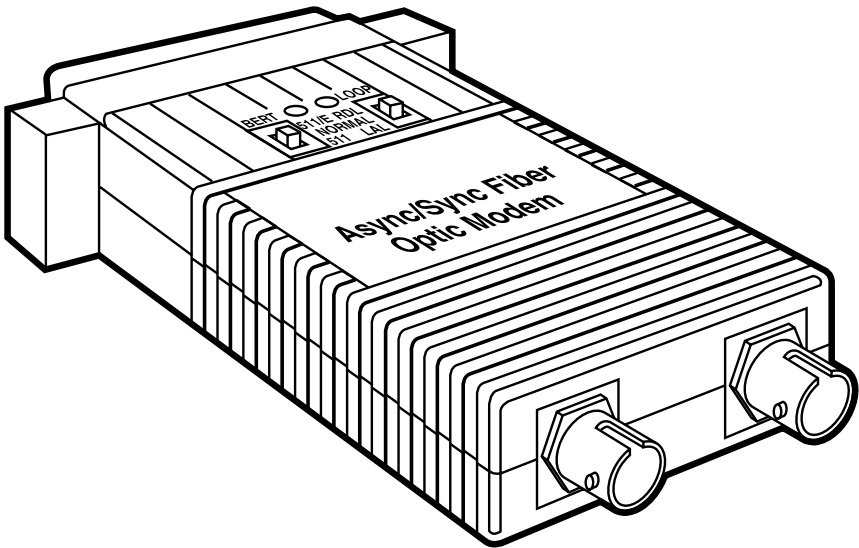




## Async/Sync Fiber Optic Modem



**CUSTOMER  
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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  
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**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 B 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 conectado 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 física 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 líneas de energía.
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 objetos líquidos 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: Objetos 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

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

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# 1. Specifications

**Transmission Line:** Dual optical cable

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

**Interfaces:** EIA RS-232, CCITT V.24

**Data Rates:** Up to 57.6 kbps

**Distance:** 3.5 miles (5.6 km) over continuous fiber

**RTS/CTS Delay:** Switch-selectable: No delay, 9 ms, 79.5 ms

**Receiver Sensitivity:** -38 dBm

**Coupled Power Output:** > -25 dBm

**Optic Wavelength:** 850 nm

**Connectors:** DB25 male or female (DCE) on RS-232 side, ST® or SMA on fiber side

**Indicators:** (2) LEDs: Error (Loop), Test (BERT)

**Temperature:** 32 to 104°F (0 to 40°C)

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

**Humidity:** Up to 95% noncondensing

**Power:** No external power required; uses power from RS-232 data and control signals; 8 VDC minimum, pins 4, 9, or 20

**Size:** 2.3"H x 2.1"W x 0.7"D (5.8 x 5.3 x 1.8 cm)

**Weight:** Standalone models: 0.1 lb. (>0.1 kg)

## 2. Introduction

The Async/Sync Fiber Optic Modem is a miniature modem that combines the inviolability of fiber with the troubleshooting capabilities of V.52 and V.54 diagnostics. The modem operates in asynchronous or synchronous mode, supports data rates to 57.6 kbps, and plugs directly into a workstation's RS-232 port. The modem is also available in a card version (ME570C-R2).

Like all fiberoptic modems, the Async/Sync Fiber Optic Modem 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." Two easy-to-read LED indicators monitor the Error and Test modes. Drawing all necessary power from the RS-232 interface, the modem requires no AC power or batteries to operate.

The miniature modem fits into tight installation spaces. On the RS-232 side, the modem is equipped with either a male or female DB25 connector. On the fiber side, the modem has either SMA or ST® connectors. It supports distances of up to 3.5 miles (5.6 km).



## 3. Configuration

The Async/Sync Fiber Optic Modem is fairly simple to install. The following instructions will help you set up and install the modem properly. If you have questions, call Black Box Technical Support at 724-746-5500.

### 3.1 Configuration Switches

The Async/Sync Fiber Optic Modem uses a unique set of 16 external mini DIP switches that allow configuration to an extremely wide range of applications. These 16 DIP switches are grouped in two eight-switch sets and are externally accessible from the underside of the modem (see Figure 3-1).

The configuration switches allow you to select data rates, clocking methods, V.52 and V.54 tests, word lengths, extended signaling rates, and async or sync mode. The following pages describe all switch locations, positions, and functions.

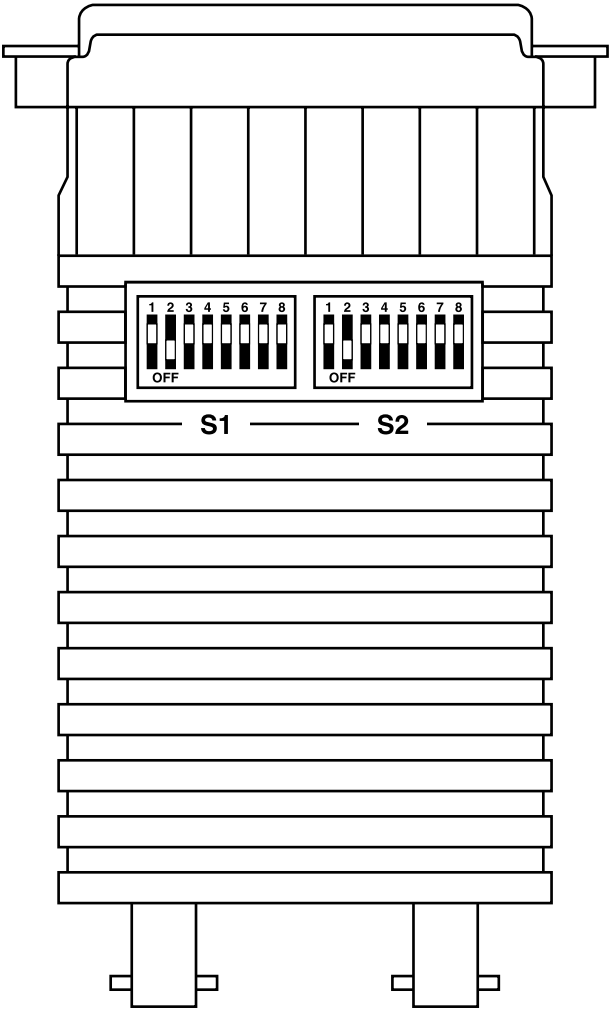


Figure 3-1. DIP switches on the Async/Sync Fiber Optic Modem.

## ASYNCR/SYNCR FIBER OPTIC MODEM

The Async/Sync Fiber Optic Modem has two sets of eight switches, referred to as S1 and S2. As Figure 3-2 shows, the orientation of all DIP switches is the same with respect to “ON” and “OFF” positions.

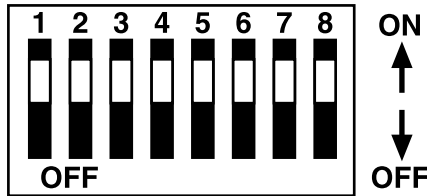


Figure 3-2. Close-up of DIP switches showing “ON” and “OFF” positions.

### 3.2 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)

**3.2.1 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.**

<b>S1-1</b>	<b>S1-2</b>	<b>S1-3</b>	<b>S1-4</b>	<b>Setting</b>
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

**3.2.2 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.**

<b>S1-5</b>	<b>S1-6</b>	<b>Setting</b>
On	On	Internal transmit clock*
Off	On	Receive recover clock
On	Off	External transmit clock

\*Default

**3.2.3 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.**

<b>S1-7</b>	<b>Setting</b>
On	Asynchronous*
Off	Synchronous

\*Default

**3.2.4 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.**

<b>S1-8</b>	<b>Setting</b>
Off	Constantly On*
On	Switched Carrier

\*Default

### 3.3 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 test.

**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	Off (-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)

#### 3.3.1 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

**3.3.2 S2-3: EXTENDED SIGNALING RATE**

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.**

<b>S2-3</b>	<b>Setting</b>	
On	-2.5% to +1%	Basic
Off	-2.5% to +2.3%	Extended*

\*Default

**3.3.3 S2-4 AND S2-5: RTS/CTS DELAY**

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.**

<b>S2-4</b>	<b>S2-5</b>	<b>Setting</b>
On	On	7 ms*
Off	On	53 ms
On	Off	No delay
Off	Off	No delay

\*Default

**3.3.4 S2-8: V.54 LOOPBACK TEST ENABLE**

To reset the V.54 circuit, set switch S2-8 to the “On” position, then back to the “Off” position.

**Table 3-10. S2-8 switch setting.**

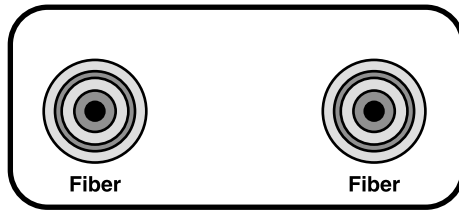
<b>S2-8</b>	<b>Setting</b>
Off	V.54 Enable*
On	V.54 Disable

\*Default



## 4. Installation

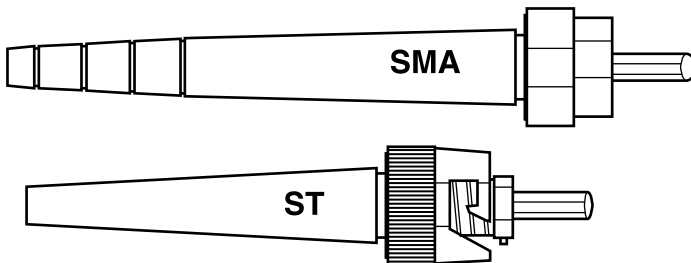
The Async/Sync Fiber Optic Modem is easy to install. After configuring the DIP switches, simply connect the two fiber cables and then connect the RS-232 interface. Figure 4-1 shows the location of the fiber connections on the rear panel.



**Figure 4-1. Rear panel.**

### 4.1 Fiber Connections

The Async/Sync Fiber Optic Modems are designed to work in pairs. You will need one at each end of a dual-fiber cable. This cable connects to each modem using either an ST or an SMA connector. Figure 4-2 shows a close-up of each of the connectors.



**Figure 4-2. SMA and ST connectors.**

### 4.2 RS-232 Connection

Because the Async/Sync Fiber Optic Modem is designed to act as either a DCE or a DTE device, it does not need special cables to operate. Always use a straight-through RS-232 cable.

## 5. Operation

Once you have configured each Async/Sync Fiber Optic Modem and connected the fiber and RS-232 cables, you are ready to operate the units. This chapter describes the LED status monitors, the V.52 and V.54 diagnostics, and the power-on process.

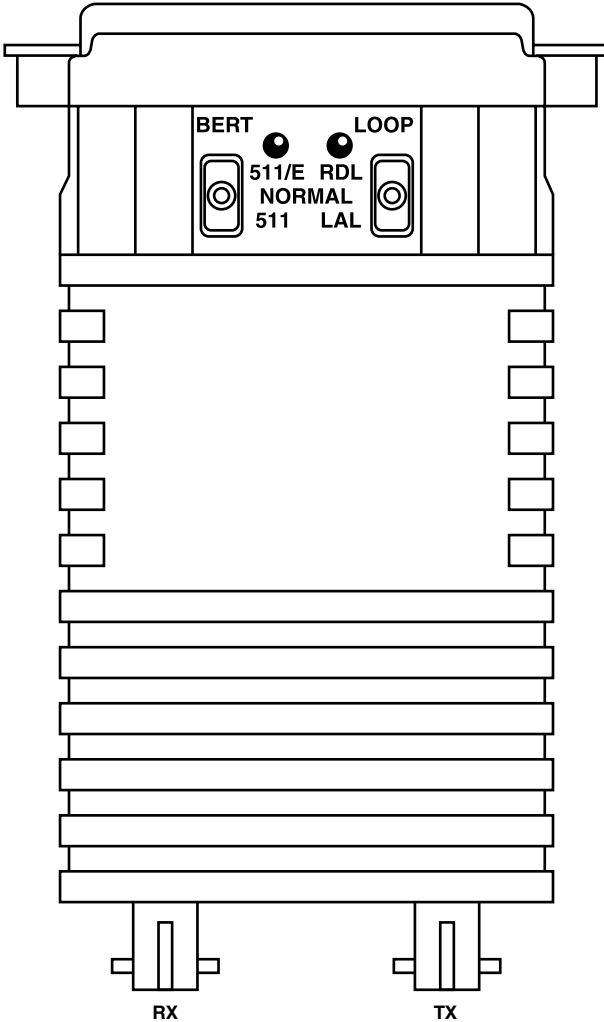


Figure 5-1. LEDs.

## Test Modes

The Async/Sync Fiber Optic Modem offers two V.54 test modes to evaluate the condition of the modems and the communication link. These tests can be activated physically from the front panel or via the interface.

### NOTE

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

#### 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 front-panel toggle switch down to LAL. Second, by raising pin 18 on the interface.

### NOTE

**Make sure DIP-switch SW1-8 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. If a fault is indicated, call a technician to replace the unit.
3. 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 modem.

**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 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 up to RDL. Second, by raising pin 21 on the interface.

**NOTE**

**Make sure SW1-8 is OFF.**

2. Perform a BER (bit error rate) test on the system.
3. If the BER test equipment indicates a fault, and the Local Analog Loopback test was successful for both modems, you may have a problem with the twisted-pair line between the modems. You should then check the fiber line for proper connections and continuity.

**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:

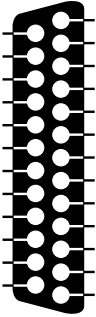
1. Locate the 511/511E toggle switch on the front panel of the modem and move it DOWN. This activates the V.52 BER test mode and transmits a 511 test pattern to the other unit. If any errors are present, the receiving modem's red Error LED will blink sporadically.

**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 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

DIRECTION	"DCE" STANDARD SETTING	DIRECTION
To Modem	 <p>1-(FG) Frame Ground                  2-(TD) Transmit Data                  3-(RD) Receive Data                  4-(RTS) Request to Send                  5-(CTS) Clear to Send                  6-(DSR) Data Set Ready                  7-(SG) Signal Ground                  8-(DCD) Data Carrier Detect</p> <p>Data Term. Ready (DTR) -20</p>	To Modem From Modem To Modem From Modem From Modem From Modem

**Figure A-1. Pin configuration.**



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