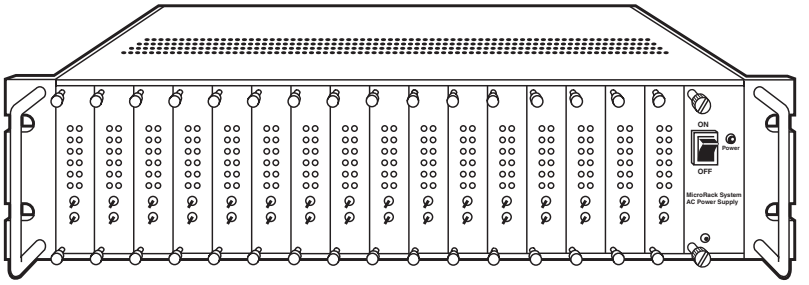


Figure 4-1. The MicroRack 16.

The power supply (PS460A or PS461A) used in the MicroRack uses the same mid-plane architecture as the modem cards. The front card of the power supply slides in from the front, and the rear card slides in from the rear. They plug into one another in the middle of the rack. The front card is then secured by thumbscrews and the rear card by conventional metal screws.

Switching the Power Supply On and Off

The power supply on/off switch is located on the front panel. When plugged in and switched on, a red front-panel LED will glow.

Since the MicroRack is a "hot-swappable" rack, it is not necessary for any cards to be installed before switching on the power supply. The power supply may be switched off at any time without harming the installed cards.

Replacing the Power-Supply Fuse

The rack-chassis power supply uses a 400-mA fuse for 120-VAC circuits, and a 200-mA fuse for 240-VAC circuits. The fuse compartment is located just below the AC socket on the rear card. To replace the fuse, follow these steps:

1) Turn the power switch off and remove the power cord.

2) Using a small screwdriver, pop the compartment open (it will slide open like a drawer). Depending upon the exact part used, the drawer may slide completely out of the fuse holder or it may stop partway out.

3) Note that there are two fuses in the drawer. The front fuse is the spare, and the rear fuse is the "active" fuse.

4) If the active fuse appears to be blown, remove it from the clips and replace it with the spare from the front compartment. Note the size and rating of the blown fuse before discarding it.

5) Buy a replacement fuse at an electronics store. (Note: For continued protection against the risk of fire, replace only with the same type and rating of fuse.)

Switching the Power Supply Between 120 and 240 Volts

Although the MicroRack is shipped from the factory with a customer-specified power-supply configuration, you may change the configuration yourself. Here are the steps to switch the configuration of the power supply between 120 and 240 VAC:

1) Remove the front power-supply card and locate the two-position switch near the back of the card. Slide the switch to the desired voltage. (Note: The actual values on the switch may be "110/220" or "115/230.")

2) Verify that the existing fuse is the correct value (400 mA for the 120-volt, 200 mA for the 240-volt).

3) Connect the power-supply cord.

4.2 Installing the MicroNTU G.703 Card in the MicroRack Chassis

The MicroNTU G.703 Card is made up of a front card and a rear card. The two cards meet inside the MicroRack chassis and plug into each other by way of mating 50-pin card edge connectors. Use the following steps as a guideline for installing each MicroNTU G.703 Card in the chassis.

1) Slide the rear card into the back of the chassis along the metal rails provided.

2) Secure the rear card using the metal screws provided.

3) Slide the card into the front of the chassis. It should meet the rear card when it's almost all the way into the chassis.

4) Push the front card gently into the card-edge receptacle of the rear card. It should click into place.

5) Secure the front card using the thumbscrews.

NOTE

Since the MicroRack chassis allows hot-swapping of cards, it is not necessary to power down the rack when you install or remove a MicroNTU G.703 Card.

4.3 Connection to the G.703 Network

The MicroNTU G.703 Card supports 2.048-Mbps communication over an unstructured G.703 network. Both 120- and 75-ohm interface cards are available (see Figure 4-2).

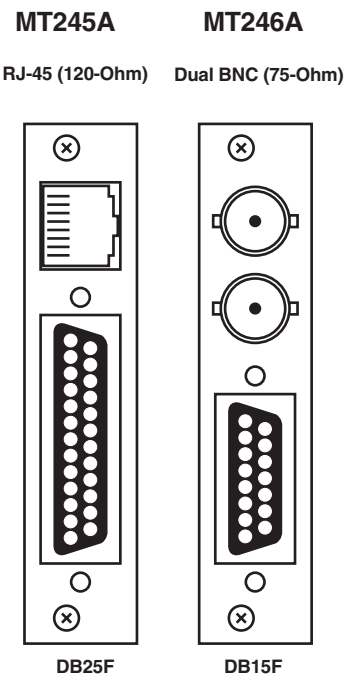


Figure 4-2. Rear interface card options.

4.3.1 Twisted-Pair (120-Ohm) Connection (MT245A)

The 120-ohm version of the MicroNTU G.703 Card is equipped with a single RJ-45 jack for connection to a 120-ohm twisted-pair G.703 network interface. The pinout of this jack is as follows:

RJ-45 Pins	Signal
1 and 2	Receive pair (from network)
3	Shield reference point
4 and 5	Transmit pair (to network)
6	Shield reference point
7	Not used
8	Not used

4.3.2 Dual Coax BNC (75-Ohm) Connection (MT246A)

The 75-ohm version of the MicroNTU G.703 Card is equipped with dual female BNCs (TX and RX) for connection to a 75-ohm dual coax G.703 network interface. The outer conductor of the coax cables is isolated from system earth ground.

4.4 Connection to the Terminal Device

The MicroNTU G.703 Card is wired as a DCE, and—when configured properly—supports communication with a variety of terminal (DTE) devices.

4.4.1 EIA-530 (RS-422) Terminal Connection (MT245A)

The 120-ohm rear card for the MicroNTU G.703 Card is equipped with a female DB25 connector. This connector is wired according to the EIA-530 standard (see the wiring diagram in the **Appendix**). To connect to an RS-530 terminal (DTE), use a standard DB25 cable.

NOTE

The 120-ohm rear card must be set for non-synchronized clocking (see Section 3.2.1) in order to support the EIA-530 interface.

4.4.2 X.21 Terminal Connection (MT246A)

The 75-ohm rear card for the MicroNTU G.703 Card is equipped with a female DB15 connector, wired according to the CCITT X.21 standard (see the **Appendix**). To connect to an X.21 terminal (DTE), use a standard DB15 cable.

NOTE

The 120-ohm rear card can also be used with X.21 terminal devices. To do this, the Card must be set for synchronized clocking (see Section 3.2.1), and a DB25-to-DB15 adapter cable must be used. See the Appendix if you are going to construct your own cable.

5. Operation

Once you have configured each MicroNTU G.703 Card and connected the cables, you are ready to operate the units.

5.1 Power-Up

There is no power switch on the MicroNTU G.703 Card: Power is automatically applied to the Card when its card-edge connector makes contact with the chassis's mid-plane socket, or when the chassis's power supply is turned on.

NOTE

The MicroNTU G.703 Card is a hot-swappable card—it will not be damaged by plugging it in or removing it while the rack is powered up.

5.2 LED Status Monitors

The MicroNTU G.703 Card features four front-panel LEDs that monitor power, network connection, master clock, and loopback. Figure 5-1 shows the front-panel location of each LED. Following Figure 5-1 is a description of each LED's function.

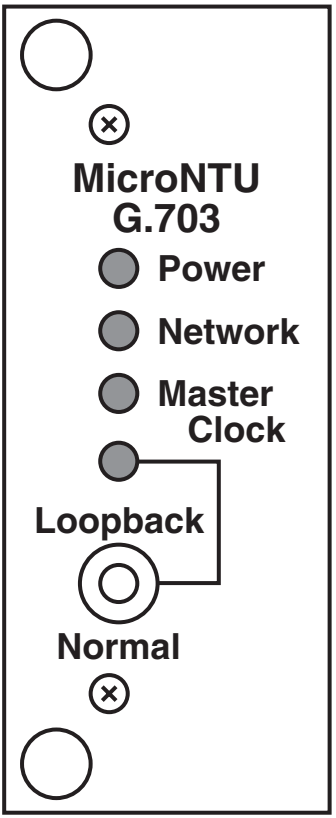


Figure 5-1. The front panel.

Power	Glows red when the Card is powered up.
Network	Glows green when the Card is receiving correctly encoded data from the line-interface equipment.
Master Clock	Glows green when the Card is configured as the master clock unit.
Loop	Glows green when the Card is in loopback mode.

5.3 Loopback Test (LAL)

The MicroNTU G.703 Card is equipped with a Local Analog Loopback (LAL) mode to assist in evaluating the operation of the local MicroNTU G.703 Card. Any data sent to the local MicroNTU G.703 Card in this test mode will be echoed back (returned) to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen. To perform a LAL test:

a.) Activate LAL by moving the front-panel toggle switch up and holding it in the "Loopback" mode. The "Loop" LED should glow. Once LAL is activated, the MicroNTU G.703 Card transmit output is connected to its own receiver.

NOTE

The front-panel switch is spring loaded, so it will return to "Normal" operating mode when pressure is released.

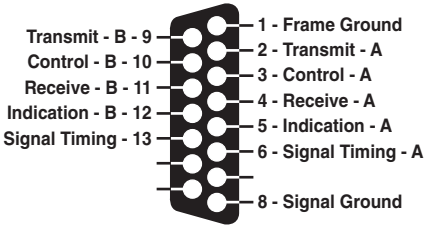
b.) Verify that the data-terminal equipment is operating properly and can be used for a test. If a fault is indicated, call Black Box for technical support or replace the unit.

c.) Perform a BER (bit error rate) test on each unit. If the BER test equipment indicates no faults, but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the MicroNTU G.703 Card.

Appendix. Interface Standards

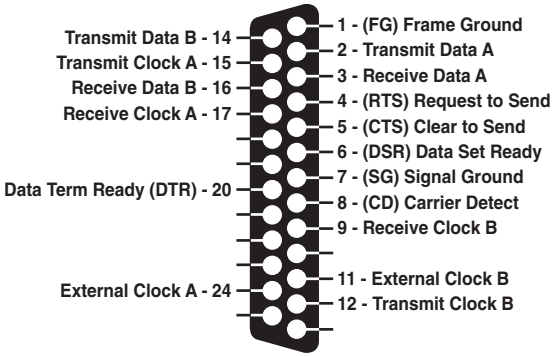
MT246A

CCITT X.21 INTERFACE (DB15)



MT245A

EIA-530 INTERFACE (DB25)



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