Async 232↔422/530 Card

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.

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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 parato 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 equio 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

Data Rate	0 to 19.2 Kbps
Connectors	IC474C: (2) RJ-11; IC475C: (2) RJ-45
Transmission Format	Asynchronous
Transmission Mode	Full duplex, 4-wire
Transmission Line	4-wire, unconditioned line (2 twisted pairs)
Transmit Level	0 dBm
Control Signal	DCE Mode: CTS (Pin 8) turns ON immediately after the terminal raises RTS (Pin 9); DSR (Pin 2) turns ON immediately after the rack has power; CD (Pin 3) is constantly ON if RXC is present, normal if RXC is absent
Surge Protection	600W power dissipation at 1 mS
MTBF	239,906 hours
MTTR	1 hour
Operating Temperature	32° to 122°F (0° to 50°C)
Humidity	10 to 95%, noncondensing
Altitude	Up to 15,000 feet (4570 m)
Power	Provided by power supply in rack
Size	3.1"H x 0.95"W x 5.4"L (7.9 x 2.4 x 13.7 cm)

2. Introduction

The Async 232↔422/530 Card is a dual rack card incorporating two converters. The converters let computers, terminals, and modems using the RS-232 interface communicate with devices using RS-422 balanced electrical signals. Both units operate full duplex at data rates to 19.2 Kbps over 2 twisted pairs. The Async 232↔422/530 Card features 13 easy-to-read front-panel LEDs, which monitor the status of data transmission. As an added feature, a set of easily accessible configuration straps allows the user to control the function of the carrier-detect LEDs.

The Async 232↔422/530 Card uses the latest surface-mount technology for high-quality short-range modem performance in a convenient rack card. Filling one function card slot on the MicroRack (RM202, RM204, RM208, and RM216) chassis, the Async 232↔422/530 Card is available with RJ-11 or RJ-45 rear interface cards.

3. Configuration

This section describes the location and orientation of the Async 232↔422/530 Card's configuration jumpers, provides detailed instructions on setting each jumper, and describes the settings for each of the rear connection cards.

The Async 232↔422/530 Card uses two jumpers that allow configuration to a wide range of asynchronous applications. These jumpers are accessible when the card is slid out of the rack chassis. Once the hardware is configured, the Async 232↔422/530 Card is designed to operate transparently, without need for frequent re-configuration: Just set it and forget it.
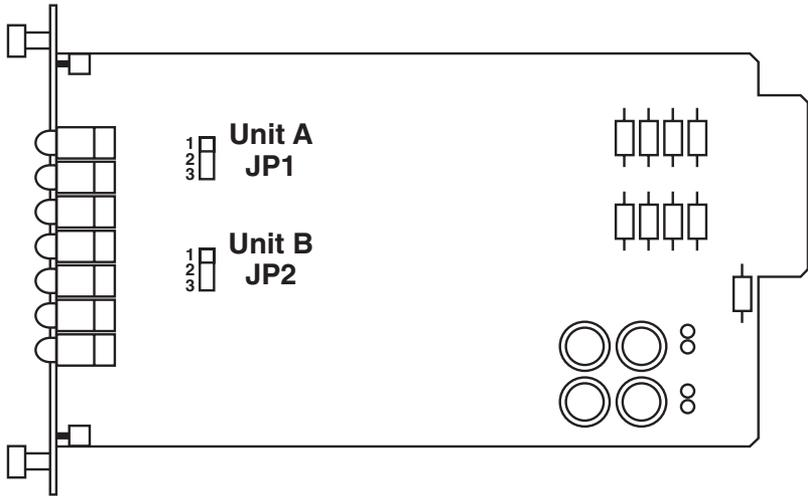
**Figure 3-1. Location of configuration jumpers
on the Async 232↔422/530 Card.**

3.1 Jumper Locations and Orientation

The configuration jumpers on the Async 232↔422/530 Card and the rear interface card allow you to configure the function of both front-panel "Carrier Detect" LEDs, as well as the rear interface card CD signal. Figure 3-2 shows the orientation of these jumpers. Notice that each jumper can be either on pegs 1 and 2, or on pegs 2 and 3. Note: Pin 1 is *always* located on the top or left side of the jumper set.

Figure 3-2. Orientation of interface card straps.

3.2 Setting the Configuration Straps

The Async 232↔422/530 Card contains two sets of configuration jumpers, which allow you to set the function of both front-panel "Carrier Detect" LEDs and the CD signal exiting the rear interface card in the rack. Since the Async 232↔422/530 Card contains *two* converters, each unit can be configured separately.
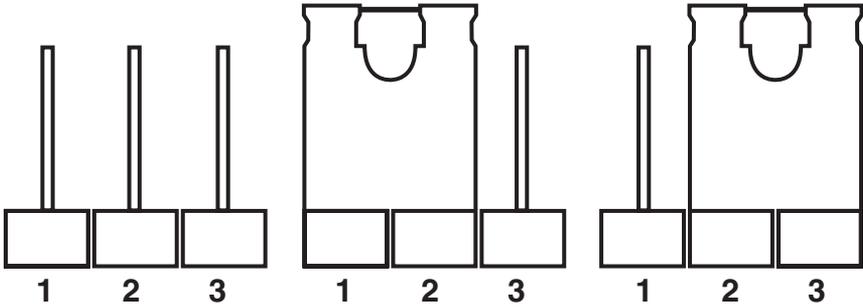
Both "Carrier Detect" straps can be set to "Normal" or "Always on." When operating normally, the "CD" LED will blink to indicate the presence or absence of the carrier. When set to "Always on," the CD LED will always indicate that the carrier is ON. The table below summarizes the jumper settings. The default position is "Always on."

Interface Card Jumper Summary Table			
Jumper	**Function**	**Position 1 & 2**	**Position 2 & 3**
JP1—Unit A	Carrier Detect	"Always ON"	"Normal"
JP2—Unit B	Carrier Detect	"Always ON"	"Normal"

3.3 Rear-Card Configuration

The Async 232↔422/530 Card has two interface-card options: the IC474C (which comes equipped with two RJ-11 ports and two RJ-45 ports) and the IC475C (which comes equipped with four RJ-45 ports). Figure 3-3 shows these options.

IC474C   **IC475C**

(6-pin) RJ-11	**RJ-45 (8-pin)**
(6-pin) RJ-11	**RJ-45 (8-pin)**
(10-pin) RJ-45	**RJ-45 (10-pin)**
(10-pin) RJ-45	**RJ-45 (10-pin)**
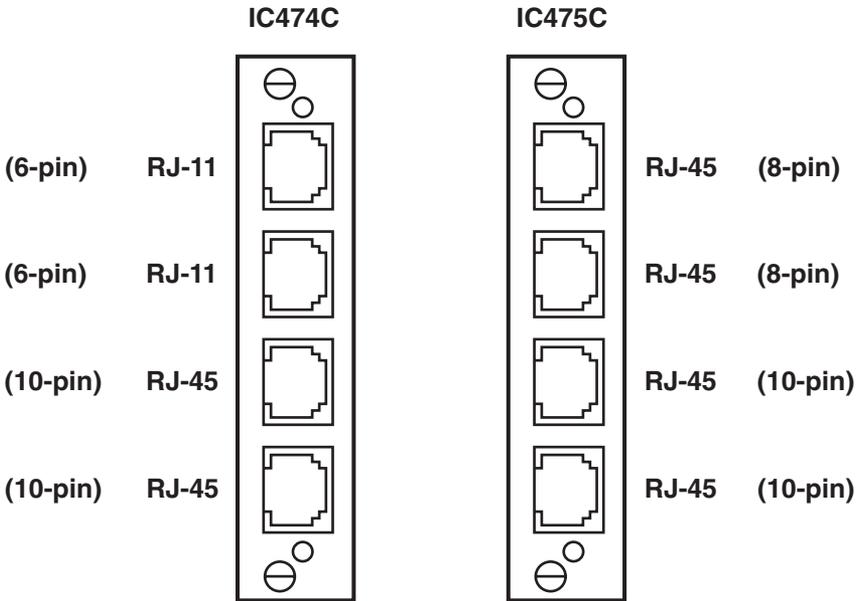
Figure 3-3. Async 232↔422/530 Card rear interface cards.

Before installation, you should examine the rear card you have selected and make sure that it is suitable for your application. Each rear card is configured by setting straps on the PC board.

3.3.1 RJ-11/RJ-45 JUMPER SETTINGS

Figure 3-4 shows the jumper locations for the IC474C rear card. These jumpers determine various grounding characteristics for the RS-232 and twisted-pair lines.

Figure 3-4. RJ-11/RJ-45 jumper locations.

Table 3-1 (on the next page) provides a summary of jumper functions for both of the rear cards. The next page describes each jumper's function.

Table 3-1. Summary of jumper settings

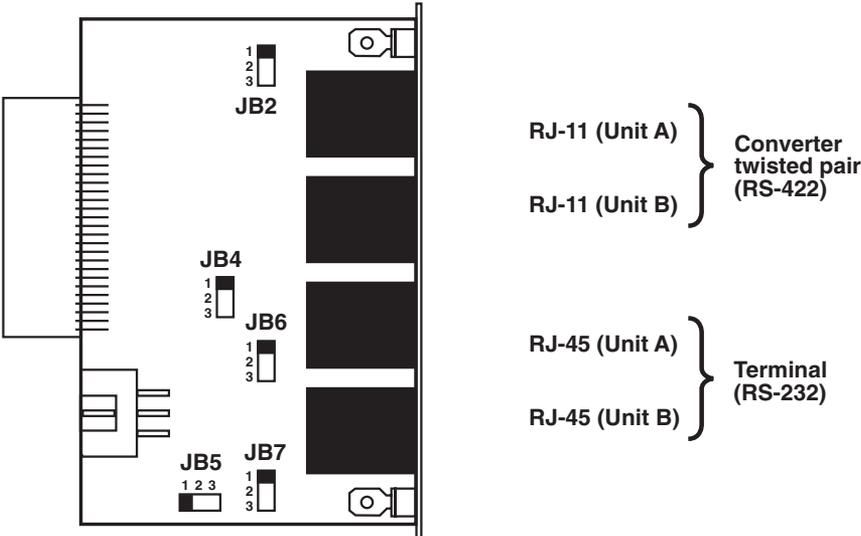| Interface Card Jumper Summary			
Jumper	Function	Position 1 & 2	Position 2 & 3
JB2	Line A Shield	Connected	No Shield*
JB4	Line B Shield	Connected	No Shield*
JB5	SGND & FRGND	Connected	Open*
JB6	DTE A DSR*	Connected	N/A
JB7	DTE B DSR*	Connected	N/A

*Indicates factory default

Line Shield (JB2 and JB4)

This jumper pertains to the line interface. In the connected position, the jumper links RJ-11 pins 1 and 6 to frame ground and the rear panel. These pins can be used as connections for the twisted-pair cable shield. In position 2 and 3, pins 1 and 6 (or RJ-45 pins 2 and 7) are disconnected from frame ground.

JB2 and JB4

Position 1 & 2   = Line Shield A and B Connected to Frame Ground
Position 2 & 3   = No Shield

DTE as DSR or RI (JB6 and JB7)

Because this rear card is designed to function in more applications than the Async 232↔422/530 Card, this jumper must be installed only in one position. Place the jumper across pins 1 and 2 so that the terminal (DTE) sees DSR as high when the rack is powered. The other positions, across pins 2 and 3, are for Ring Indicate as defined by EIA/TIA-561. The RI function is irrelevant (and on the Async 232↔422/530 Card is also disconnected) and can cause improper operation if the jumper is installed incorrectly.

JB6 and JB7
Position 1 & 2 = DSR
Position 2 & 3 = N/A (Do not use.)

SGND and FRGND (JB5)

In the connected position, this jumper links RJ-45 pin 5 (Signal Ground) and frame ground through a 100-ohm, ½-watt resistor. In the open position, pin 1 is disconnected from frame ground.

JB5
Position 1 & 2 = SGND (Pin 5) and FRGND Connected
Position 2 & 3 = SGND (Pin 5) and FRGND Not Connected

3.3.2 RJ-45/RJ-45 JUMPER SETTINGS
Figure 3-5 shows the strap locations for the IC475C rear card. These jumpers determine grounding characteristics for the RS-232 and twisted-pair converter lines.
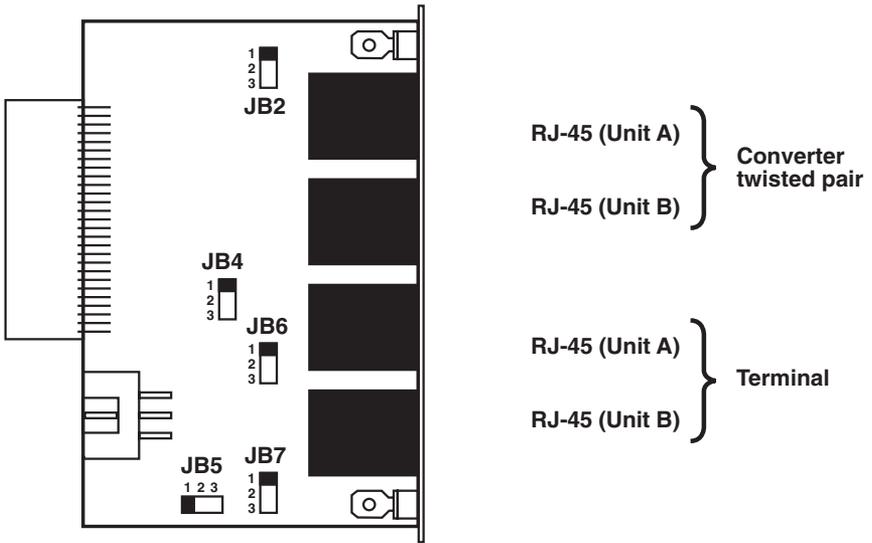
Figure 3-5. RJ-45/RJ-45 jumper locations.

Refer to Table 3-1 for a summary of the jumper functions.

Line Shield (JB2 and JB4)

This jumper pertains to the line interface. In the connected position, the jumper links RJ-45 pins 2 and 7 to frame ground and the rear panel. These pins can be used as connections for the twisted-pair cable shield. In position 2 and 3, pins 2 and 7 are disconnected from frame ground.

JB2 and JB4

Position 1 & 2   =   Line Shield A and B Connected to Frame Ground
Position 2 & 3   =   No Shield

DTE as DSR or RI (JB6 and JB7)

Because this rear card is designed to function in more applications than the Async 232↔422/530 Card, this jumper must be installed only in one position. Place the jumper across pins 1 and 2 so that the terminal (DTE) sees DSR as high when the rack is powered. The other positions, across pins 2 and 3, are for Ring Indicate as defined by EIA/TIA-561. The RI function is irrelevant (and on the Async 232↔422/530 Card is also disconnected) and can cause improper operation if the jumper is installed incorrectly.

JB6 and JB7

Position 1 & 2   =   DSR
Position 2 & 3   =   N/A   (Do not use.)

SGND and FRGND (JB5)

In the connected position, this jumper links RJ-45 pin 5 (Signal Ground) and frame ground through a 100-ohm, ½ watt resistor. In the open position, pin 1 is disconnected from frame ground.

JB5

Position 1 & 2   =   SGND (Pin 5) and FRGND Connected
Position 2 & 3   =   SGND (Pin 5) and FRGND Not Connected

4. Installation

This chapter describes the functions of the MicroRacks, tells how to install front and rear Async 232↔422/530 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.

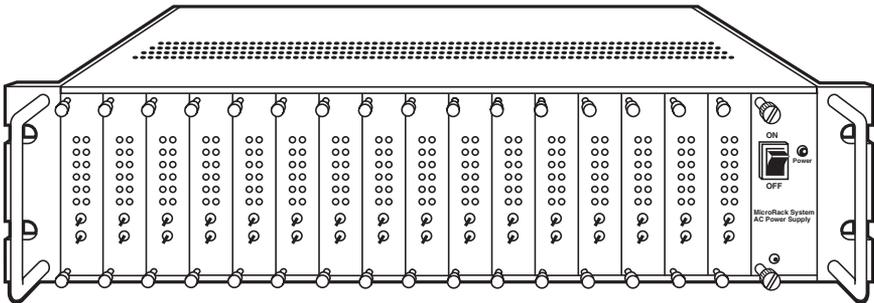**Figure 4-1. The MicroRack 16 with power supply.**

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.

WARNING!

There are no user-serviceable parts in the power-supply section of the MicroRack 16. Voltage setting changes and fuse replacement should only be performed by qualified service personnel.

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 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.

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:

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 at the top of the next page 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 Async 232↔422/530 Card in the Chassis

The Async 232↔422/530 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 Async 232↔422/530 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 Function 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 an Async 232↔422/530 Card.

4.3 Wiring Up the Async 232↔422/530 Card

Each of the rear interface cards is compatible with the Async 232↔422/530 Card and has four RJ ports. The two upper ports are either RJ-11 or RJ-45 jacks, depending on the card you select.

4.3.1 RS-232 CONNECTION

The RS-232 ports are always the *lower* ports on the interface card. The 10-pin RJ-45s are based on the EIA/TIA-561 Standard. For specific interface pinouts, refer to the diagrams in **Appendix B**.

NOTE

European "CE" recommendations require that any terminal cable connected to the Async 232↔422/530 Card must be shielded cable, and the outer shield must be 360° bonded—at both ends—to a metal or metalized backshell.

The Async 232↔422/530 Card is wired as a DCE (Data Communications Equipment). Therefore, it wants to connect to a DTE (Data Termination Equipment). If your RS-232 output device is a DTE, use a straight-through cable to connect to the Async 232↔422/530 Card. If your RS-232 output device is DCE, call your supplier for specific installation instructions.

4.3.2 TWISTED-PAIR CONNECTION

The Async 232↔422/530 Card operates full duplex 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 Async 232↔422/530 Card can only be installed on private twisted-pair cable. 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.

4.3.3 POINT-TO-POINT TWISTED-PAIR CONNECTION

The six-position RJ-11 and eight-position RJ-45 jack options for the Async 232↔422/530 Card (always the two *upper* jacks on the rear interface card) are prewired for a standard telco wiring environment. Connection of a 4-wire twisted-pair circuit between two or more Async 232↔422/530 Cards requires a crossover cable. Refer to the next page for more information.

CROSSOVER CABLES
RJ-11

Signal	Pin No.	Color‡	Color	Pin No.	Signal
GND†	1	Blue ....White		6	GND†
RCVB	2	Yellow.............Red		4	XMTB
XMTA	3	Green ....Black		5	RCVA
XMTB	4	Red.................Yellow		2	RCVB
RCVA	5	Black..............Green		3	XMTA
GND†	6	White ....Blue		1	GND†

RJ-45

Signal	Pin No.	Color‡	Color	Pin No.	Signal
GND†	2	Orange ....Brown		7	GND†
RCVB	3	Black..............Green		5	XMTB
XMTA	4	Red.................Yellow		6	RCVA
XMTB	5	Green ....Black		3	RCVB
RCVA	6	Yellow.............Red		4	XMTA
GND†	7	Brown ....Orange		2	GND†

IMPORTANT!

In the pinouts above, "A" means positive and "B" means negative.

†Connection to ground is optional

‡Standard color codes—yours may be different

RJ-11

RJ-45/8 **RJ-45/10**

1 - Blue
2 - Yellow
3 - Green
4 - Red
5 - Black
6 - White

1 - Blue
2 - Orange
3 - Black
4 - Red
5 - Green
6 - Yellow
7 - Brown
8 - Slate

1 - n/a
2 - Blue
3 - Orange
4 - Black
5 - Red
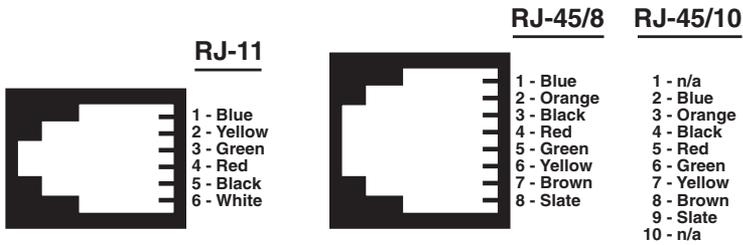6 - Green
7 - Yellow
8 - Brown
9 - Slate
10 - n/a

Figure 4-2. AT&T® standard modular color codes.

DCE-DTE Connection:

Two lower RS-232 jacks on rear interface card

1. N/A

2. DSR

3. CD

4. N/A

5. SG

6. RD

7. TD

8. CTS

9. RTS

10. N/A

5. Operation

Once you have configured each Async 232↔422/530 Card and connected the cables, you are ready to operate the units.

5.1 LED Status Monitors

The Async 232↔422/530 Card features 13 front-panel LEDs that indicate the condition of the modem and communication link. Figure 5-1 shows the positions of the LEDs.
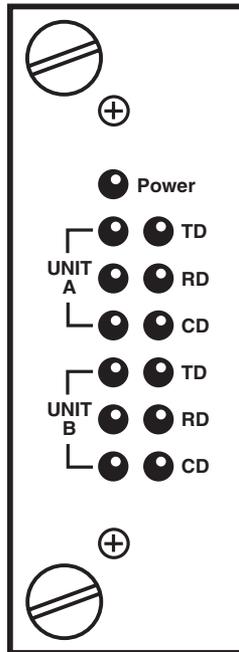

Figure 5-1. The Async 232↔422/530 Card front panel, showing LED positions.

- The green "PWR" LED glows when power is being applied to the modem card through its mid-plane chassis connection.

- The green "TD" and "RD" LEDs blink to show positive state data activity. The red "TD" and "RD" indicators blink to show negative state data activity. A solid red light indicates an idle state.

- If your carrier-detect strap is configured as "Always On," the "CD" LED will always be green. If the carrier-detect strap is set to "Normal," the green LED lights when the carrier is on; the red LED lights when the carrier is off.

5.2 Power-Up

There is no power switch on the Async 232↔422/530 Card: Power is automatically applied to the Async 232↔422/530 Card when its card-edge connector touches the chassis's mid-plane socket, or when the chassis's power is turned on.

NOTE

The Async 232↔422/530 Card is a hot-swappable card—it will not be damaged by plugging it in or removing it while the rack is powered up.

Appendix A. Cable Recommendations

The Card operates at frequencies of 20 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.

The following data rate/distance results were obtained during bench tests using or simulating cable with the characteristics listed above:

| Data Rate (bps)	Gauge (AWG)/Distance (Mi)		
	19	22	24
38.4—115.2	5.6	3.1	2.5
0—19.2	9.4	5.6	4.4

For optimum performance from your Async 232↔422/530 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. Use the data rate/distance table as a general guideline only.

Appendix B. Interface Settings

RS-232 Modular Interface: 10-Wire RJ-45		
Contact Number	**Circuit**	**Description**
1	N/A	Not Used
2	107	DSR
3	109	Received Line Signal Indicator (CD)
4	108/2	DTE Ready (DTR)
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.
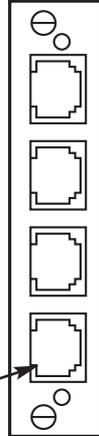
For all modular jacks (6-, 8-, or 10-position): Pin 1 is always toward the bottom when the rear card is oriented correctly in the slot.

Appendix C. PC Adapters

	DB25	**RJ-45 (8-Pin)**
DSR	6- - - - - - - - - - - - - - -	1
CD	8- - - - - - - - - - - - - - -	2
DTR	20- - - - - - - - - - - - - - -	3
Signal Ground	7- - - - - - - - - - - - - - -	4
RD	3- - - - - - - - - - - - - - -	5
TD	2- - - - - - - - - - - - - - -	6
CTS	5- - - - - - - - - - - - - - -	7
RTS	4- - - - - - - - - - - - - - -	8

	DB9	**RJ-45 (8-Pin)**
DSR	6- - - - - - - - - - - - - - -	1
CD	1- - - - - - - - - - - - - - -	2
DTR	4- - - - - - - - - - - - - - -	3
Signal Ground	5- - - - - - - - - - - - - - -	4
RD	2- - - - - - - - - - - - - - -	5
TD	3- - - - - - - - - - - - - - -	6
CTS	8- - - - - - - - - - - - - - -	7
RTS	7- - - - - - - - - - - - - - -	8

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