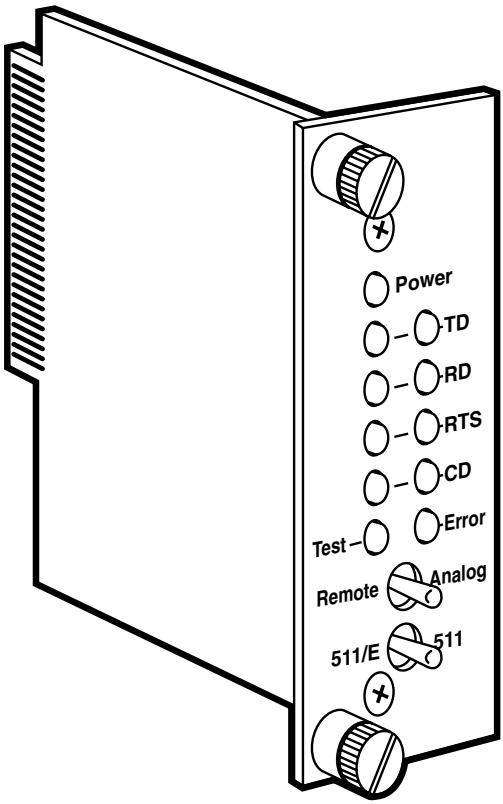
BLACK BOX®
NETWORK SERVICES

MARCH 1997
ME680C
ME681C

LD—Dual Handshake Card



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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 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.

Contents

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
Surge Protection	Silicon Avalanche Diodes
Controls	Carrier constantly “ON” or “Controlled by DTR”
Fuse	1A for 120V applications; 200 mA for 240V applications

Indicators	Bi-color LED indicators for TD, RD, RTS, and CD; single LEDs for Test, Power, and Error
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
Power	Powered by the rack; Rackmount power supply is switchable between 120 and 240 VAC; chassis supplies 10 VAC to the Card; typical consumption is 700 mW
Size	Card front: 3"H x 1"W x 5¾"D (7.6 x 2.5 x 14.6 cm); Card rear: 3¼"H x 1"W x 2¾"D (8.3 x 2.5 x 7 cm)
Weight	2 oz. (57 g)

2. Introduction

The LD—Dual Handshake Card high-speed short-range modem passes two in-band flow-control signals (DTR/DCD), as required by SLIP/PPP applications, and two channel-independent out-of-band flow-control signals (RTS/CTS). Asynchronous data rates range from 1.2 to 57.6 kbps at distances up to 3 miles over two twisted pair.

The Card incorporates two V.54 test modes (local analog loop and remote digital loop), which can be activated from the front panel via the RS-232 or V.35 interface. In addition, a built-in V.52 BER test generator can output 511 and 511/E bit patterns.

Easy-to-read LED indicators monitor power, transmit data, receive data, request to send, carrier detect, test mode, and errors. For protection against ground loops and transient surges, the Dual Handshake Card incorporates both isolation transformers and Silicon Avalanche Diode surge suppressors.

The Cards are designed to mount in MicroRacks (Part numbers RM202, RM204, RM208, and RM216). The 16-card chassis has a switchable 120/240 VAC power supply (optional 48 VDC) and mounts cards in mid-plane architecture (the front card can be plugged into different rear cards). Measuring only 3.5 inches high, the Card is designed to occupy only 2U in a 19-inch rack. This means that the Dual Handshake Cards can have several interface options and can be switched with other short-haul cards.

The figure on the next page illustrates a typical application.

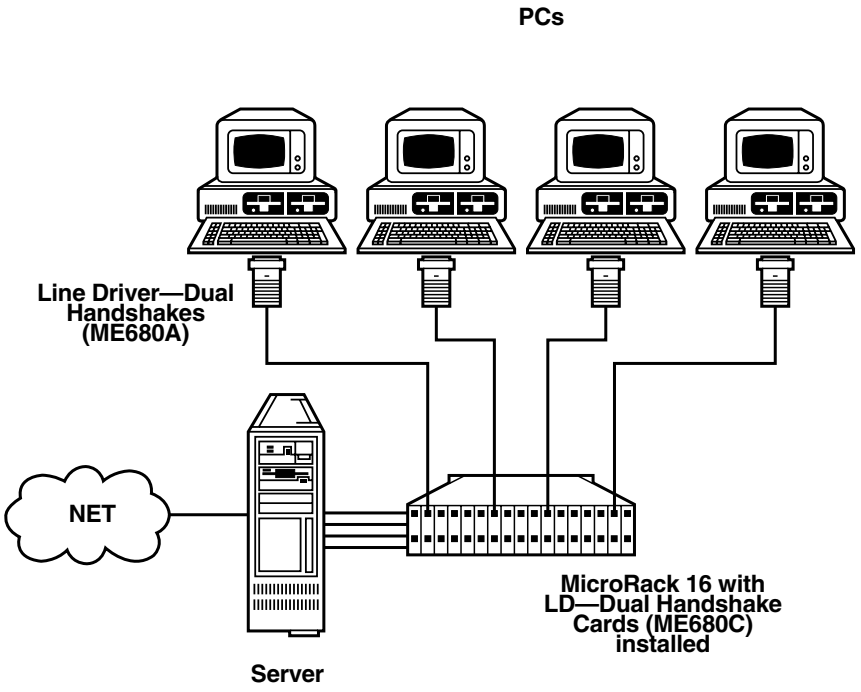

Figure 1. Install a MicroRack-16 chassis in your control room and fill it with LD—Dual Handshake Cards. Then connect your remote user sites to your central hub using plug-in Line Driver—Dual Handshakes (part number ME680A-M, ME680A-F, ME681A-M, ME681A-F, ME680AE-M, ME680AE-F, ME681AE-M, or ME681AE-F)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

3. Configuration

This chapter describes the location and orientation of the Dual Handshake Card's configuration switches and jumpers, and provides detailed instructions for all possible settings.

The Dual Handshake 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 Dual Handshake Card incorporates both front and rear cards. Configuration of both may be necessary. The switches/jumpers are accessible when the cards are slid out of the rack chassis. Once configured, the Dual Handshake Card is designed to operate transparently, without need for frequent re-configuration: Just set it and forget it.

3.1 Function-Card Configuration

The Dual Handshake Card has two sets of eight switches (S1 and S2), which are mounted on the PC board (see Figure 2). These configuration switches allow you to configure the Dual Handshake Card for a wide range of applications. The ON/OFF orientation of the DIP switches is shown in Figure 3. Jumpers JP1 through JP4 are primarily used for factory configuration, and should be left in their default positions.

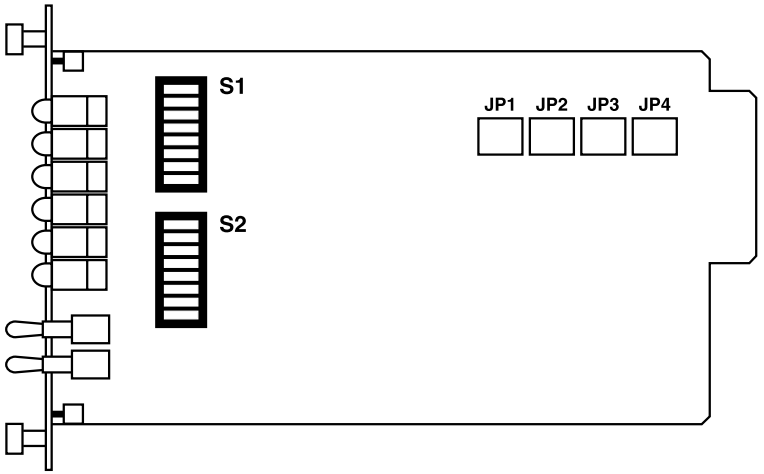

Figure 2. Location of the DIP switches.

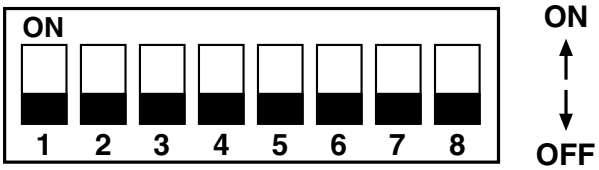

Figure 3. Close-up of DIP switches showing ON/OFF positions.

3.1.1 Configuration Switch Pack S1

The eight DIP switches on pack S1 set Remote Test Activation, Link Data Rate, and RTS/CTS Delay. Descriptions of all possible S1 switch settings, including the factory-default settings, are found in this section.

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	On	Enabled
Switch S1-2	DTE Control of RDL	On	Enabled
Switch S1-3	Not Used	Off	N/A
Switch S1-4	Not Used	Off	N/A
Switch S1-5	Not Used	Off	N/A
Switch S1-6	Not Used	Off	N/A
Switch S1-7	RTS/CTS Delay	Off	0
Switch S1-8	RTS/CTS Delay	Off	mS

S1-1: DTE Control of LAL

The setting for the Switch S1-1 determines whether the Local Analog Loopback test on the Dual Handshake Card can be activated via pin 18 of the RS-232 interface.

S1-1	Setting
On	Enabled
Off	Disabled

S1-2: DTE Control of RDL

The setting for switch S1-2 determines whether the Remote Digital Loopback test on the Dual Handshake Card can be activated via pin 21 of the RS-232 interface.

S1-2	Setting
On	Enabled
Off	Disabled

S1-3 through S1-6: Link Data Rate Setting

Switches S1-3 through S1-6 are set not used.

S1-3	S1-4	S1-5	S1-6	Setting
Off	Off	Off	Off	Not used. No other settings are valid.

S1-7 and S1-8: RTS/CTS Delay

Switches S1-7 and S1-8 are set in combination to determine the RTS/CTS delay for the Dual Handshake Card. This parameter is not user-definable, so there is only one valid setting.

S1-7	S1-8	Setting
Off	Off	0-mS delay. No other valid settings.

3.1.2 Configuration Switch Set S2

The eight DIP switches on pack S2 set Digital Reset, Carrier Control, Link Clocking, Async Data Rate, and Microprocessor Reset. Factory-default settings are summarized in Table 2. Descriptions of all possible S2 switch settings, including the factory-default settings, are found in this section.

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

S2 SUMMARY TABLE			
Position	**Function**	**Factory Default**	
Switch S2-1	V.54 Disable	Off	Normal
Switch S2-2	Control of Carrier	On	Ctrl by DTR
Switch S2-3	Link Clocking	On	
Switch S2-4	Link Clocking	On	Internal
Switch S2-5	Async Data Rate	On	
Switch S2-6	Async Data Rate	On	57.6
Switch S2-7	Async Data Rate	On	kbps
Switch S2-8	Microprocessor Reset	Off	Normal

S2-1: Digital Reset

The setting for switch S2-1 determines whether the Dual Handshake Card's V.54 diagnostics are disabled or are in normal operating mode.

S2-1	Setting
On	V.54 Test Disabled
Off	V.54 Test Enabled (Normal Operating Mode)

S2-2: Carrier Control

The setting for switch S2-2 determines whether Carrier is "Constantly ON" or "Controlled by DTR."

S2-2	Setting
On	Controlled by DTR
Off	Constantly ON

S2-3 and S2-4: Link Clocking Method

Switches S2-3 and S2-4 are set in combination to determine the synchronous link clocking method for the Dual Handshake Card. This parameter is not user-definable, so there is only one valid setting.

S2-3	S2-4	Setting
On	On	Internal. No other valid settings.

S2-5 through S2-7: Asynchronous Data Rate Setting

Switches S2-5 through S2-7 are set in combination to determine the asynchronous (terminal) data rate for the Dual Handshake Card.

S2-5	S2-6	S2-7	Setting
Off	Off	Off	1.2 kbps
Off	Off	On	2.4 kbps
Off	On	Off	4.8 kbps
Off	On	On	9.6 kbps
On	Off	Off	19.2 kbps
On	Off	On	28.8 kbps
On	On	Off	38.4 kbps
On	On	On	57.6 kbps

S2-8: Microprocessor Reset

The setting for switch S2-8 determines whether the Dual Handshake Card's microprocessor is in normal operating mode or reset mode. This switch is used primarily for factory test purposes, since removing the card from the chassis resets the microprocessor automatically.

S2-8	Setting
On	Reset Mode
Off	Normal Operating Mode

3.1.3 Configuration Jumpers

Configuration jumpers JP1 through JP4 on the Dual Handshake Card are primarily intended for factory configuration of the RS-232 interface. We recommend that you do not reconfigure these jumpers unless instructed to do so by your supplier.

3.2 Rear-Card Configuration

The Dual Handshake Card has two rear interface card options: DB25 and RJ-11 or DB25 and RJ-45 (see Figure 4). Both of these options support one terminal connection and one line connection.

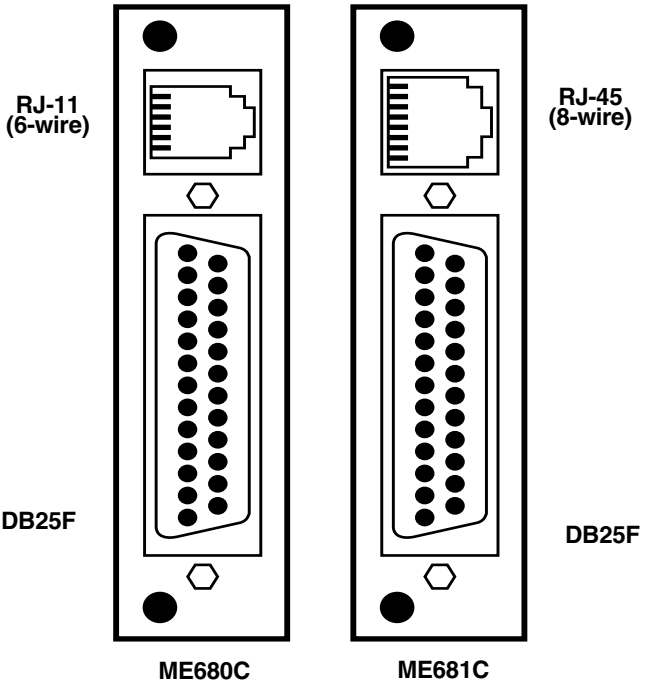

Figure 4. The interface cards.

Prior to installation, you will need to examine the rear card you have selected and make sure it is properly configured for your application. Each rear card is configured by setting straps located on the PC board.

Figure 5 shows the jumper locations for the rear-card options. These jumpers determine various grounding characteristics for the RS-232/V.35 and twisted-pair lines.

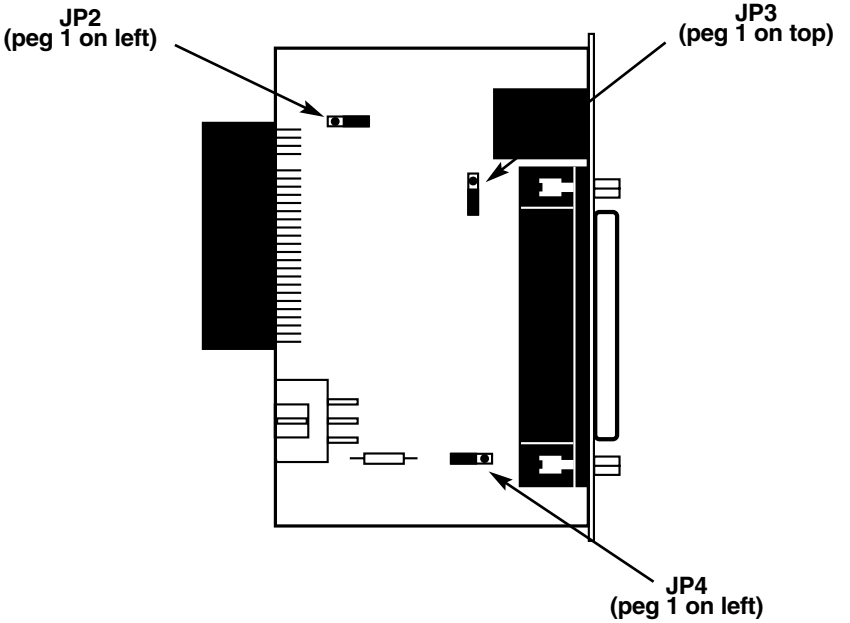

Figure 5. Rear-card jumper locations.

Figure 6 shows the orientation of the rear interface-card jumpers. The jumper can be either on pegs 1 and 2, or on pegs 2 and 3.

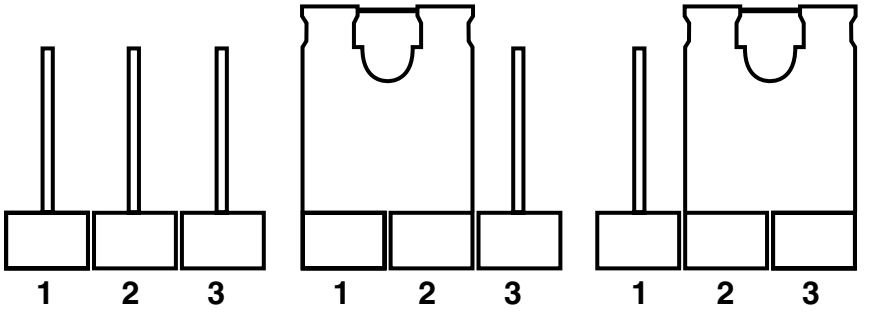

Figure 6. Orientation of interface-card straps.

Table 3 provides an overview of interface jumper functions for the rear interface cards. Following this overview is a detailed description of each jumper's function.

Strap	Function	Position 1 & 2	Position 2 & 3
JP2	Line Shield & FRGND	Connected	Open*
JP3	DTE Shield (Pin 1) & FRGND	Connected	Open*
JP4	FRGND & SGND	Connected	Open*

NOTE: * indicates factory default

Table 3. Summary of strap settings

Line Shield & FRGND (JP2)

This jumper affects the line interface. In the connected (closed) position, it links RJ-11 pins 1 and 6, or RJ-45 pins 2 and 7 to frame ground. These pins can be used as connections for the twisted-pair cable shield. In the open (disconnected) position, pins 1 and 6 (or 2 and 7) remain connected to each other, but are "lifted" from the frame ground.

JP2

Position 1 and 2 = Line Shield and FRGND Connected

Position 2 and 3 = Line Shield and FRGND Not Connected

DTE Shield & FRGND (JP3)

In the connected position, this jumper links DB25 pin 1 (M/34 pin x) and frame ground. In the open position, pin 1 (pin x) is "lifted" from frame ground.

JP3

Position 1 and 2 = DTE Shield (DB25 Pin 1 or M/34 Pin x) and FRGND Connected

Position 2 and 3 = DTE Shield (DB25 Pin 1 or M/34 Pin x) and FRGND Not Connected

SGND & FRGND (JP4)

In the connected position, this jumper links DB25 pin 7 or M/34 pin x (Signal Ground) and frame ground. In the open position, pin 1 (or pin x) is "lifted" from frame ground.

JP4

Position 1 and 2 = SGND (DB25 Pin 7 or M/34 Pin x) and FRGND Connected

Position 2 and 3 = SGND (DB25 Pin 7 or M/34 Pin x) and FRGND Not Connected

4. Installation

This chapter describes the functions of the MicroRacks, tells how to install front and rear Dual Handshake Cards in the chassis, and provides diagrams for wiring the interface connections correctly.

4.1 The MicroRack Chassis

The MicroRack 16 has sixteen short-range modem card slots, plus its own power supply. Measuring only 3.5 inches high, the MicroRack is designed to occupy only 2U in a 19-inch rack. Sturdy front handles allow the MicroRack 16 to be extracted and transported conveniently.

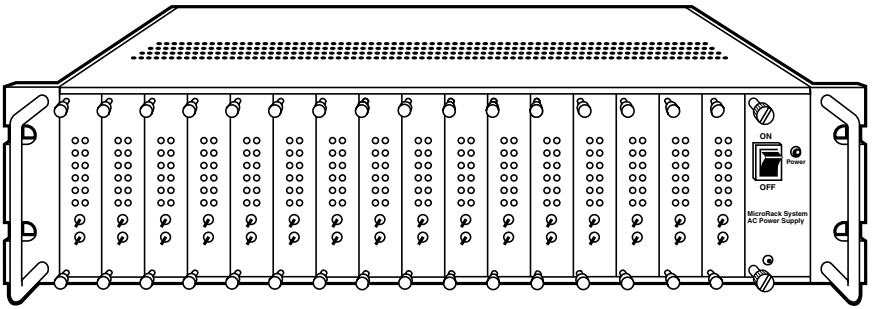

Figure 7. The MicroRack 16 with power supply.

The power supply used in the MicroRack 16 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.

Switching the Power Supply On and Off

The power supply on/off switch is located on the front panel. When the MicroRack is plugged in and switched on, a red front-panel LED will glow. Since the MicroRack is a hot-swappable rack, it is not necessary for any of the function 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.

WARNING

There are no user-serviceable parts in the power supply section of the Dual Handshake Card. Voltage setting changes and fuse replacement should only be performed by qualified service personnel. The instructions below for replacing the fuse are for qualified service personnel only.

Replacing the Power-Supply Fuse

The rack chassis power supply uses a 400-mA fuse for 120-VAC circuits, and a 200-mA fuse for 240-VAC circuits. The fuse compartment is located just below the AC socket on the rear card. To replace the fuse, follow these steps:

1) Turn the power switch off and remove the power cord.

2) Using a small screwdriver, pop the compartment open (it will slide open like a drawer). Depending upon the exact part used, the drawer may slide completely out of the fuse holder or it may stop partway out.

3) Note that there are two fuses in the drawer. The front fuse is the spare, and the rear fuse is the "active" fuse.

4) If the active fuse appears to be blown, remove it from the clips and replace it with the spare from the front compartment. Note the size and rating of the blown fuse before discarding it.

5) Buy a replacement fuse at an electronics store.

WARNING!

For continued protection against the risk of fire, replace only with the same type and rating of fuse.

Switching the Power Supply Between 120 and 240 Volts

Although the MicroRack 16 is shipped from the factory with a customer-specified power-supply configuration, you can change the configuration yourself. Follow the steps below to switch the configuration of the power supply between 120 and 240 VAC:

1) Remove the front power-supply card and locate the two-position switch near the back of the card. Slide the switch to the desired voltage. (Note: The actual values on the switch may be "110/220" or "115/230.")

2) Replace the existing fuse with one of the correct value.

3) Replace the power supply cord, if necessary.

4.2 Installing the Dual Handshake Card in the Chassis

The Dual Handshake 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 by way of mating 50-pin card edge connectors. Use the following steps as a guideline for installing each Dual Handshake Card into the rack chassis.

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

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

3) Slide the 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 MicroRack chassis allows hot-swapping of cards, it is not necessary to power down the rack when you install or remove a Dual Handshake Card.

4.3 Wiring the Dual Handshake Card

Each of the rear interface cards compatible with the Dual Handshake Card has one terminal-interface port and one 4-wire (twisted pair) port. These cards provide a female DB25 for the terminal-interface connection.

4.3.1 Terminal-Interface Connection

The RS-232 versions of the Dual Handshake Card use a DB25 female to connect the terminal interface to your computing hardware. It is pinned according to the RS-232C/V.24 and EIA-530 interface standards. For specific interface pinouts, refer to the diagram in **Appendix B**.

The EIA-561 versions of the Dual Handshake Card use a 10-pin RJ-45 to connect the terminal interface to your computing hardware. It is pinned according to the EIA-561 DCE interface standard. For specific interface pinouts, refer to the diagram in **Appendix B**.

NOTE

Any terminal cable connected to the Dual Handshake 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 Twisted-Pair Connection

The Dual Handshake Card operates over two twisted pairs. In all applications, the twisted-pair wire must be 26 AWG or thicker, unconditioned, dry, metallic wire. Both shielded and unshielded wire yield favorable results.

NOTE

The Dual Handshake Card can only communicate in a closed data circuit, and is compatible with the following short hauls: ME680A-F or -M, ME680AE-F or -M, ME681A-F or -M, ME681AE-F or -M. Dialup analog circuits, such as those used with a standard Hayes® compatible modem, are not acceptable. For more information about acceptable wire grades, refer to Appendix A.

Point-to-Point Twisted-Pair Connection

The six-position RJ-11 and 8-position RJ-45 jack options for the Dual Handshake Card are prewired for a standard telco wiring environment. Connection of a 2-wire or 4-wire twisted-pair circuit between two or more Dual Handshake Cards requires a crossover cable. Refer to the next page for more information.

RJ-11/4-Wire

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

RJ-45/4-Wire

Signal	Pin No.	Color	Color	Pin No.	Signal
GND†	2	Orange‡	Brown	7	GND
RCV-◊	3	Black	Green	5	XMT-
XMT+	4	Red	Yellow	6	RCV+
XMT-	5	Green	Black	3	RCV-
RCV+	6	Yellow	Red	4	XMT+
GND	7	Brown	Orange	2	GND

†Connection to ground is optional

‡Standard color codes—yours may be different

◊The Dual Handshake Card is not sensitive to polarity

NOTE

Any modular cable connected to the Card must be shielded cable, and the outer shield must be properly terminated to a shielded modular plug on both ends of the cable.

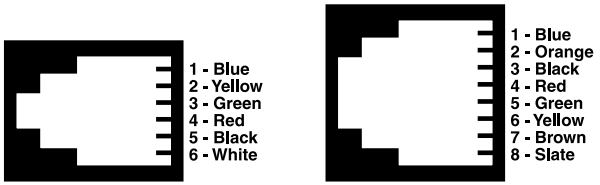

Figure 8. AT&T® standard modular color codes.

5. Operation

Once you have configured each Dual Handshake Card and connected the cables, you are ready to operate the units. This chapter describes the power-up procedure and the built-in V.54 and V.52 test modes.

5.1 Power-up

There is no power switch on the Dual Handshake 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 Dual Handshake Card is a hot-swappable card—it will not be damaged by plugging it in or removing it while the rack is powered up.

5.2 Test Modes

The Dual Handshake Card offers two V.54 test modes and two V.52 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.

5.2.1 Local Analog Loopback (LAL)

The Local Analog Loopback (LAL) test checks the operation of the local Dual Handshake Card, and is performed separately on each unit. Any data sent to the local Dual Handshake Card 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 to the right to "Analog." The other is to raise the signal on pin 18 of the RS-232 interface (switch S1-6 must be enabled). Once LAL is activated, the Dual Handshake Card's 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) Move the lower of the two toggle switches on the front panel of the Dual Handshake Card to the left. 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, move the V.52 toggle switch to the right to activate the "511/E" test with periodic errors. If this test is working properly, the red Error LED will glow. A successful 511/E test will confirm that the loop is in place, and that the Dual Handshake Card's built-in "511" generators and detectors are working properly.

5) If the BER test indicates that errors are present, make sure that the RS-232 cable connecting the DTE to the Dual Handshake Card is wired straight-through, and is plugged in properly. Also, make sure that the Dual Handshake Card is configured properly. Then recheck your DTE equipment. If you still have errors and can't find the cause, call your supplier for technical support.

5.2.2 Remote Digital Loopback (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Dual Handshake Cards, and the communication link between them. Any characters sent to the remote Dual Handshake Card 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 left to "Remote." The other is to raise the signal on pin 21 of the RS-232 interface.

2) Verify that the DTE attached to the Card is operating properly and can be used for a test.

3) Move the lower of the two toggle switches on the front panel of the Dual Handshake Card to the left. 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 right to activate the "511/E" test with periodic errors. If this test is working properly, the red Error LED will glow. A successful 511/E test will confirm that the loop is in place, and that the Dual Handshake Card's built-in 511 generators and detectors are working properly.

5) If the remote BER test indicates that errors are present, but the local analog loopback BER tests showed that both Dual Handshake Cards were functioning properly, there is probably a problem with the twisted-pair communication line connecting the two modems. A common problem is improper crossing of the pairs. Also, check the cable's pinning and continuity. If you still have errors and can't find the cause, call your supplier for technical support.

5.2.3 Using the V.52 BER Test Independently

The Dual Handshake Card 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 both the local and one to do the same at the remote Dual Handshake Card. To use the V.52 BER test by itself, both operators should simultaneously follow these steps:

1) Move the lower of the two toggle switches on the front panel of the Dual Handshake Card to the left. 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 independent test to work properly, the "511/E—511" switch on both Dual Handshake Cards 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 BER test indicates no errors are present, move the toggle switch to the right to activate the "511/E" test with errors present. If this test is working properly, the receiving modem's red Error LED will glow. A successful 511/E test will confirm that the link is in place, and that the Dual Handshake Card's built-in 511 generators and detectors are working properly.

Appendix A: Cable Recommendations

The Dual Handshake Card operates at frequencies of 40 KHz or less and has been performance tested using twisted-pair cable with the following characteristics:

Wire Gauge	Capacitance	Resistance
19 AWG	83nf/mi or 15.72 pf/ft.	0.0163 ohms/ft.
22 AWG	83nf/mi or 15.72 pf/ft.	0.0326 ohms/ft.
24 AWG	83nf/mi or 15.72 pf/ft.	0.05165 ohms/ft.

For optimum performance from your Dual Handshake Card, keep the following guidelines in mind:

- *Always use twisted-pair wire*—this is not an option.
- Use twisted-pair wire with a capacitance of 20 pf/ft. or less.
- Avoid twisted-pair wire thinner than 26 AWG (in other words, avoid higher AWG numbers than 26).
- Use of twisted pair with a resistance greater than the above specifications may cause a reduction in maximum distance obtainable. Functionality should not be affected.
- Many different environmental factors can affect the maximum distances obtainable at a particular site.

Appendix B: Interface Standards

DIRECTION	STANDARD RS-232C/V.24 "DCE" SETTING	DIRECTION
	1 - Frame Ground	
From Line Driver	Transmit Clock - 15	To Line Driver
	2 - Transmit Data	From Line Driver
	3 - Receive Data	To Line Driver
From Line Driver	Receive Clock - 17	
	4 - Request to Send	From Line Driver
To Line Driver	Analog Loop - 18	
	5 - Clear to Send	From Line Driver
	6 - Data Set Ready	
To Line Driver	Data Term. Ready -20	
	7 - Signal Ground	
To Line Driver	Digital Loop - 21	
	8 - Data Carrier Detect	From Line Driver
To Line Driver	External Clock - 24	
From Line Driver	Test Mode - 25	

Modular Interface - 8/10 Wire RJ-45		
Contact Number	**Circuit**	**Description**
1	N/A	Not Used
2	125	DSR
3	109	Received Line Signal Indicator
4	108/2	DTE Ready
5	102	Signal Common
6	104	Received Data
7	103	Transmitted Data
8	106	Clear to Send
9	105/133	Request to Send/Ready for Receiving
10	N/A	Not Used

Pins 2–9 conform to the EIA/TIA-561 eight-position non-synchronous interface standard.

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