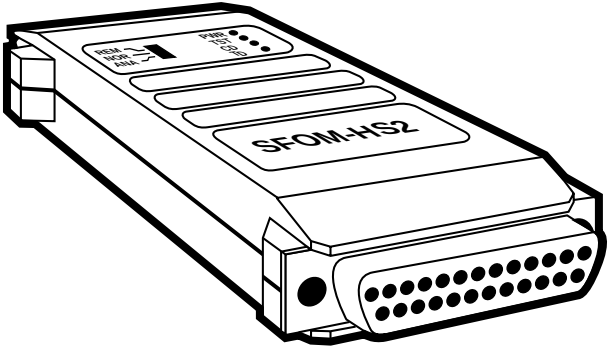
BLACK BOX
NETWORK SERVICES

NOVEMBER 1997
MT632A-ST35
MT632A-ST232
MT632A-SM35
MT632A-SM232

SFOM-HS2



CUSTOMER SUPPORT INFORMATION

Order **toll-free** in the U.S. 24 hours, 7 A.M. Monday to midnight Friday: **877-877-BBOX**
FREE technical support, 24 hours a day, 7 days a week: Call **724-746-5500** or fax **724-746-0746**
Mail order: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018
Web site: **www.blackbox.com** • E-mail: **info@blackbox.com**

TRADEMARKS USED IN THIS MANUAL

UL is a registered trademark of Underwriters Laboratories Incorporated.

ST is a registered trademark of AT&T.

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

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 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.

UL Listing Requirements

IMPORTANT SAFETY INSTRUCTIONS

For North American Users

The SFOM-HS2 is powered by an external power supply (product code PS632). To reduce the risk of shock, fire, and injury, use it only with a UL® listed and CSA Certified Class 2 power supply rated 9 VDC, 300 mA.

Exigences UL

INSTRUCTIONS IMPORTANTS DE SÉCURITÉ

Pour les utilisateurs Nord Americains

Le SFOM-HS2 est renforcé par un transformateur extérieur (code produit PS632). Afin de réduire le risque d'électrocution, d'incendie ou de blessure, utiliser seulement avec un transformateur 9 VDC, 300 mA Certifié classe 2 CSA et repris sur la liste UL®.

TÜV Certification Requirements

Installation – User Instructions

Electrical ratings: 9 VDC, 300 mA

The following instructions are intended to guarantee the basic operation of the equipment concerning safety.

CAUTION!

1. **To reduce the risk of electric shock, use only with a power supply which is approved for the lastest version of EN 60950.**
2. **For continuous protection against risk of fire, do not operate the equipment with the enclosure completely or partially removed.**
3. **Do not install the equipment with indicators facing down.**

TÜV-Zertifizierungsanforderungen

Installation – Bedieningsanleitung

Leistungsaufnahme: 9 VDC, 300 mA

Die nachfolgenden Anleitungen sollen den Grundbetrieb der Anlage hinsichtlich Sicherheit gewährleisten.

ACHTUNG!

1. **Um das Risiko eines elektrischenSchlages oder Brandes so weit wie möglich zu vermeiden verwenden Sie nur ein Netzteil, das gemäß der neuesten Version des Standards EN 60950 zugelassen ist.**
2. **Als ständigen Schutz vor Brand betrieben Sie die Anlage nie mit ganz oder teilweise entfernter Abdeckung.**
3. **Installieren Sie de Anlage nicht mit nach unten weisenden Anzeigeelementen.**

Contents

1. Specifications

Compliance — FCC Class B, IC Class/ classe B; UL®, CSA, TÜV

Interfaces — Device side:
"–Sx232" models:
TIA RS-232/ITU-TSS V.24;
"–Sx35" models:
ITU-TSS V.35;
Line side:
Multimode fiberoptic

Protocols — Synchronous or asynchronous (user-selectable)

Clock Source — Internal, external (from device side), or recovered (from line-side receive signal)

Data Format — **Async:** 1 start bit (fixed); 5, 6, 7, or 8 data bits; even, odd, or no parity; and 1, 1.5, or 2 stop bits (user-selectable), with a minimum of 8 and a maximum of 11 total bits

Frequency Allowance —	**Async:** Stop bit can be shortened on the receive end to accommodate a frequency difference between the SFOM-HS2 and the attached device, either by 12.5% (allows a –2.5% to +1% difference) or by 25% (allows a –2.5% to +2.3% difference), user-selectable
Carrier —	Constantly ON or follows RTS (user-selectable)
Operation —	Full-duplex over duplex fiberoptic cable
Data Rates —	56 or 64 Kbps (user selectable)
Optical Output (Transmit Level)—	100/140µ fiber: –26 dBm; 62.5/125µ fiber: –28 dBm; 50/125µ fiber: –32 dBm
Receiver Sensitivity —	–43 dBm

Optical Wavelength — 850 nm

Maximum Distance — 2.5 miles (4 km)

User Controls — (1) Top-mounted three-position slide switch for test selection;
(10) Internal DIP-switch positions for protocol, data rate, data format, stop-bit shortening, carrier, and interface-based loop control

Diagnostics — Local analog and remote digital loopback, controlled with top-panel switch or optionally with interface signals

Indicators — (4) Top-mounted LEDs: PWR (power), TST (test), CD, and TD

Connectors —	Device side: (1) Front-mounted DB25 female; V.35 models include a 17.5" (45-cm) adapter cable that patches this to an M/34 (34-pin M-block) female; Line side: "-SMxxx" models: (2) SMA 906 female; "-STxxx" models: (2) ST female
Power —	From wallmount power supply PS632 (not included): Input: 115-VAC, 60 Hz; Output: 9 VDC, 300 mA
Size —	5.1"H x 2.1"W x 1.2"D (13 x 5.3 x 3 cm)
Weight —	0.2 lb. (0.1 kg)

2. Introduction

The SFOM-HS2 is a high-speed fiberoptic local (short-haul) modem. You can use pairs of SFOM-HS2s to make extended-distance, full-duplex connections across fiberoptic cable between synchronous or asynchronous terminals, PCs, or controllers on one end and high-speed computers on the other.

There are four models of SFOM-HS2 available (see **Table 2-1** below). Each has fiberoptic connectors on one side for attaching fiberoptic cable, and a DB25 connector on the other side for attaching your data-terminal equipment (DTE). (The V.35 models include a special adapter cable that patches the DB25 connector to a 34-pin M-block connector more appropriate for most V.35 equipment.)

Table 2-1. The SFOM-HS2 Models and their Interfaces

Product Code	Fiber Connectors	DTE Interface Standard
MT632A-ST35	ST® Style	V.35
MT632A-ST232	ST Style	RS-232
MT632A-SM35	SMA Style	V.35
MT632A-SM232	SMA Style	RS-232

Each SFOM-HS2 converts the electrical data signal from the DTE interface into light pulses for transmission across the fiber interface. It can operate at 56 or 64 Kbps, and can transmit data as far as 2.5 miles (4 km); see **Figure 2-1** below.

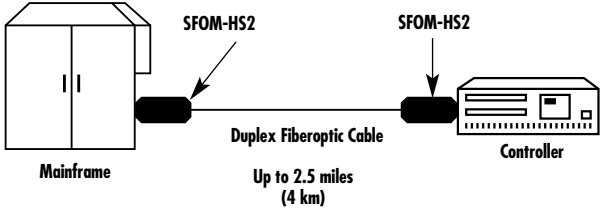


Figure 2-1. A typical SFOM-HS2 application.

Each unit also supports two ITU V.54 industry-standard loop tests for easy, convenient diagnostics (see **Section 4.3**).

The SFOM-HS2 can get its transmit timing from any of three sources: its own oscillator (internal clock), the attached DTE (external clock), or the receive signal (recovered clock).

You can also choose whether carrier is constantly ON or switched. In switched mode, the carrier is controlled by the RTS signal so you can transfer a control signal end-to-end.

9-VDC power for the unit comes from the external wallmout AC power supply PS632 (sold separately).

3. Installation and Configuration

Each SFOM-HS2 has a three-position loop-activation switch on the front panel, plus ten internal DIP switches (see **Figure 3-1** below). Use these switches to configure the SFOM-HS2 prior to installation. (See **Chapter 4** for more about configuration options.)

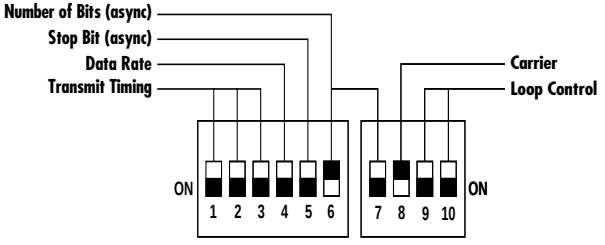


Figure 3-1. The internal DIP switches.

To set the DIP switches in an SFOM-HS2:

1. Use a small screwdriver to gently pry open each of the unit's four locking tabs and open the plastic case (see **Figure 3-2** on the next page).

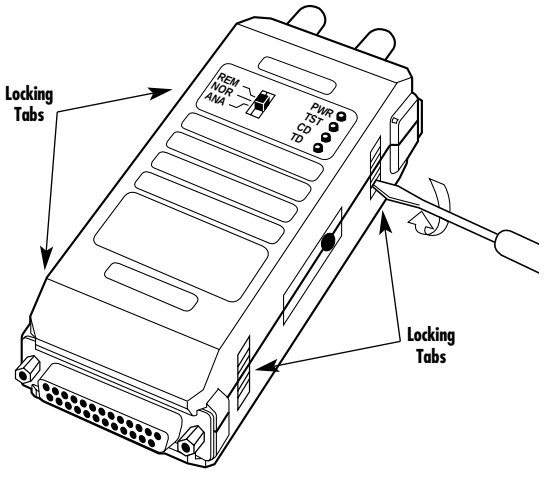


Figure 3-2. Opening the plastic cover.

2. Set the DIP switches to match your application's requirements. **Table 3-1** on the next page lists the possible settings. (A similar table is printed inside the unit's plastic case, for reference during field installations.) See **pages 18** and **19** for the recommended settings for most synchronous and asynchronous applications respectively.

Table 3-1. DIP-Switch Functions, Settings, and Defaults

Feature	Function Settings	Possible DIP Switch Settings	Default
Transmit Timing	Determines sync clock source or async mode	1 2 3 ON OFF OFF OFF OFF OFF OFF OFF ON OFF ON OFF	External Internal Receive Async
Data Rate	Determines data-transmission rate	4 ON—56 Kbps OFF—64 Kbps	64 Kbps
Async Data Format (Word Length)	Determines the amount of stop-bit shortening to be used in async mode	5 ON—12.5% OFF—25%	25%
	Determines word length in async mode (see **Appendix A**)	6 7 # of bits OFF OFF 8 OFF ON 9 ON OFF 10 ON ON 11	10 bits
Carrier	Determines carrier—constantly on, or controlled by RTS	8 ON—Constantly ON OFF—Controlled	ON
Loop Activation from the DTE Interface (Loop Control)	ANA Determines DTE control of analog loop REM Determines DTE control of remote digital loop	9 ON—Enable OFF—Disable 10 ON—Enable OFF—Disable	Disable Disable

- Follow these steps to configure your SFOM-HS2 for synchronous operation. (Note that DIP switches 5, 6, and 7 are not relevant for sync operation.)

  a. Use switches 1, 2, and 3 to set XMT timing to INT (internal), EXT (external), or RCV (recovered).

  b. Use switch 4 to set the data rate to 56 or 64 Kbps.

  c. Use switch 8 to set carrier to constantly on or controlled by RTS.

  For example, DIP switch settings on an SFOM-HS2 configured for internal clocking, 64 Kbps, and constant carrier would be:

  1, 2, 3 = OFF 4 = OFF 8 = ON

- Follow these steps to configure your SFOM-HS2 for for asynchronous operation.

  a. Use switches 1, 2, and 3 to select "async" (turn XMT timing off).

  b. Use switch 4 to set the data rate.

  c. Use switches 5, 6, and 7 to set frequency allowance and character length (if necessary, refer to **Table 3-1** on **page 17**, **Figure 3-1** on **page 15**).

  d. Use switch 8 to set carrier to constantly on or controlled by RTS.

  For example, DIP-switch settings on an SFOM-HS2 configured for async operation, 64 Kbps, and constant carrier would be:

  1, 3 = OFF 2 = ON 4 = ON
  6, 7 = OFF 8 = ON

NOTE

PCs working at high speeds in async mode operate at 57.6 Kbps (instead of 56 Kbps). In such cases, the PC should be set to use two stop bits, and the SFOM-HS2 should be set to use one stop bit and to communicate at 56 Kbps.

3. Carefully close the two halves of the unit's plastic case, pressing them together firmly until the four locking tabs snap back into place.

4. If possible, plug the SFOM-HS2 directly into your DTE's DB25 connector (or, if your unit is a V.35 model, run the included adapter cable from the SFOM-HS2 to your DTE's M/34 [also called "34-pin M-block"] connector). If you have to run an additional cable between the DTE and the SFOM-HS2, keep it as short as possible. Once you've made this connection, tighten the connector screws to ensure a secure hold.

5. Remove the plastic dust caps from the fiberoptic connectors and attach your fiber cable to them:

   - Connect the local SFOM-HS2's TX port to the remote unit's RX port.

   - Connect the local SFOM-HS2's RX port to the remote unit's TX port.

6. Connect the output cord of the included external power supply to the SFOM-HS2's power jack, then plug the transformer into a nearby AC wall outlet.

4. Troubleshooting

4.1 Diagnostic Loopback Tests

You can configure the SFOM-HS2 to perform either of two test loops. V.54 Loop 3 (ANA, local analog loopback) tests the local SFOM-HS2 by routing the transmit signal the unit gets from the attached device back to that device through its receiver (see **Figure 4-1** below).

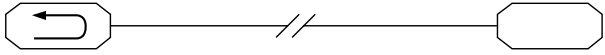


Figure 4-1. Local analog loopback (ANA).

V.54 Loop 2 (REM, remote digital loopback) tests the local SFOM-HS2, the line, and the remote SFOM-HS2 (see **Figure 4-2** below).

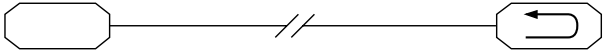


Figure 4-2. Remote digital loopback (REM).

Both loops can be controlled either physically, with the top-panel loop-selection switch, or electronically, by having the DTE raise and lower the signals to Pins 18 (ANA) and 21 (REM) of the SFOM-HS2's DB25 connector.

NOTE

To select loops electronically with the V.35 version of the SFOM-HS2, use Pins JJ (ANA) and HH (REM) of the adapter cable's M/34 connector.

To activate loops from your DTE, DIP switches 9 and 10 must be set to ENABLE (see **Figure 3-1** on **page 15** and **Table 3-1** on **page 17**).

Start the loop test by moving the top-panel loop-selection switch to the desired test position or raising the appropriate signal on the DTE interface.

While a diagnostic loop is active, the top-panel TST LED will light and the Test Mode signal (DB25 Pin 25 or M/34 Pin KK) will be held high (ON).

To return to normal operation, reset the top-panel loop-selection switch to the center NOR position or lower the controlling DTE-interface signal. The TST LED and Test Mode signal will turn OFF automatically.

4.2 Calling Black Box

If your SFOM-HS2 seems to be malfunctioning, *do not attempt to alter or repair the unit.* It contains no user-serviceable parts. Call Black Box Technical Support at 724-746-5500. The problem might be solvable over the phone.

Before you call, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

4.3 Shipping and Packaging

If you need to transport or ship your SFOM-HS2:

- Package it carefully. We recommend that you use the original container.
- If the shipping is return- or repair-related, pack the SFOM-HS2, its power supply, and this manual together. Contact Black Box to get a Return Materials Authorization (RMA) number.

NOTES