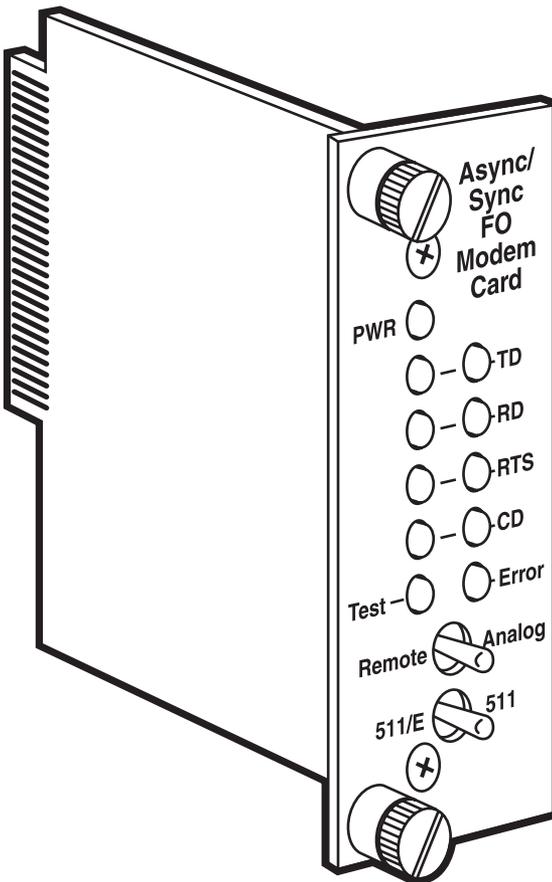# Async/Sync Fiber Optic Modem Card

CUSTOMER
SUPPORT
INFORMATION

Order **toll-free** in the U.S.: Call **877-877-BBOX** (outside U.S. call **724-746-5500**)
FREE technical support 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mailing address: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

NORMAS OFICIALES MEXICANAS (NOM)
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.

TRADEMARKS USED IN THIS MANUAL

ST® is a registered trademark of American Telephone and Telegraph Company.

Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

Contents

1. Specifications

Transmission Line: Dual optical cable

Transmission Mode: Async or sync, half- or full-duplex

Interfaces: EIA RS-232, CCITT V.24

Data Rates: Up to 57.6 kbps

Distance: 4 miles (6.4 km) over continuous fiber

RTS/CTS Delay: Switch-selectable: No delay, 7 ms, 53 ms

Receiver Sensitivity: -45 dBm

Coupled Power Output: -20 to -25 dBm

Optic Wavelength: 850 nm

Switches: (1) Remote/Analog, (1) 511E/511

Indicators: (11) LEDs: (1) Power LED, (4) pairs of LEDs for TD, RD, RTS, CD, (1) Test LED, (1) Error LED

Connectors: HD26 female on RS-232 side, ST® or SMA connectors on fiber side

Temperature: 32 to 104°F (0 to 40°C)

Altitude: Up to 15,000 feet (4572 m)

Humidity: Up to 95% noncondensing

Power: 120/240 VAC (switchable) on rack chassis

Size: 3.1"H x 0.95"W x 5.4"D (7.9 x 2.4 x 13.7 cm)

Weight: 2 oz. (57 g)

2. Introduction

2.1 Description

The Async/Sync Fiber Optic Modem Card is the rackmountable counterpart to the standalone Async/Sync Fiber Optic Modem. Communicating full- or half-duplex over dual optical fibers, the Modem Card supports data rates to 57.6 kbps and distances to 4 miles (6.4 km). Both V.54 and V.52 diagnostics are built into the unit. Like all fiber optic modems, the Card is inherently immune to RFI/EMI noise, ground loops, and transient surges. The carrier may be switch-selected as either "Continuously On" or "Controlled by RTS." The Card has (11) LEDs. Four pairs of bi-level LED indicators monitor TD, RD, RTS, and CD. (1) LED monitors Test, and (1) LED monitors Error. A single LED monitors power.

The Card is designed to mount in a 2U-high 19" rack chassis. The 16-card chassis has a switchable 120/240-volt power supply and mounts cards in a mid-plane architecture. The front "brains" half-card can be plugged into different rear "interface" cards. The Card is available with a choice of two interface cards: one with SMA connectors and one with ST connectors. Both cards are equipped with an HD-26 female connector for the RS-232 interface.

2.2 Features

- Supports async or sync communication over dual optical fibers

- RS-232 data rates up to 57.6 kbps

- V.52 and V.54 diagnostics

- Distance to 4 miles (6.4 km) over continuous fiber

- Mounts in a 16-card chassis

- Immune to RFI/EMI noise, ground loops, and transient surges

- Easily accessible configuration jumpers and switches

- Bi-level LED status indicators for TD, RD, RTS, and CTS; (1) LED each for Test and Error; (1) Power LED

- Works with switchable 120- or 240-volt rackmount power supply

- SMA or ST connectors available (HD26 female connector on RS-232 port) on rear interface card

3. Configuration

The Async/Sync Fiber Optic Modem Card uses a combination of DIP switches and jumpers that allow configuration to an extremely wide range of applications. Designed around a mid-plane architecture, the Card incorporates both front and rear cards. Configuration of both may be necessary. The switches/jumpers are accessible when the cards are removed from the rack chassis. Once configured, the Card is designed to operate transparently, without need for frequent re-configuration.

3.1 Front Card Configuration

The Async/Sync Fiber Optic Modem Card has two sets of eight switches (S1 and S2), which are mounted on the PC board (see Figure 3-1). These configuration switches allow you to configure the Card for a wide range of applications. The ON/OFF orientation of the DIP switches is shown in Figure 3-2.
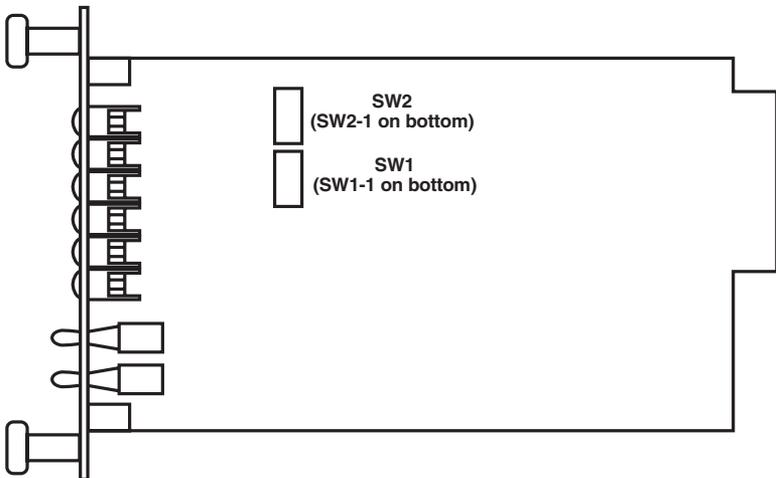

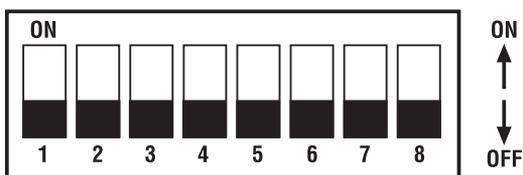**Figure 3-1. Front card jumper locations.**

Figure 3-2. Close-up of DIP switches showing "ON" and "OFF" positions.

3.1.1 CONFIGURATION SWITCH SET S1

The DIP switches on S1 set data rate, clock source, async/sync mode, and carrier-control method. The default settings are summarized in Table 3-1.

Table 3-1. S1 summary table.

Position	Function	Factory Default
S1-1	Data Rate	On (9600 bps)
S1-2	Data Rate	Off (9600 bps)
S1-3	Data Rate	Off (9600 bps)
S1-4	Data Rate	On (9600 bps)
S1-5	Clock Source	On (Internal)
S1-6	Clock Source	On (Internal)
S1-7	Async/Sync	On (Async)
S1-8	Carrier Control	Off (Constantly On)

S1-1 THROUGH S1-4: DATA RATE SETTING

Switches S1-1 through S1-4 are set in combination to determine the asynchronous and synchronous data rate for the Async/Sync Fiber Optic Modem.

Table 3-2. Data rate setting.

S1-1	S1-2	S1-3	S1-4	Setting
On	On	On	On	1.2 kbps
Off	On	On	On	1.8 kbps
On	Off	On	On	2.4 kbps
Off	Off	On	On	3.6 kbps
On	On	Off	On	4.8 kbps
Off	On	Off	On	7.2 kbps
On	Off	Off	On	9.6 kbps*
Off	Off	Off	On	14.4 kbps
On	On	On	Off	19.2 kbps
Off	On	On	Off	28.8 kbps
On	On	Off	Off	38.4 kbps
Off	On	Off	Off	57.6 kbps

*Default

S1-5 AND S1-6: CLOCK SOURCE

Switches S1-5 and S1-6 are set in combination to determine the transmit clock source for the Async/Sync Fiber Optic Modem.

Table 3-3. S1-5 and S1-6 switch settings.

S1-5	S1-6	Setting
On	On	Internal transmit clock*
Off	On	Receive recover clock
On	Off	External transmit clock

*Default

S1-7: ASYNCHRONOUS/SYNCHRONOUS MODE

The setting for switch S1-7 determines whether the Async/Sync Fiber Optic Modem is in asynchronous or synchronous operating mode.

Table 3-4. S1-7 switch setting.

S1-7	Setting
On	Asynchronous*
Off	Synchronous

*Default

S1-8: CARRIER CONTROL METHOD

The setting for switch S1-8 determines whether the carrier is constantly on or controlled by RTS. This setting allows for operation in switched-carrier, multipoint, and hardware-handshaking applications.

Table 3-5. S1-8 switch setting.

S1-8	Setting
Off	Constantly On*
On	Switched Carrier

*Default

3.1.2 CONFIGURATION SWITCH SET S2

The DIP switches on S2 set word length, extended signaling rate, RTS/CTS delay, and V.52 and V.54 diagnostic tests.

Table 3-6. S2 summary table.

Position	Function	Factory Default
S2-1	Word Length	Off (10 bits)
S2-2	Word Length	Off (10 bits)
S2-3	Extended Signaling Rate	On (-2.5% to +2.3%)
S2-4	RTS/CTS Delay	On (7 ms)
S2-5	RTS/CTS Delay	On (7 ms)
S2-6	Future Use	—
S2-7	Future Use	—
S2-8	V.52/V.54 Tests	Off (Enable)

S2-1 AND S2-2: WORD LENGTH

Switches S2-1 and S2-2 are set in combination to determine the word length for asynchronous data.

Table 3-7. S2-1 and S2-2 switch settings.

S2-1	S2-2	Setting
Off	On	8 bits
On	On	9 bits
Off	Off	10 bits*
On	Off	11 bits

*Default

S2-3: EXTENDED **S**IGNALING **R**ATE

The setting for switch S2-3 determines the range of variability the Async/Sync Fiber Optic Modem looks for in asynchronous data rates (i.e., the actual variance from a given frequency level the modem will tolerate).

Table 3-8. S2-3 switch setting.

S2-3	Setting	
Off On	-2.5% to +1% -2.5% to +2.3%	Basic Extended*

*Default

S2-4 **AND S2-5: RTS/CTS **D**ELAY

The combined settings for switches S2-4 and S2-5 determine the amount of delay between the time the modem sees RTS and when it sends CTS. Options are no delay, 7 ms, and 53 ms.

Table 3-9. S2-4 and S2-5 switch settings.

S2-4	S2-5	Setting
On	On	7 ms*
Off	On	53 ms
On	Off	No delay
Off	Off	No delay

*Default

S2-8: V.54 LOOPBACK TEST ENABLE

To reset the V.54 circuit, set switch S2-6 to the "On" position, then back to the "Off" position.

Table 3-10. S2-8 switch setting.

S2-8	Setting
Off	V.54 Enable*
On	V.54 Disable

*Default

3.2 Rear Card Configuration

The Async/Sync Fiber Optic Modem Card is compatible with two dual-fiber interface cards, one with dual ST connectors and one with dual SMA connectors. Both cards use an HD26 female connector for the RS-232 interface. The single configuration jumper (JB1) functions identically on both cards. Figure 3-3 shows the jumper's location.
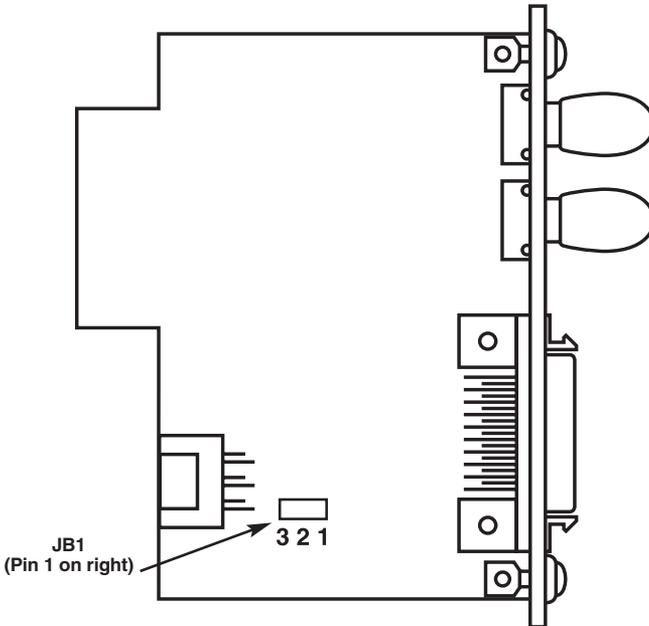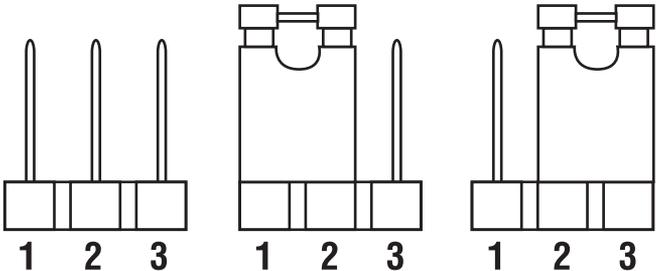

JB1
(Pin 1 on right)

3 2 1

Figure 3-3. Jumper locations on the rear card (Card version only).

HOW THE JUMPER WORKS

Figure 3-4 shows the 3-pin jumpers used on the rear card. The strap enables or disables a particular function depending upon whether it straddles pins 1 and 2 or pins 2 and 3.

Figure 3-4. Orientation of interface card strap.

DTE SHIELD (PIN 1) AND FRGND (JB1)

In the connected (closed) position, this strap links DB25 pin 1 and frame ground. In the open (disconnected) position, pin 1 is "lifted" from frame ground.

JB1 SETTINGS

Position 1 and 2 = DTE Shield (Pin 1) and FRGND connected

Position 2 and 3 = DTE Shield (Pin 1) and FRGND not connected

4. Installation

4.1 The Rack Chassis

The Rack Chassis (Figure 4-1) has 16 short-range modem card slots, plus its own power supply. Measuring only 3.5" high, the Chassis is designed to occupy only 2U in a 19" rack. Sturdy front handles allow the rack to be extracted and transported conveniently.
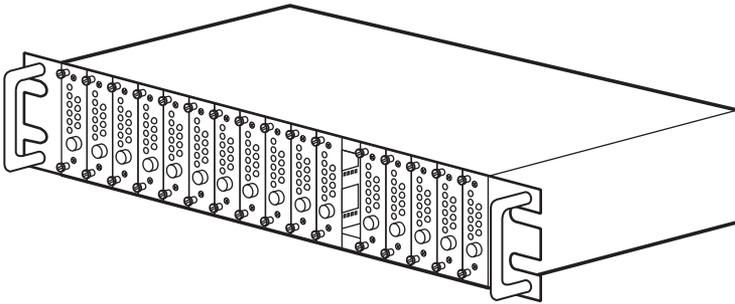
Figure 4-1. The Rack Chassis.

4.1.1 THE RACK POWER SUPPLY

The power supply included in the rack 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.

WARNING

There are no user-serviceable parts in the power supply. Voltage setting changes and fuse replacement should only be performed by qualified service personnel.

4.1.2 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 rack 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.

4.2 Installing the Modem Card

The Modem Card is made up of a front card and a rear card. The two cards meet inside the rack chassis and plug into each other via mating 50-pin card-edge connectors. Use the following steps as a guideline for installing each Card into the Rack Chassis.

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

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

3. Slide the front 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 Rack Chassis allows "hot swapping" of cards, you don't have to power down the rack when you install or remove a Modem Card.

4.3 Wiring the Card

Both of the rear interface cards compatible with the front card have one RS-232 and one dual-connector fiber port (see Figure 4-2). Depending on the card you have, the fiber port will be either an ST or SMA connector. The RS-232 port is always a female HD26 connector.
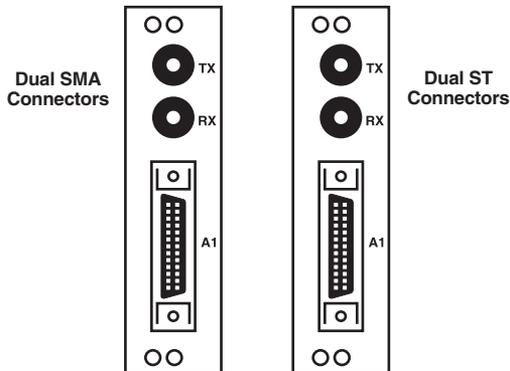
Figure 4-2. Interface card options.

4.3.1 RS-232 CONNECTION

The RS-232 port on the rear card of the Async/Sync Fiber Optic Modem Card is wired as a DCE, and uses a female HD26 connector. The HD26 is an alternate connector according to the EIA RS-232E specification, and the pinout is the same as a standard DB25. Pin 26 is not used.

You will need an interface cable to connect the Modem Card to your RS-232 device. Assuming your RS-232 device is a DTE (PC, host, terminal, workstation, etc.), the cable should be wired straight through. You may provide your own cable, or call Black Box Technical Support for details about ordering one.

NOTE

Any terminal cable connected to the Modem Card must be shielded cable, and the outer shield must be 360-degree bonded—at both ends—to a metal or metalized backshell.

4.3.2 FIBER CONNECTIONS

The Modem Card is designed to work with the self-powered Async/Sync Fiber Optic Modem (ME570A-R2) or with another Modem Card (ME570C-R2). In either case, you will need one unit at each end of a dual fiber cable. This cable connects to the Modem using either ST or SMA connectors. Figure 4-3 shows a close-up of each of these connector types.
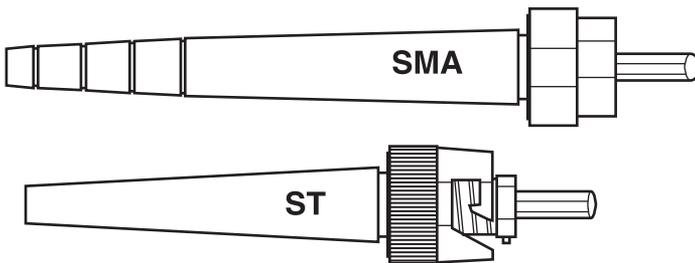

Figure 4-3. Close-up of ST and SMA connectors.

5. Operation

Once you have configured each Async/Sync Fiber Optic Modem Card properly and connected the fiber and RS-232 cables, you are ready to operate the units. This section describes the LED status monitors and power-on procedure.

5.1 LED Status Monitors

The Modem Card features four pairs of front-panel status LEDs that indicate the condition of the modem and communication link. It also has (1) Test LED, (1) Error LED, and (1) Power LED.

- The green PWR LED lights when power is applied to the Modem Card through its mid-plane chassis connection.

- The green TD and RD indicators blink to show positive state data activity. The red TD and RD indicators blink to show negative state data activity. Solid red indicates an idle state.

- The green RTS and CD indicators light steadily to show the control signal is on. The red RTS and CD indicators light steadily to show the control signal is off. When the Modem Card is connected to a DTE, RTS will light green for an incoming signal on RS-232 pin 4. CD will light green for an incoming signal from the line and an outgoing signal on RS-232 pin 8.

- The Test LED lights when either the Local Analog Loopback (LAL) or Remote Digital Loopback (RDL) V.54 test mode is initiated. The Error LED blinks when an error is detected by the V.52 diagnostics.

5.2 Power-On

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

NOTE
The Modem Card is hot-swappable—it will not be damaged by plugging it in or removing it while the rack is powered on.

When the local and remote units are both powered on and are passing data normally, the following LED conditions will exist:

- PWR: green

- TD and RD: flashing red and green

- RTS and CD: green

- Test: Off

- Error: Off

5.3 Test Modes

The Async/Sync Fiber Optic Modem Card offers two V.54 test modes to evaluate the condition of the modems and the communication link. Both sets of tests can be activated physically from the front panel. The V.54 test can also be activated from the RS-232 interface.

NOTE
V.54 and V.52 test modes on the Async/Sync Fiber Optic Modem are available for point-to-point applications only.

5.3.1 LOCAL ANALOG LOOPBACK (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local modem, and is performed separately on each unit. Any data sent to the local modem in this test mode will be echoed back (returned) to the user device. For example, characters typed on the keyboard or terminal will appear on the terminal screen. To perform an LAL test, follow these steps:

1. Activate LAL. This may be done in one of two ways: First, by moving the upper front-panel toggle switch right to "Analog." Second, by raising pin 18 on the RS-232 interface.

NOTE
Make sure DIP-switch SW2-8 is OFF.

Once LAL is activated, the modem transmit output is connected to its own receiver. The Test LED should be lit.

2. Verify that the data terminal equipment is operating properly and can be used for a test.

3. Locate the lower of the two toggle switches on the front panel of the Modem Card and move it to the right. This will activate the V.52 BER test mode and inject a "511" test pattern into the local loop. If any errors are present in the loop, the red Error LED will blink sporadically.

4. If the BER test indicates no errors are present, check to see that the RS-232 cable connecting the DTE to the Modem Card is wired straight through and is plugged in properly. Also, make sure that the Modem Card is configured properly. Then re-check your DTE equipment. If you still have errors, call Black Box Technical Support at 724-746-5500.

5.3.2 REMOTE DIGITAL LOOPBACK (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote modems and the communication link between them. Any characters sent to the remote modem in this test mode will be returned back to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote modem and looped back. To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in two ways: First, by moving the front-panel toggle switch left to "Remote." Second, by raising pin 21 on the RS-232 interface.

NOTE
Make sure SW2-8 is OFF.

2. Verify that the DTE equipment on the local end is operating properly and can be used for a test.

3. Locate the lower of the two toggle switches on the front panel of the Modem Card and move it to the right. This will activate the V.52 BER test mode and inject a 511 test pattern into the remote loop. If any errors are present in the loop, the red Error LED will blink sporadically.

4. If the BER test indicates no errors are present, move the V.52 toggle switch to the left, thus activating the 511/E test with periodic errors. If the test is working properly, this suggests a problem with the twisted-pair communication line connecting the two modems. A common problem is improper crossing of the pairs. Also, verify that the modular connections are pinned properly and the twisted pair line has continuity. If you still have errors, call Black Box Technical Support at 724-746-5500.

5.3.3 USING THE V.52 BER TEST INDEPENDENTLY

The V.52 BER test can be used independently of the V.54 loopback tests. This requires two operators: one to initiate and monitor the test at the local modem, and one at the remote modem. To use the V.52 BER test by itself, both operators should simultaneously follow these steps:

1. Locate the lower of the two toggle switches on the front panel of the Modem Card and move it to the right. This will activate the V.52 BER test mode and transmit a 511 test pattern to the other unit. If any errors are present, the receiving modem's red Error LED will blink sporadically.

NOTE
For this test to function, the 511 switch on both modems must be on.

2. If the test indicates no errors are present, move the V.52 toggle switch UP, activating the 511E test with periodic errors present. If the test is working properly, the receiving modem's red Error LED will glow. A successful 511E test will confirm that the link is in place, and that the modem's built-in 511 generator and detector are working properly.
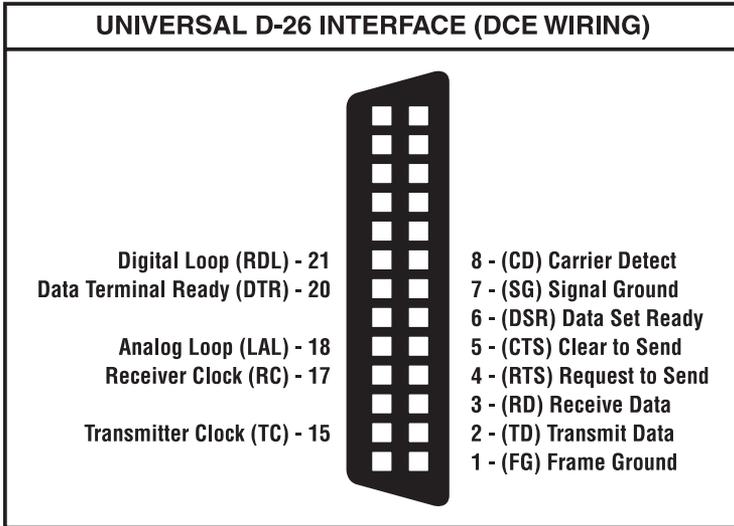
Appendix. Pin Configuration

UNIVERSAL D-26 INTERFACE (DCE WIRING)

Digital Loop (RDL) - 21
Data Terminal Ready (DTR) - 20

Analog Loop (LAL) - 18
Receiver Clock (RC) - 17

Transmitter Clock (TC) - 15

8 - (CD) Carrier Detect
7 - (SG) Signal Ground
6 - (DSR) Data Set Ready
5 - (CTS) Clear to Send
4 - (RTS) Request to Send
3 - (RD) Receive Data
2 - (TD) Transmit Data
1 - (FG) Frame Ground

Figure A-1. HD26 interface pin configuration.

BLACK BOX®
NETWORK SERVICES