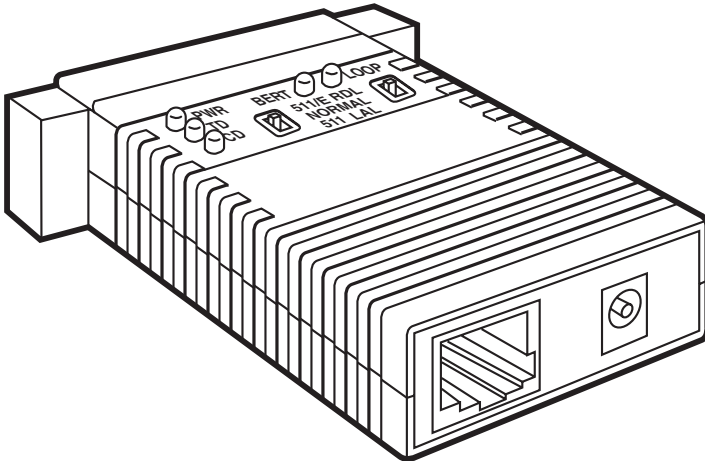




ME680A-M
ME680A-F
ME681A-M
ME681A-F

ME680AE-M
ME680AE-F
ME681AE-M
ME681AE-F

Line Driver—Dual Handshake



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This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

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.

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**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.

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1. Specifications

Asynchronous Data Rates	1.2, 2.4, 4.8, 9.6, 19.2, 28.8, 38.4, and 57.6 Kbps (switch-selectable)
Link Clocking	Internal only/76.8 Kbps (fixed)
Diagnostics	V.52-compliant bit error rate pattern; V.54-compliant: RDL and LAL, activated by front-panel switch or via terminal interface
Internal Interface	Connection to MicroRack (RM202, RM204, RM208, or RM216) chassis via male card edge
Line Interface	Twisted pair
Connectors	DB25 female or male on RS-232 side; RJ-11 or RJ-45 on line side
Transmission Format	Asynchronous to terminals; synchronous between units
Transmission Line	4-wire unshielded twisted pair (UTP), 19–24 AWG
Leads Supported	1–8, 20
Operating Mode	Point-to-point
Operation	Full duplex
Transformer Isolation	1500 V RMS
Controls	Carrier constantly “ON” or “Controlled by DTR”
Fuse	1A for 120V applications; 200 mA for 240V applications
Distance	2.4 miles (3.9 km)

LINE DRIVER — DUAL HANDSHAKE

BERT	100% compliance with V.52, including 511 and 511/E bit-pattern generation (switch-selectable)
Surge Protection	600W power dissipation at 1 mS and response time of 1 pS
Indicators	(5) LEDs: PWR, TD, CD, BERT, LOOP
RTS/CTS Delay	No delay
MTBF	142,000 hours
MTTR	1 hour
Operating Temperature	32° to 122°F (0° to 50°C)
Humidity	0 to 95%, noncondensing
Altitude	Up to 15,000 feet (4572 m)
Power	7.5 VDC wallmount transformer
Size	Card front: 3"H x 1"W x 5 ³ / ₄ "D (7.6 x 2.5 x 14.6 cm); Card rear: 3 ¹ / ₄ "H x 1"W x 2 ³ / ₄ "D (8.3 x 2.5 x 7 cm)
Weight	2 oz. (57 g)

2. Introduction

The Line Driver—Dual Handshake high-speed short-range modem passes two in-band flow-control signals (DTR/DCD), as well as two channel-independent out-of-band flow-control signals (RTS/CTS). This makes the Dual Handshake suitable for SLIP (Serial Line Internet Protocol) and PPP (Point-to-Point Protocol) applications, as well as other serial applications requiring extra controls.

The Dual Handshake supports asynchronous data rates up to 57.6 Kbps and distances up to 2.4 miles (3.9 km) over two twisted pairs. Diagnostics include V.54 loopback tests, a built-in V.52 BER test generator, and tri-state LED indicators. Communication is protected from transient surges by built-in surge protectors, and from ground loops by 1500 V RMS isolation transformers.

The Dual Handshake's miniature size allows the unit to plug directly into the RS-232 port of a host, terminal server, PC, or other device. Power is supplied to the Dual Handshake by a wallmount AC transformer. Configuration is facilitated by two sets of externally accessible DIP switches, so there is no need to open the case to set switches.

The figure on the next page illustrates a typical application.

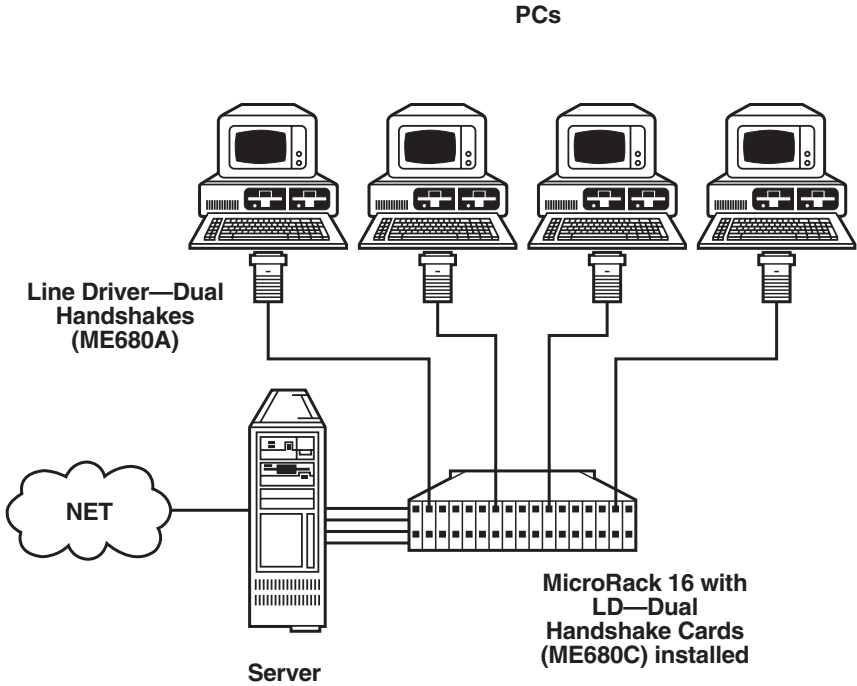


Figure 1. Install a MicroRack-16 (RM216) chassis in your control room and fill it with LD—Dual Handshake Cards (ME680C, ME681C). Then connect your remote user sites to your central hub using Line Driver—Dual Handshakes (part number ME680A-M, ME680A-F, ME681A-M, ME681A-F, ME680AE-M, ME680AE-F, ME681AE-M, or ME681AE-F) and twisted-pair wiring. Now your multiport host or terminal server can become a cost-saving Internet server.

3. Configuration

The Line Driver—Dual Handshake provides sixteen configuration switches, which allow selection of data rates, clocking methods, V.54 test modes, and extended signaling rates. This chapter describes switch locations and explains all possible switch configurations.

3.1 Configuration Switches

The Dual Handshake’s set of sixteen internal DIP switches allows configuration to an extremely wide range of applications. These switches are grouped into two eight-switch sets and are located on the inside of the unit (see Figure 2). For instructions on opening the Dual Handshake’s case, see Section 3.2.

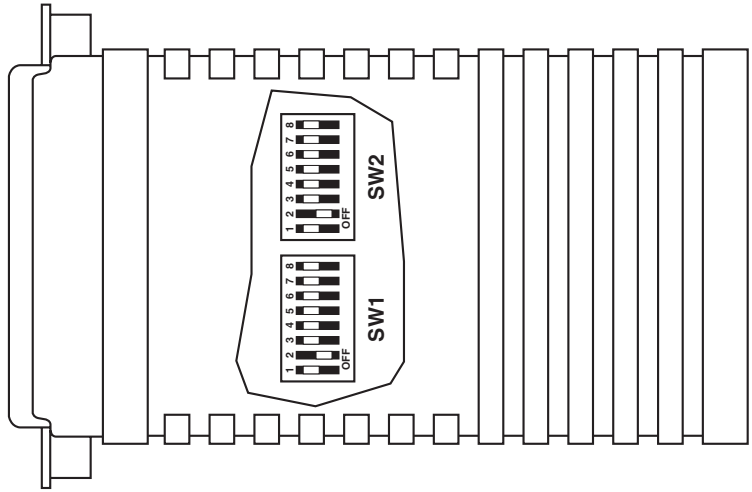


Figure 2. The inside of the Line Driver—Dual Handshake.

Figure 3 shows the orientation of the switches, including the ON/OFF positions.

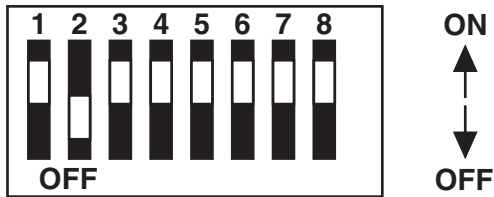


Figure 3. Close-up of configuration switches.

3.2 Opening the Case

Open the unit by gently inserting a screwdriver into the special pry slot on the plastic case (below). You don't have to worry about breaking the plastic.

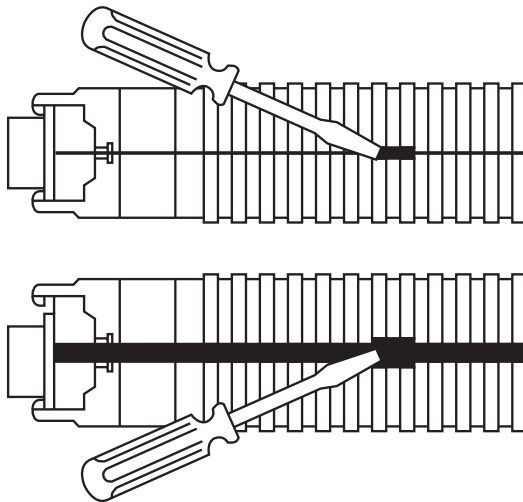


Figure 4. Opening the case.

3.3 Switch Settings

All possible settings for the Line Driver—Dual Handshake’s configuration switches are presented in the summary table and descriptions below. If you have additional questions regarding configuration, call your supplier.

3.3.1 SWITCH SET S1

The configuration switches on switch set S1 set analog loopback, digital loopback, and V.54 enable/disable. The default settings are summarized in Table 1.

Table 1. Summary of switch settings and factory defaults for S1

S1 SUMMARY TABLE			
Position	Function	Factory Default	
Switch S1-1	DTE Control of LAL	Off	Disabled
Switch S1-2	DTE Control of RDL	Off	Disabled
Switch S1-3	Not Used	Off	N/A
Switch S1-4	Microprocessor Reset	Off	Normal
Switch S1-5	Data Rate	On	57.6
Switch S1-6	Data Rate	On	Kbps
Switch S1-7	Data Rate	On	
Switch S1-8	V.52/V.54 Tests	Off	Enabled

S1-1: DTE Initiation of Local Analog Loopback Test

The setting for the switch S1-1 determines whether or not the Dual Handshake’s Local Analog Loopback test can be initiated by raising pin 18 on the DTE.

<u>S1-1</u>	<u>Setting</u>
On	Pin 18 Initiation Enabled
Off	Pin 18 Initiation Disabled

S1-2: DTE Initiation of Remote Digital Loopback Test

The setting for switch S1-2 determines whether or not the Dual Handshake's Remote Digital test can be initiated by raising pin 21 on the DTE.

<u>S1-2</u>	<u>Setting</u>
On	Pin 21 Initiation Enabled
Off	Pin 21 Initiation Disabled

S1-3: Not Used

S1-4: Microprocessor Reset

Switch S1-4 may be used to reset the microprocessor and associated circuitry. The switch should remain in the OFF position for normal operation.

<u>S1-4</u>	<u>Setting</u>
On	Reset microprocessor
Off	Normal operation

S1-5 through S1-7: DTE Data Rate Setting

Switches S1-5 through S1-7 are set in combination to determine the asynchronous DTE data rate for the Dual Handshake.

<u>S1-5</u>	<u>S1-6</u>	<u>S1-7</u>	<u>Setting</u>
Off	Off	Off	1.2 Kbps
On	Off	Off	2.4 Kbps
Off	Off	On	4.8 Kbps
On	Off	On	9.6 Kbps
Off	On	Off	19.2 Kbps
On	On	Off	28.8 Kbps
Off	On	On	38.4 Kbps
On	On	On	57.6 Kbps

S1-8: V.54 Enable/Disable

The setting for switch S1-8 determines whether or not the Dual Handshake's V.54 circuits are enabled.

<u>S1-8</u>	<u>Setting</u>
On	V.54 Test Functions Disabled
Off	V.54 Test Functions Enabled

3.3.2 SWITCH SET S2

The configuration switches on switch set S2 set data rate, clock source, carrier control, and RTS/CTS delay. The default settings are summarized in Table 2.

Table 2. Summary of switch settings and factory defaults for S2

S2 SUMMARY TABLE			
Position	Function	Factory Default	
Switch S2-1	Not Used	Off	
Switch S2-2	Not Used	Off	N/A
Switch S2-3	Not Used	Off	
Switch S2-4	Clock Source	On	Internal
Switch S2-5	Clock Source	On	
Switch S2-6	Carrier Control	On	DTR Controlled
Switch S2-7	RTS/CTS Delay	Off	No
Switch S2-8	RTS/CTS Delay	Off	Delay

S2-1 through S2-3: Not Used

S2-4 and S2-5: Clock Source

Switches S2-4 and S2-5 are set in combination to determine the synchronous link clock source for the Dual Handshake. The Dual Handshake may be set for either internal clock or receive recover clock.

NOTE

Although the Line Driver—Dual Handshake supports only asynchronous DTE communication, the link between two Dual Handshakes is actually synchronous.

<u>S2-4</u>	<u>S2-5</u>	<u>Setting</u>
On	On	Internal Transmit Clock
Off	On	Receive Recover Clock

S2-6: Carrier Control Method

The setting for switch S2-6 determines whether the carrier is “constantly on” or “controlled by DTR.” This setting allows for operation in switched-carrier, multipoint, or hardware-handshaking applications.

<u>S2-6</u>	<u>Setting</u>
Off	Constantly On
On	Controlled by DTR

S2-7 and S2-8: RTS/CTS Delay

The combined settings for switches S2-7 and S2-8 determine the amount of delay between the time the Dual Handshake sees RTS and when it sends CTS. Currently, the Dual Handshake does not have optional delay settings. “No Delay” is defined as between 500 nsec and 1 msec. The switches should remain in the OFF position.

<u>S2-7</u>	<u>S2-8</u>	<u>Setting</u>
Off	Off	No delay. No other valid settings.

4. Installation

Once the Line Driver—Dual Handshake is properly configured, it is ready to connect to your system. This chapter tells you how to properly connect the Dual Handshake to the twisted-pair and RS-232 interfaces.

4.1 Connection to the Twisted-Pair Interface

The Line Driver—Dual Handshake supports communication between two RS-232 devices at distances up to 2.4 miles (3.9 km) and data rates up to 57.6 Kbps. Here are the two essential requirements for installing the Dual Handshake:

- 1) These units work in pairs. You *must* have one Line Driver—Dual Handshake (or a compatible model) at each end of a two-twisted-pair interface.
- 2) To function properly, the Dual Handshake needs two twisted pairs of metallic wire. These twisted pairs must be unconditioned, dry, metallic wire, between 19 and 26 AWG (the higher-numbered gauges may limit distance somewhat). Standard dialup telephone circuits, or leased circuits that run through signal-equalization equipment, or standard, flat modular telephone type cable, are not acceptable.

For your convenience, the Line Driver—Dual Handshake is available with two different twisted-pair interfaces: RJ-11 and RJ-45 jacks.

Twisted-Pair Connection Using RJ-11 or RJ-45

The RJ-11 and RJ-45 connectors on the Dual Handshake's twisted-pair interface are pre-wired for a standard telco wiring environment (see Figure 4). The signal/pin relationships are shown on the next page.

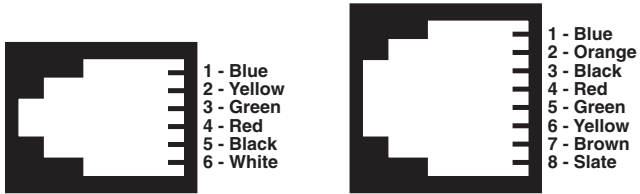


Figure 5. AT&T® standard color codes.

<u>RJ-11</u>	<u>Signal</u>
1.....	GND†
2.....	RCV
3.....	XMT
4.....	XMT
5.....	RCV
6.....	GND†

<u>RJ-45</u>	<u>Signal</u>
1.....	N/C
2.....	GND†
3.....	RCV
4.....	XMT
5.....	XMT
6.....	RCV
7.....	GND†
8.....	N/C

†Connection to ground is optional

When connecting two Line Driver—Dual Handshakes, it is necessary to use a twisted-pair “crossover” cable. The table on the next page shows how a crossover cable should be constructed for an environment where both Dual Handshakes use a 6-wire RJ-11 connector. Similar logic should be followed when using RJ-45 connectors or a combination of the two.

LINE DRIVER—DUAL HANDSHAKE

Signal	Pin No.	Color [†]	Color	Pin No.	Signal
GND [†]	1	Blue	White	6	GND [†]
RCV	2	Yellow.....	Red	4	XMT
XMT	3	Green	Black	5	RCV
XMT	4	Red.....	Yellow	2	RCV
RCV	5	Black.....	Green	3	XMT
GND [†]	6	White	Blue	1	GND [†]

[†]Connection to ground is optional

[†]Standard color codes—yours may be different

4.2 Connection to the RS-232 Interface

Once you have connected the twisted-pair wires correctly, simply plug the Dual Handshake directly into the DB25 port of the RS-232 device. After doing so, remember to insert and tighten the two captive connector screws.

4.2.1 CONNECTION TO A DTE DEVICE

The Line Driver—Dual Handshake is wired as a DCE, and therefore “wants” to plug into a DTE such as a terminal, PC, or host. A direct connection to the RS-232 DTE port is most desirable.

If you must use a cable to connect the Dual Handshake to the DTE port, make sure it is a straight-through cable of the shortest possible length—we recommend 6 feet (1.8 m) or less.

4.2.2 CONNECTION TO AN RS-232 DCE DEVICE

Since the Dual Handshake is wired as a DCE, you cannot connect it directly to another DCE such as a modem, multiplexor, or printer. If you need to connect the Dual Handshake to another RS-232 DCE device, you must use a null-modem cable wired according to the diagram on the next page. We recommend a cable of the shortest possible length, preferably 6 feet (1.8 m) or less.

Connection to Dual Handshake[†]	Connection to DCE Device
DB25 Pin No.	DB25 Pin No.
1	1
2	3
3	2
4	8
8	4
6	20
20	6
17	24
24	17
7	7

[†]Note: When connected to another DCE device, the Dual Handshake should be configured for “external clock” (see **Section 3.3.2**).

5. Operation

Once the Dual Handshake is properly configured and installed, it should operate transparently—as if it were a standard cable connection. This chapter describes reading the LED status monitors, powering up, and using the built-in V.52 and V.54 test modes. The Dual Handshake is powered by a 7.5-VDC external wall-mount transformer. To power up the unit, connect the power-supply cord to the power jack on the rear of the Dual Handshake and plug the power adapter into the wall. There is no ON/OFF switch.

5.1 Front-Panel Switches

During normal operation, both front-panel switches should be in the “normal” center position. To operate a test mode, see **Section 5.3**.

5.2 LED Status Monitors

The Dual Handshake features five front-panel LEDs that monitor transmit data, carrier detect, the two test modes, and power. Figure 5 shows the front panel with the LEDs. Following Figure 5 is a description of each LED’s function.

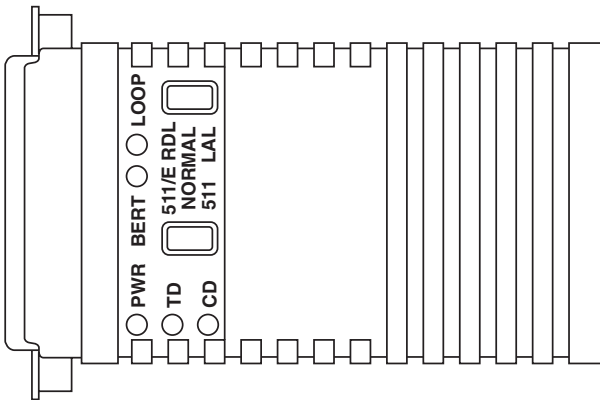


Figure 6. The Dual Handshake’s LED indicators and test switches.

PWR	Glows green when the Dual Handshake is powered up.
TD	Glows red for a “space” on transmit data.
CD	Glows red for high on carrier detect.
BERT	Glows red when bit errors occur in test mode 511 pattern); Lights when 511/E test pattern has been selected.
LOOP	Glows red when the Dual Handshake is in remote digital loopback or local analog loopback mode.

5.3 Test Modes

The Dual Handshake 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 from the interface.

NOTE

The V.54 test modes on the Dual Handshake 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 Dual Handshake, and is performed separately on each unit. Any data sent to the local Dual Handshake in this test mode will be echoed back (returned) to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal’s screen. To perform an LAL test, follow these steps:

- 1) Activate LAL. You can do this in either of two ways. One is to move the front-panel toggle switch labeled “RDL—LAL” to the “LAL” position. The other is to raise the signal on pin 18 on the interface (switch S1-8 must be OFF). Once LAL is activated, the Dual Handshake’s transmit output is connected to its own receiver. The BERT 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 or 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 Dual Handshake.

5.3.2 REMOTE DIGITAL LOOPBACK (RDL)

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

- 1) Activate RDL. You can do this in either of two ways. One is to move the front-panel toggle switch UP to "RDL." The other is to raise the signal on pin 21 on the interface (switch S1-8 must be OFF).
- 2) Perform a BER (bit error rate) test on the system.
- 3) If the BER test equipment indicates a fault, but the Local Analog Loopback test showed that both Dual Handshakes were functioning properly, there is probably a problem with the twisted-pair line connecting the two modems. You should then check the twisted-pair line from proper connections and continuity.

5.3.3 USING THE V.52 BER TEST INDEPENDENTLY

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

- 1) Move the front-panel toggle switch labeled “511/511E” to the DOWN position. 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 BERT LED will blink sporadically.

NOTE

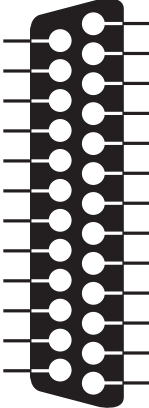
For this independent test to work properly, the “511/E—511” switch on both Dual Handshakes must be set the same way (that is, moved to the “511” position for this step and to the “511/E” position for the next step).

- 2) If the BERT test indicates no errors are present, move the “511/E—511” toggle switch UP to activate the “511/E” test with errors present. If this test is working properly, the receiving modem’s red BERT LED will glow. A successful 511/E test will confirm that the link is in place, and that the Dual Handshake’s built-in 511 generators and detectors are working properly.

5.4 Power-Down

Turn off the Dual Handshake by unplugging the AC power adapter from the wall. There is no power switch on the Dual Handshake.

Appendix: Pin Configurations

DIRECTION	RS-232 PINOUT REFERENCE (DB25)	DIRECTION
<p>To Line Driver</p> <p>To Line Driver From Line Driver</p> <p>From Line Driver</p>	 <p>1 - Frame Ground</p> <p>2 - Transmit Data</p> <p>3 - Receive Data</p> <p>4 - Request to Send</p> <p>5 - Clear to Send</p> <p>6 - Data Set Ready</p> <p>7 - Signal Ground</p> <p>8 - Data Carrier Detect</p> <p>Local Analog L.back - 18</p> <p>Data Term. Ready - 20</p> <p>Remote Digital L.back - 21</p> <p>Test Mode - 25</p>	<p>Common</p> <p>To Line Driver</p> <p>From Line Driver</p> <p>To Line Driver</p> <p>From Line Driver</p> <p>From Line Driver</p> <p>Common</p> <p>From Line Driver</p>



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