BLACK BOX®
NETWORK SERVICES

Async/Sync 2-Wire
Short Haul Modem Cards

**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.

SAFETY WARNING

Always observe standard safety precautions during installation, operation, and maintenance of this product. If you attempt to remove the power-supply fuse, be sure to disconnect the power cord from the power source first, in order to avoid the possibility of electric shock.

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

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

Contents

1. Specifications

Compliance—FCC Part 15 Subpart J Class A, DOC Class/MDC classe A

Standard—T1: ANSI T1.601.1988

Protocols—DTE side: Synchronous or asynchronous; Line side: 2B1Q encoding

Clock Source—Internal, external (from DTE), or received (from other unit); user-selectable

Data Format—7 or 8 data bits; 1 or 2 stop bits; even, odd, or no parity (user-selectable)

Operation—Line side: Full duplex with echo cancellation

Data Rate—128, 115.2, 64, 57.6, 48, 38.4, 19.2, 9.6, 4.8, 2.4, 1.2, and 0.6 kbps

Transmission Level—Up to 14 dBm

Connectors—(1) DB25 female

Digital Interface—ME375C-232: CCITT V.24/RS-232; ME375C-530: RS-530; ME375C-X21: X.21

Diagnostics—*Digital Loopback:* Local (DIG), activated by a manual switch; Remote (REM), activated by a manual switch or by the DTE interface connector signal (only by manual switch in X.21 version); *Analog Loopback:* Local (ANA), activated by manual switch or by the DTE interface signal (only by manual switch in X.21 version)

Maximum Altitude—8000 ft. (2438.4 m)

Temperature Tolerance—32 to 122°F (0 to 50°C)

Power—5 watts (from rack)

Size—6.2"H x 1"W x 9"D (15.7 x 2.5 x 22.9 cm)

Weight—0.8 lb. (0.4 kg)

2. Introduction

2.1 The Modem Cards

The Async/Sync 2-Wire Short Haul Modem Card (A/S2W SHM) operates synchronously or asynchronously at high speeds (up to 128 kbps) and in full duplex over one pair of dedicated telephone lines. It has a range of 3.4 miles (5.5 km) over 26-AWG wire.

   The A/S2W SHM Card operates in full duplex over 2 wires by using the adaptive "echo-canceling" technique. Because it also uses 2B1Q line coding, it can achieve a range of 3.4 miles no matter what the data rate is.

   The A/S2W SHM Card incorporates interface circuits for the terminal/computer, an adaptive echo-canceler, an automatic adaptive equalizer, a modulator, and a demodulator. It is coupled to the telephone line through an isolation transformer, which protects against AC or DC overvoltages. The protection circuitry enables the Card to operate even if DC were accidentally connected to the line.

   The A/S2W SHM Card has diagnostic capabilities: It can perform local analog loopback and local and remote digital loopback. The operator at either end of the line may test both modems and the line in the remote digital loopback mode. Loopback can be controlled via signals passed through the DTE (PC, data terminal) interface.

   The ME375C-232, ME375C-530, and ME375C-X21 are card versions of the Async/Sync 2-Wire Short Haul Modem. The main difference between these cards and the standalone versions is that where the standalone units have their own interface-specific connectors on their rear panels, the cards plug into the RackNest 2/14 and use its generic connectors.

   The Cards' front-panel indicators and controls are arranged vertically rather than horizontally, The indicators and controls are described in **Section 3.1**. For the X.21 card, the RTS LED is equivalent to Control signal (C), and DCD LED is equivalent to Indication signal (I).

   The ME375C-232 and ME375C-530 are alike in this way: ME375C-232 and ME375C-530 pairs are designed to communicate with each other across an RS-232 or RS-530 interface. That is, they use only one transmit, one receive, and one ground lead, as opposed to using a pair of transmit leads and a pair of receive leads (with an optional ground). The ME375C-X.21 is an X.21 version of this card.

Each Card consumes 5 watts of power from the RackNest 2/14, is 6.2"H x 1"W x 9"D (15.7 x 2.5 x 22.9 cm), and weighs 0.8 lb. (0.4 kg).

2.2 The RackNest 2/14

The RackNest 2/14 is a 19" rack component that can host a number of short-haul modems and line drivers. As shown in **Figures 3-2** and **3-3**, it consists of a rack chassis (with one or two power supplies) into which you can plug as many as 14 modem or driver cards.

The Nest's rear panel consists of fourteen 5-screw terminal blocks ("TB1") and fourteen connectors ("J1"). Each terminal block ("TB1") provides four screws, two of which are used for connecting the Nest-to-Nest 2-wire transmit and receive lines. The transmit line or pair can be connected to (one of) the terminals marked XMT, and the receive line or pair can be connected to (one of) the terminals marked RCV. A fifth screw connects to ground (optional for balanced-interface cards).

Each interface connector ("J1") on the ME375C-232, ME375C-530, or ME375C-X21 is a DB25 female. The pinning of this connector depends on the type of Card installed in the corresponding slot, because the Cards will present and expect different signals on different pins. For the RS-232 model of the (unbalanced-interface) A/S 2W SHM Card (ME375C-232), the pinning is RS-232; for the RS-530 the pinning is RS-530; and for the X.21 models of these cards, the pinning is X.21. (Refer to the **Appendix** for more information.

2.3 The RackNest 2/14's Power Supply

The 115-VAC RackNest 2/14 (our product code RM110A) uses the PS1000A power supply, which accepts 115-VAC input power. The 230-VAC RackNest 2/14 (product code RM110AE) uses power supply PS1000AE, which accepts 230-VAC input power. Each of these power supplies consists of a power-line transformer, a fuse, and an operating switch. The 115-VAC RackNest can also be ordered with dual power supplies (our product code RM110A-2PS); either of these power supplies can be hot-swapped if it fails.

All power-regulating circuitry for the RackNest 2/14 is located on the card modems themselves. Each card has two fuses which protect the entire system against power failure due to a short circuit in one card. Primary power needed is 115 or 230 VAC ±10%, 47 to 63 Hz, at 24 VA maximum.

Supply AC power to the RackNest 2/14 through a standard power cable run between the AC mains socket on the rear of the RackNest's power-supply module (an IEC 320 male power inlet which contains an integral fuse) and a standard, grounded, easily accessible AC outlet. (If your RackNest is an RM110A, you can use the power cord supplied with it; if your RackNest is an RM110AE, use a power cord appropriate for your site's mains outlets.)

The RackNest begins operating and supplying power to the installed Cards as soon as it is plugged into a mains outlet, and will continue operating until it is unplugged.

WARNING!

The power supply should always be grounded through the protective earth lead of the power cable. Before AC power is connected to the power supply, the mains plug should be inserted only into a socket outlet provided with protective earth contact. *Make sure you're <u>not</u> using an extension that's missing a grounding connector.*

Whenever it is likely that the power supply's fuse (located in a bayonet-type fuse holder on the power supply's rear panel) has been blown or damaged, make the power supply inoperative and secure it against unintended operation until the fuse can be replaced. 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.

Interrupting the grounding conductor, inside or outside the power supply, or disconnecting the protective earth contact, can make this power supply dangerous!

3. Installation and Operation

3.1 Setting the Internal Controls

Before you install any cabling and definitely before you plug in the unit, you should set the Async/Sync 2-Wire Short Haul Modem Card's controls to suit your application. (If you don't feel comfortable about doing this yourself, get an experienced technician to do it or to help you.)

Refer to **Figure 3-1** on the next page and **Table 3-1** on the succeeding pages for the locations of the controls and their possible settings.
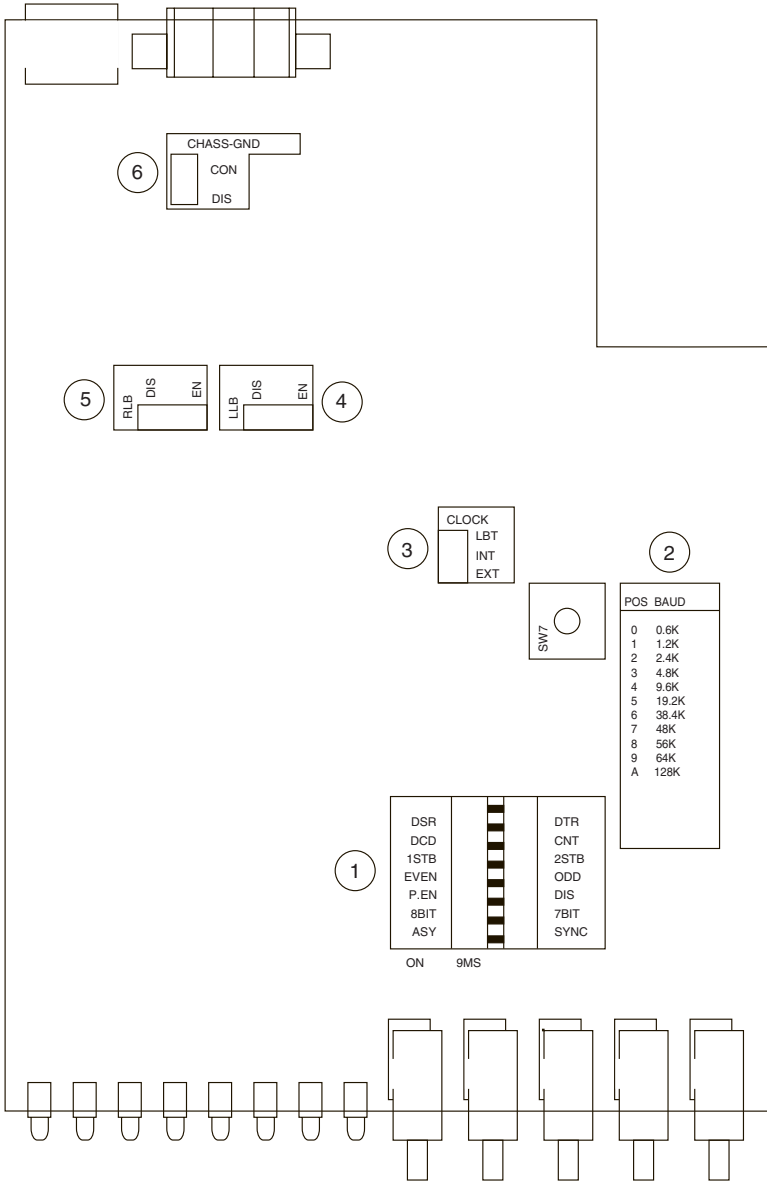
Figure 3-1. The A/S2W SHM's controls and indicators.

3.2 Switches and Strapping

Table 3-1. Switches and Strapping.

Callout Number Setting on Board Diagram (p.11)	Description	Function Switch Number	Settings	Default Factory
1	DIP-switch settings	Switch 1 ON-SYNC; OFF-ASYNC Switch 2 ON-8-bit; OFF-7 bit Switch 3 ON-PRTY; OFF-DIS Switch 4 ON-EVEN; OFF-ODD Switch 5 ON-1 STB; OFF-2 STB Switch 6 ON-DCD; OFF-CNT Switch 7 ON-DSR; OFF-DTR	Sync or Async 8 bit or 7 bit Parity enable or disable Parity, even or odd 1 stop bit or 2 stop bits DCD (On) or CNT (Control-Off)* DSR (On) or DTR* (Off)	SYNC 8 bit PRTY Even 1 STB DCD
2	Data Rate Selector, SW7	Position 0 Position 1 Position 2 Position 3 Position 4 Position 5 Position 6 Position 7 Position 9 Position A Position C Position D	Baud 0.6 kbps Baud 1.2 kbps Baud 2.4 kbps Baud 4.8 kbps Baud 9.6 kbps Baud 19.2 kbps Baud 38.4 kbps Baud 48 kbps Baud 64 kbps Baud 128 kbps Baud 57.6 kbps Baud 115.2 kbps	
3	CLK Source	Selects the transmit timing signal from either the INTERNAL or EXTERNAL TIMING clock for the master unit. In the slave unit, the clock is always loopback timing (LBT).	INT EXT	INT
4	Analog Loopback (LLB)*	Enables analog loopback test from the terminal.	DIS EN	DIS
5	Remote Loopback (RLB)*	Enables remote loopback test from the terminal.	DIS EN	DIS
6	Chassis Ground (CHAS_GND)	The setting connects Signal Ground to Chassis ground or isolates them.	CON DIS	CON

NOTE

The straps RLB and LLB are connected only for the purpose of activating the loops from the DTE interface. The pushbutton switches on the front panel are not affected by these straps; therefore, they can activate the loops in both options of the straps.

These straps are <u>not</u> available in the X.21 model.

3.3 Timing Options

In any case of clocking, one unit has to be strapped to one of the strap-select options: INT or EXT. This unit becomes the "master." The other unit should be strapped to LBT and becomes the "slave" unit. The slave unit uses the clock derived from the line when transmitting to or receiving from the DTE.

INT: The master clock uses the clock derived from an internal crystal when transmitting to or receiving from the DTE.

   All reception uses the clock derived from the receive signal.

EXT: The master clock uses the clock derived from the digital interface to receiving data from the DTE and for transmitting data to the line. If the digital interface is X.21, reception of sample data from the DTE and transmission of data to the DTE use the clock derived from the DTE interface (using unassigned pins of the X.21 standard).
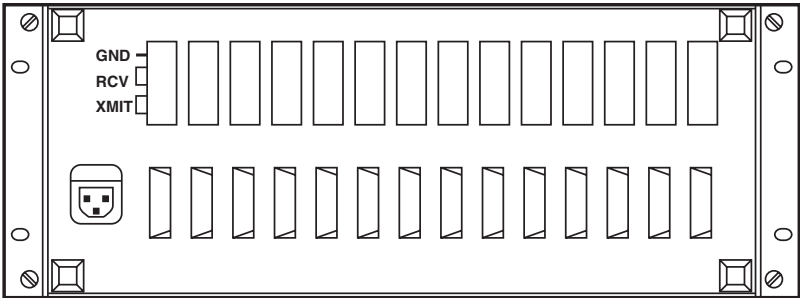
3.4 The RackNest 2/14 Illustrated

You will be installing the Async/Sync 2-Wire Short Haul Modem Card in the RackNest 2/14 as shown in **Figure 3-2** below. The front and rear panels of the RackNest are shown in **Figure 3-3** on the next page; the numbered connectors, controls, and indicators are described in **Table 3-2**.

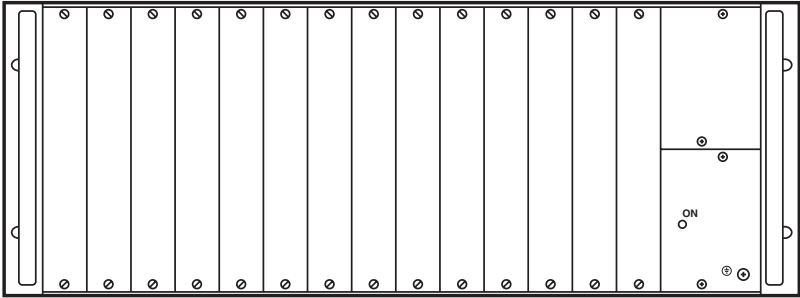**Figure 3-2. The RackNest 2/14: Card installation.**

Figure 3-3. The RackNest 2/14 front and rear views.

Table 3-2. Descriptions of RackNest 2/14 components

Item	Control, Indicator, or Connector	Function
1	Card Slots	Slots for installation of compatible cards (slot no. 1 located at the left-hand side). Unused slots are closed with blank panels.
2	Power-Supply Module	Provides power to modules installed in the enclosure.
3	ON Indicator	Lights when power supply is operating.
4	Chassis-Ground Terminal	Connector for attaching other grounds, devices, etc., to the RackNest's chassis ground (optional).
5	Power Connector	Power connector with integral fuse.
6	Main Channel Connectors (J1)	DB25 female connectors for the module DTE connection.
7	5-Wire Terminal Blocks (TB1)	For connection of 2- or 4-wire lines. Each modem card has a separate terminal-block connector.

3.5 Installing the Cards in the RackNest

After you install the RackNest 2/14 in your 19" rack (refer to the RackNest's manual), follow these steps to install an Async/Sync 2-Wire Short Haul Modem Card in the RackNest:

1. Configure the Card by setting its board-level controls; refer toTable 3-1.

2. Insert the Card into an empty slot on the RackNest. Do not use excessive force. If the card does not go in easily, remove the card, realign it with the RackNest's enclosure guides, and push it into place.

NOTE

When the RackNest 2/14 is ON, personnel are not exposed to any voltage over 30V on any card or accessible area of the RackNest. Still, take all reasonable precautions to avoid electric shock.

3. Tighten the nut on the top of the card.

4. Push the bottom of the card as far into the RackNest as it will comfortably go. This ensures that the Card's card-edge connector makes full contact with the RackNest's.

5. Run an appropriate cable from your DTE to the corresponding DB25 connector ("J1") on the back of the RackNest:

- ME375C-232 (RS-232) units: Can use standard RS-232 (DB25 male-to-male) cable. Refer to the "RS-232" column in **Table A-1**.

- ME375C-530 (RS-530) units: Use standard RS-530 (DB25 male-to-male) cable. Refer to the "RS-530" column in **Table A-1**.

- ME375C-X21 (X.21) units: This cable

a) needs to be pinned for RS-530 to X.21 and have a DB25 male connector at the RackNest end and a DA15 ("DB15") male connector at the DTE end, or

b) you need to use a correctly pinned, short DB25-male-to-DA15-female cable or similar adapter to patch between the X.21 (DA15 male-to-male) cable and the RackNest's DB25 connector. Call Black Box for a quote on this type of cable.

6. If you haven't already done so, install the remote RackNest 2/24 and repeat steps 1 through 5 at the remote site.

7. Run twisted-pair cable between the local and remote cards. Attach one of the data wires to either of the corresponding XMT terminals ("TB1") on the back of the local RackNest and either of the corresponding RCV terminals on the remote RackNest. Attach the other data wire to either of the RCV terminals on the local RackNest and either of the XMT terminals on the remote RackNest. Attach the ground wire to the GND terminals on both RackNests.

4. Troubleshooting

4.1 Diagnostic Testing

If you have problems with data communication on your Async/Sync 2-Wire Short Haul Modem system, or if you just want to verify proper system operation, the A/S2W SHM has diagnostic capabilities that can help you. You can use the SHM's front-panel pushbuttons to control different kinds of tests with which you can quickly check the A/S2W SHM, the attached cables (including the transmission line), and the local DTE. By performing these tests, you can quickly find out which components of your A/S2W SHM system are operating properly and which aren't.

Before you begin testing, make sure that both of the A/S2W SHMs and both DTEs are powered up and configured normally. When you have verified this, perform the tests described in **Sections 4.1.1**, **4.1.2**, and **4.1.3**, in that order.

4.1.1 LOCAL ANALOG LOOPBACK

Use this test to check the performance of the local modem, the local DTE, and the cables between them. Perform this test separately at both the local and remote sites (refer to Figure 4-1 on the next page).

1. Push the local A/S2W SHM's ANA (Local Analog Loopback) button or (if the unit's LLB jumper is set to EN) raise the LL signal from the DTE to the unit. The A/S2W SHM's TEST LED should light as it internally connects its transmitter output to its own receiver circuits.

2. Verify that the DTE is operating properly and can be used for a test. If the DTE is malfunctioning, replace it or have it repaired.

3. Observe what happens to test data that you send and get back: Set the DTE to half duplex and get an "echo" through the system and/or use special Bit Error Rate Test (BERT) equipment.
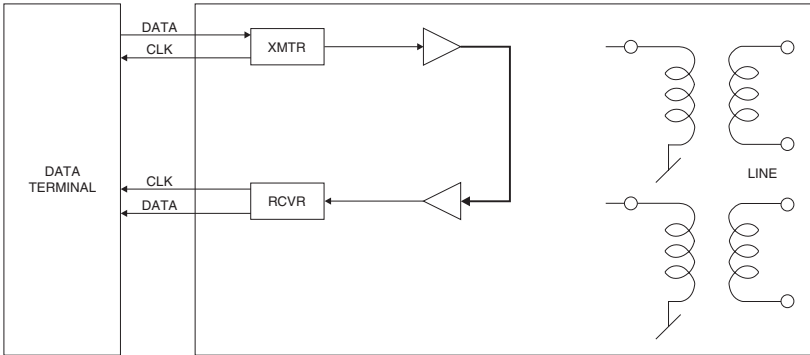
Figure 4-1. Local analog loopback.

4. If you use a BERT unit and it indicates an error, make sure the cables connecting it to the A/S2W SHM are securely connected. If they are, try swapping in known-good cables. If the error goes away, the problem was probably in the old cables. Otherwise, the A/S2W SHM is probably faulty; call Black Box for technical support.

   If you use a BERT unit and it indicates all clear, but you get errors when you perform the DTE test, the DTE is probably the source of the problem. Make sure that it is physically intact and that it is configured correctly. Refer to your DTE's manual if necessary, and if you can't solve the problem, call your DTE's supplier.

   If you don't have a BERT unit, and the DTE test indicates an error, make sure the cables connecting the DTE to the A/S2W SHM are securely connected. If they are, try swapping in known-good cables. If the error goes away, the problem was probably in the old cables. Otherwise, the DTE is probably the source of the problem. Make sure that it is physically intact and that it is configured correctly. Refer to your DTE's manual if necessary, and if you can't solve the problem, call your DTE's supplier.

5. After completing the test (or when the fault has been corrected), return the ANA button to the OFF position by pushing it again or, if you're controlling the test electronically, lower the LL signal from the DTE to the unit.

6. Repeat Steps 1 through 5 at the remote site.

Proceed with the Remote Digital Loopback test.

4.1.2 REMOTE DIGITAL LOOPBACK

Use this test to determine how the line-side circuits of the local and remote A/S2W SHMs and the 2-wire line between them are performing:

1. Push the local A/S2W SHM's REM (Remote Digital Loopback) pushbutton or (if the unit's RLB jumper is set to EN) raise the RL signal from the DTE to the unit. The TEST LED should light on both units as the local unit sends a remote-loopback command to the remote unit and the remote unit internally connects its receiver input to its transmitter output (see Figure 4-2 below).

2. Perform a DTE test and/or BERT as described in Step 3 of the Local Analog Loopback procedure. You can also press the local unit's PATT button to have it send a test pattern through the loop. (Press the PATT button again to stop the test pattern.)

3. If Step 2 indicates a fault, but Local Analog Loopback testing was successful for both A/S2W SHMs, either the line connection between the units is faulty, or the 2-wire line circuits inside one or both of the units are not operating properly. If possible, try a different line. If this isn't possible, or if the problem does not go away when you use a different line, call Black Box for technical support.

4. After completing the test (or when the fault has been corrected), return the REM button to the OFF position by pushing it again or, if you're controlling the test electronically, lower the RL signal from the DTE to the unit.
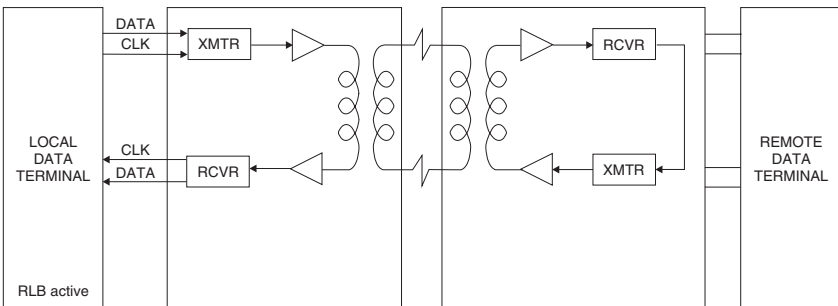
Proceed with the Local Digital Loopback test.

Figure 4-2. Remote digital loopback.

4.1.3 LOCAL DIGITAL LOOPBACK

This test is essentially the same as the Remote Digital Loopback test, but performed "in reverse," so to speak. It allows you to make doubly sure of the line and the A/S2W SHMs' line-side circuitry by setting up a loop in the opposite direction.

1. Push the local A/S2W SHM's DIG (Local Digital Loopback) pushbutton. (There is no way to initiate this test electronically.) The TEST LED should light on both units as the local unit sends a local-loopback notification to the remote unit and then internally connects its receiver input to its transmitter output (see Figure 4-3 below).

2. The operator at the remote site can test the units and the lines and take remedial action as described in Steps 2 and 3 of the Remote Digital Loopback procedure.

3. When the operator at the remote site notifies you that he or she has finished, return the DIG button to the OFF position by pushing it again.

If you have been unable to solve the problem, call Black Box for technical support (refer to **Sections 4.2** and **4.3**).
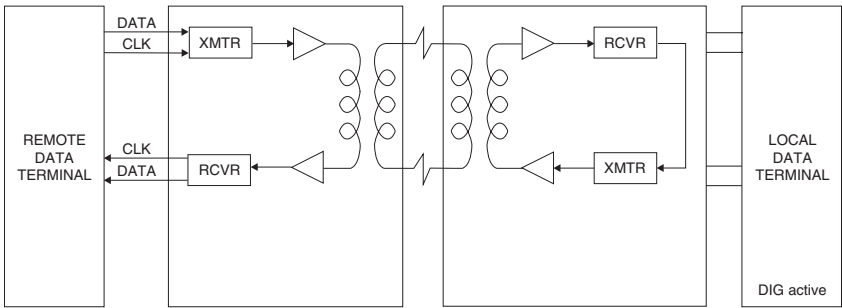

Figure 4-3. Local digital loopback.

4.2 Calling Black Box

If you determine that your Async/Sync 2-Wire Short Haul Modem Card is malfunctioning, *do not attempt to alter or repair it*. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500; the problem might be solvable over the phone.

Before you do, 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.

- The results of any testing you've already done.

4.3 Shipping and Packaging

If you need to transport or ship your Async/Sync 2-Wire Short Haul Modem Card:

- Package it carefully. We recommend that you use the original container.

- Before you ship a unit for repair or return, contact Black Box to get a Return Materials Authorization (RMA) number, and make sure you include everything you received with the unit when you ship it.

Appendix: Adapter Pinning

Signal Function	RS-232 DB25 standalone and frame	RS-530 DB25 standalone and frame	X.21 DB25 frame	Description
Protective Ground	1	1	1	Chassis ground. May be isolated from Signal Ground.
Signal Ground	7	7 AB	7	Common signal and DC power supply ground.
Transmitted Data	2	2 BA(A) 14 BA(B)	2 14	Serial digital data from DTE. In sync applications, the data transitions must occur on the rising edge of the transmit clock.
Received Data	3	3 BB(A) 16 BB(B)	3 16	Serial digital data at the output of the modem receiver. In sync applications, the data transitions occur on the rising edge of the clock.
Request to Send	4	4 CA(A) 19 CA(B)	4 19	A positive level to the modem when data transmission is requested.

(continued on the next page)

Signal Function	RS-232 DB25 standalone and frame	RS530 DB25 standalone and frame	X.21 DB25 frame	Description
Clear to Send	5	5 CB(A) 13 CB(B)		A positive level from the modem when data transmission is requested.
Data Set Ready	6	6 CC(A) 22 CC(B)		A positive level from the modem when the power is on and (a) the modem is not in a DIGITAL LOOP mode, or (b) the modem has not received a REMOTE LOOPBACK signal from the remote unit. Strap-selectable for reflecting the remote DTR.
Data Terminal Ready	20	20 CD(A) 23 CD(B)		Strap-selectable for affecting the remote DTR.
Carrier Detect	8	8 CF(A) 10 CF(B)	8 10	A positive level from the modem, except when a loss of the received signal is detected, or when Request to Send is negative.

(continued on the next page)

Signal Function	RS-232 DB25 standalone and frame	RS-530 DB25 standalone and frame	X.21 DB25 frame	Description
External Transmit Clock	24	24 DA(A) 11 DA(B)	24 11	A serial data rate clock input from the data source. Positive clock transitions must correspond with data transitions.
Transmit Clock	15	15 DB(A) 12 DB(B)	15 12	A transmit data rate clock for use by an external data source. Positive clock transitions must correspond with data transitions.
Receive Clock	17	17 DD(A) 9 DD(B)		A receive data rate clock output for use by an external data sink. Positive clock transitions must correspond with data transitions.
Local Analog Loop	18	18 LL		A control signal input, that, when on, commands the modem into Local Analog Loopback (V.54 Loop 3).

(continued on the next page)

Signal Function	RS-232 DB25 standalone and frame	RS-530 DB25 standalone and frame	X.21 DB25 frame	Description
Remote	21	21 RL		A control signal input, that Digital Loop when on, commands the modem to send a remote loopback command (V.54 Loop 2) to the remote modem.
Test Indicator	25	25 TM		A control signal output from the modem. It's positive during any test mode, or when internal BERT is activated.

BLACK BOX®

NETWORK SERVICES

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