



Doc. No. 78-3025-01

4-Port and 8-Port Asynchronous/Synchronous Serial Network Module Configuration Note

Product Numbers:

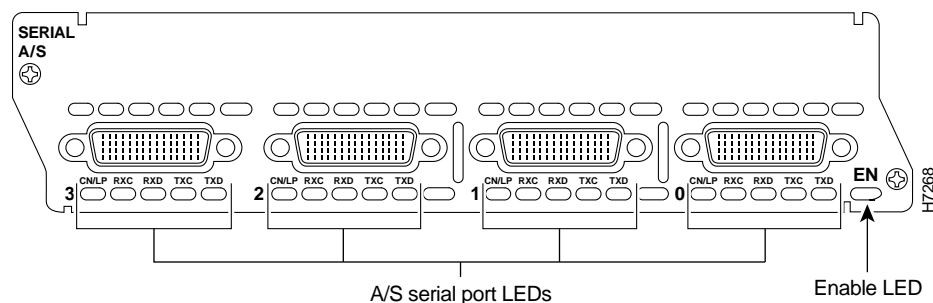
NM-4A/S, NM-8A/S, CPANM-4A/S, CPANM-8A/S

This document provides information about the following network modules for the Cisco 3600 series of modular access routers:

- 4-port asynchronous/synchronous serial network module, Cisco product number NM-4A/S or CPANM-4A/S. (See Figure 1.) This module will also be referred to as the 4-port A/S serial network module.
- 8-port asynchronous/synchronous serial network module, Cisco product number NM-8A/S or CPANM-8A/S. (See Figure 2.) This module will also be referred to as the 8-port A/S serial network module.

With the appropriate serial transition cable, the ports on these modules can provide an EIA/TIA-232, EIA/TIA-449, V.35, X.21, DTE/DCE, EIA-530 DTE, or NRZ/NRZI serial interface.

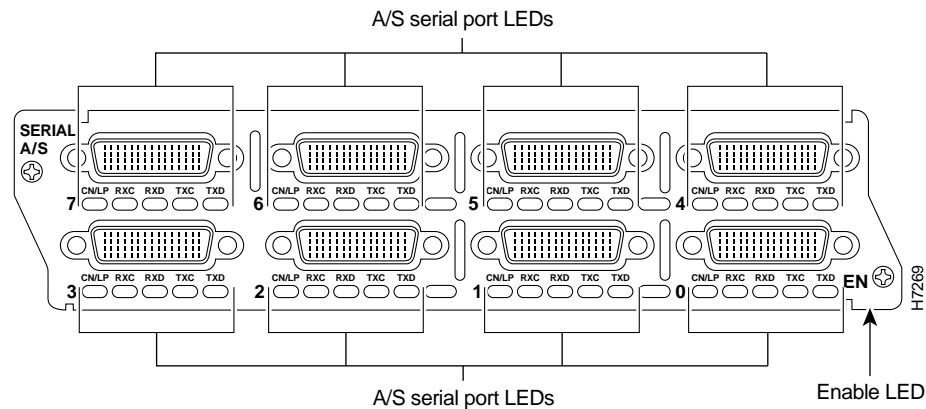
Figure 1 4-Port Asynchronous/Synchronous Serial Network Module



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Figure 2 8-Port Asynchronous/Synchronous Serial Network Module



Unless specifically identified, references to A/S serial network modules in this configuration note include all these network modules.

Use this document in conjunction with your router installation and configuration guide and the *Regulatory Compliance and Safety Information* document for your router. If you have questions or need help, refer to the section “Obtaining Service and Support” later in this document for further information.

This document contains the following sections:

- Safety Recommendations, page 3
- Required Tools and Equipment, page 5
- Installing A/S Network Modules in a Chassis Slot, page 5
- Connecting the A/S Serial Module to the Network, page 6
- Serial Cable Pinouts, page 7
- A/S Serial Module LEDs, page 17
- Configuring the Serial Interfaces, page 18
- Obtaining Service and Support, page 24
- Cisco Connection Online, page 25



Warning Only trained and qualified personnel should be allowed to install or replace this equipment. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Warning Ultimate disposal of this product should be handled according to all national laws and regulations. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Caution To avoid damaging electrostatic discharge (ESD)-sensitive components, ensure that you have discharged all static electricity from your body before opening the chassis. Before performing procedures described in this document, review the next section, “Safety Recommendations.”

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.
- Put the removed chassis cover in a safe place.
- Keep tools away from walk areas where you or others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.
- Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- Do not perform any action that creates a potential hazard to people or makes equipment unsafe.



Warning The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operator (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by a nonremovable, connect-one-time-only plug) must be made only by PTO staff or suitably trained engineers. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Warning Network hazardous voltages are present in the BRI cable. If you detach the BRI cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages also are present on the system card in the area of the BRI port (RJ-45 connector), regardless of when power is turned off. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Warning The Ethernet 10BaseT, Token Ring, serial, console, and auxiliary ports contain safety extra-low voltage (SELV) circuits. BRI circuits are treated like telephone-network voltage (TNV) circuits. Avoid connecting SELV circuits to TNV circuits. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Safety with Electricity



Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Follow these guidelines when working on equipment powered by electricity:

- Locate the emergency power-OFF switch in the room in which you are working. Then, if an electrical accident occurs, you can quickly shut the power OFF.
- Before working on the router, turn OFF the power and unplug the power cord.
- Disconnect all power before doing the following:
 - Installing or removing a router chassis
 - Working near power supplies
- Do not work alone if potentially hazardous conditions exist.



Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)



Warning Do not work on the system or connect or disconnect cables during periods of lightning activity. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

- Never assume that power is disconnected from a circuit. Always check.



Warning Do not touch the power supply when the power cord is connected. For systems with a power switch, line voltages are present within the power supply even when the power switch is OFF and the power cord is connected. For systems without a power switch, line voltages are present within the power supply when the power cord is connected. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- If an electrical accident occurs, proceed as follows:
 - Use caution; do not become a victim yourself.
 - Turn OFF power to the router.
 - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim and then call for help.
 - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Always follow ESD prevention procedures when removing and replacing cards. Ensure that the router chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.



Caution For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohm).

Required Tools and Equipment

You need the following tools and equipment to install a network module in a Cisco 3600 series chassis slot:

- Network module
- Number 1 Phillips screwdriver or small flat-blade screwdriver
- ESD-preventive wrist strap

Installing A/S Network Modules in a Chassis Slot



Caution Network modules do not support online insertion and removal (hot swap). To avoid damaging the module, before you insert a network module into a chassis slot, you must turn OFF electrical power and disconnect network cables.

The following instructions apply only to installing network modules in a chassis slot. To install a WAN interface card in a network module, see the configuration note for the WAN interface card.

You can install network modules in the chassis either before or after mounting the router, whichever is more convenient.

Follow this procedure to install a network module:

- Step 1** Turn OFF electrical power to the router. However, to channel ESD voltages to ground, do not unplug the power cable. Remove all network interface cables, including telephone cables, from the rear panel.

The following warning applies to routers that use a DC power supply:



Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

- Step 2** Using either a number 1 Phillips screwdriver or a small flat-blade screwdriver, remove the blank filler panel from the chassis slot where you plan to install the module. Save the blank panel for future use.
- Step 3** Align the network module with the guides in the chassis and slide it gently into the slot.
- Step 4** Push the module into place until you feel its edge connector mate securely with the connector on the motherboard.
- Step 5** Fasten the module's captive mounting screws into the holes in the chassis, using the Phillips or flat-blade screwdriver.
- Step 6** If the router was previously running, reinstall the network interface cables and turn ON power to the router.

The following warning applies to routers that use a DC power supply:



Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the ON position. (To see translated versions of this warning, refer to the *Regulatory Compliance and Safety Information* document that accompanied the router.)

Blank Network Module Panels

If the router is configured with fewer than four network modules, make sure that blank panels fill the open chassis slots to provide proper airflow. (See Figure 3.)

Figure 3 Blank Network Module Panel

Connecting the A/S Serial Module to the Network

The A/S serial network module provides four or eight universal high-density 60-pin receptacles. The serial cable attached to each receptacle determines the port's electrical interface type and mode, data terminal equipment (DTE) or data communications equipment (DCE).

Types of Serial Cables

Cisco Systems offers five types of serial cables (also called serial adapter cables or transition cables):

- EIA/TIA-232 Serial Cable Assembly
- EIA/TIA-449 Serial Cable Assembly
- V.35 Serial Cable Assembly
- X.21 Serial Cable Assembly
- EIA-530 Serial Cable Assembly

All serial cables provide a universal plug at the network module end. The network end of each cable provides the physical connectors most commonly used for the interface. For example, the network end of the EIA/TIA-232 serial cable is a DB-25 connector, the most widely used EIA/TIA-232 connector.

All serial interface types except EIA-530 are available in DTE or DCE format: DTE with a plug connector at the network end and DCE with a receptacle at the network end. V.35 is available in either mode with either gender at the network end. EIA-530 is available in DTE only.

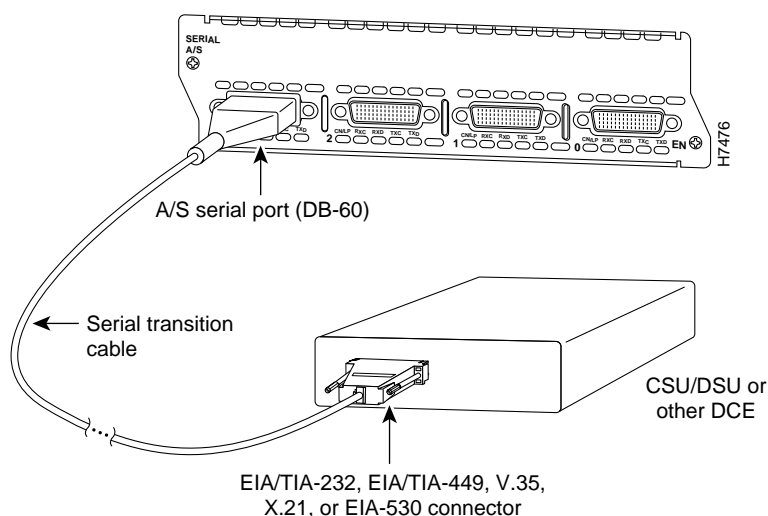
Serial cables are not provided with the network module. For ordering information, refer to the section “Obtaining Service and Support” later in this document.

Connecting the Module to the Network

After you install an A/S serial network module, use the appropriate serial cable to connect each of the modules’s DB-60 serial ports to one of the following types of equipment (see Figure 4):

- An asynchronous modem, if connecting to an analog telephone line
- A synchronous modem, channel service unit/data service unit (CSU/DSU), or other data circuit-terminating equipment (DCE), if connecting to a digital WAN line

Figure 4 Connecting an A/S Serial Network Module to a CSU/DSU



Serial Cable Pinouts

The following sections illustrate serial cables of each interface type and list their signal pinouts.

EIA/TIA-232 Serial Cable Assembly

Figure 5 shows the EIA/TIA-232 serial cable assembly. Table 1 lists the DTE pinout and Table 2 lists the DCE pinout. Arrows indicate signal direction: —> means DTE to DCE and <— means DCE to DTE.

Figure 5 EIA/TIA-232 Cable Assembly

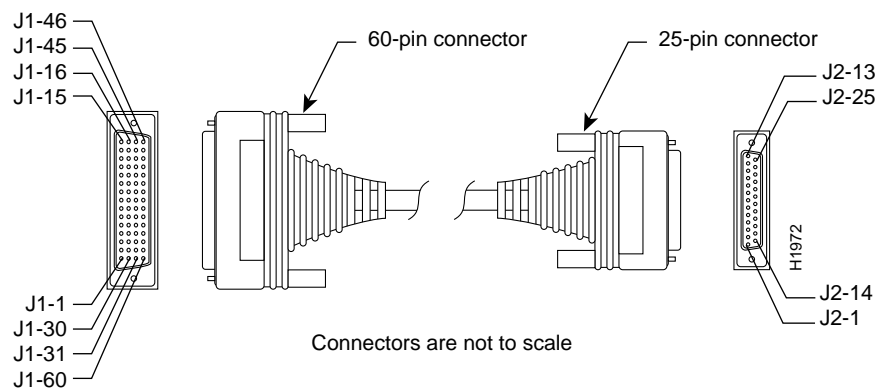


Table 1 EIA/TIA-232 DTE Cable Pinout (DB-60 to DB-25)

60-Pin	Signal	Note	Direction	25-Pin	Signal
J1-50	MODE_0	Shorting group	—	—	—
J1-51	GND				
J1-52	MODE_DC				
	E				
J1-46	Shield GND	Single	—	J2-1	Shield GND
J1-46	Shield GND	Single	—	J2-1	Shield GND
J1-41	TXD/RXD	Twisted pair no. 5	—>	J2-2	TXD
Shield	—		—	Shield	—
J1-36	RXD/TXD	Twisted pair no. 9	<—	J2-3	RXD
Shield	—		—	Shield	—
J1-42	RTS/CTS	Twisted pair no. 4	—>	J2-4	RTS
Shield	—		—	Shield	—
J1-35	CTS/RTS	Twisted pair no. 10	<—	J2-5	CTS
Shield	—		—	Shield	—
J1-34	DSR/DTR	Twisted pair no. 11	<—	J2-6	DSR
Shield	—		—	Shield	—
J1-45	Circuit GND	Twisted pair no. 1	—	J2-7	Circuit GND
Shield	—		—	Shield	—
J1-33	DCD/LL	Twisted pair no. 12	<—	J2-8	DCD
Shield	—		—	Shield	—
J1-37	TXC/NIL	Twisted pair no. 8	<—	J2-15	TXC
Shield	—		—	Shield	—
J1-38	RXC/TXCE	Twisted pair no. 7	<—	J2-17	RXC
Shield	—		—	Shield	—
J1-44	LL/DCD	Twisted pair no. 2	—>	J2-18	LTST
Shield	—		—	Shield	—
J1-43	DTR/DSR	Twisted pair no. 3	—>	J2-20	DTR
Shield	—		—	Shield	—

Table 1 EIA/TIA-232 DTE Cable Pinout (DB-60 to DB-25) (Continued)

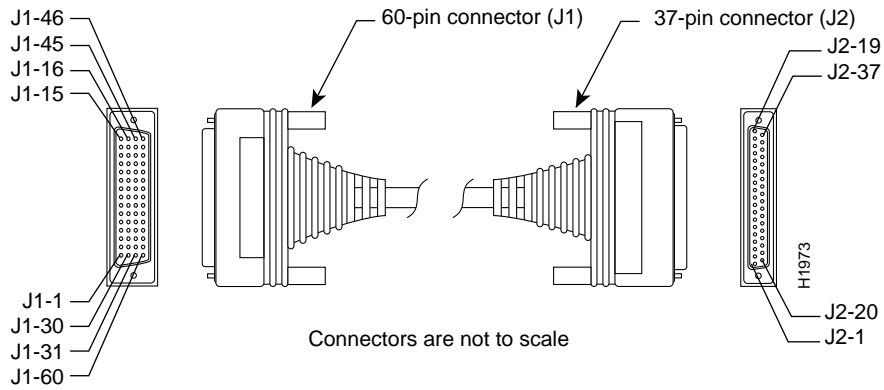
60-Pin	Signal	Note	Direction	25-Pin	Signal
J1-39	TXCE/TXC	Twisted pair no. 6	—>	J2-24	TXCE
Shield	—		—	Shield	—

Table 2 EIA/TIA-232 DCE Cable Pinout (DB-60 to DB-25)

60-Pin	Signal	Note	Direction	25-Pin	Signal
J1-50	MODE_0	Shorting group	—	—	—
J1-51	GND				
J1-36	RXD/TXD	Twisted pair no. 9	<—	J2-2	TXD
Shield	—		—	Shield	—
J1-41	TXD/RXD	Twisted pair no. 5	—>	J2-3	RXD
Shield	—		—	Shield	—
J1-35	CTS/RTS	Twisted pair no. 10	<—	J2-4	RTS
Shield	—		—	Shield	—
J1-42	RTS/CTS	Twisted pair no. 4	—>	J2-5	CTS
Shield	—		—	Shield	—
J1-43	DTR/DSR	Twisted pair no. 3	—>	J2-6	DSR
Shield	—		—	Shield	—
J1-45	Circuit GND	Twisted pair no. 1	—	J2-7	Circuit GND
Shield	—		—	Shield	—
J1-44	LL/DCD	Twisted pair no. 2	—>	J2-8	DCD
Shield	—		—	Shield	—
J1-39	TXCE/TXC	Twisted pair no. 7	—>	J2-15	TXC
Shield	—		—	Shield	—
J1-40	NIL/RXC	Twisted pair no. 6	—>	J2-17	RXC
Shield	—		—	Shield	—
J1-33	DCD/LL	Twisted pair no. 12	<—	J2-18	LTST
Shield	—		—	Shield	—
J1-34	DSR/DTR	Twisted pair no. 11	<—	J2-20	DTR
Shield	—		—	Shield	—
J1-38	RXC/TXCE	Twisted pair no. 8	<—	J2-24	TXCE
Shield	—		—	Shield	—

EIA/TIA-449 Serial Cable Assembly

Figure 6 shows the EIA/TIA-449 serial cable assembly. Table 3 lists the DTE pinout and Table 4 lists the DCE pinout. Arrows indicate signal direction: —> means DTE to DCE and <— means DCE to DTE.

Figure 6 EIA/TIA-449 Serial Cable Assembly**Table 3 EIA/TIA-449 DTE Cable Pinout (DB-60 to DB-37)**

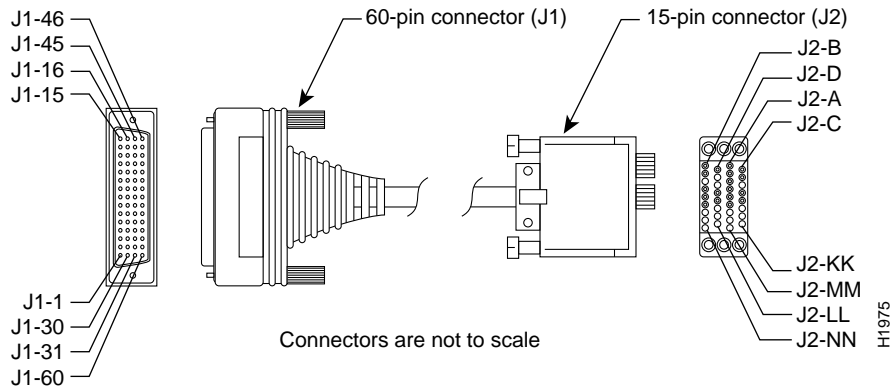
60-Pin	Signal Name	Note	Direction	37-Pin	Signal Name
J1-49	MODE_1	Shorting group	—	—	—
J1-48	GND				
J1-51	GND	Shorting group	—	—	—
J1-52	MODE_DCE				
J1-46	Shield_GND	Single	—	J2-1	Shield GND
J1-11	TXD/RXD+	Twisted pair no. 6	—>	J2-4	SD+
J1-12	TXD/RXD-		—>	J2-22	SD-
J1-24	TXC/RXC+	Twisted pair no. 9	<—	J2-5	ST+
J1-23	TXC/RXC-		<—	J2-23	ST-
J1-28	RXD/TXD+	Twisted pair no. 11	<—	J2-6	RD+
J1-27	RXD/TXD-		<—	J2-24	RD-
J1-9	RTS/CTS+	Twisted pair no. 5	—>	J2-7	RS+
J1-10	RTS/CTS-		—>	J2-25	RS-
J1-26	RXC/TXCE+	Twisted pair no. 10	<—	J2-8	RT+
J1-25	RXC/TXCE-		<—	J2-26	RT-
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-9	CS+
J1-2	CTS/RTS-		<—	J2-27	CS-
J1-44	LL/DCD	Twisted pair no. 12	—>	J2-10	LL
J1-45	Circuit_GND		—	J2-37	SC
J1-3	DSR/DTR+	Twisted pair no. 2	<—	J2-11	DM+
J1-4	DSR/DTR-		<—	J2-29	DM-
J1-7	DTR/DSR+	Twisted pair no. 4	—>	J2-12	TR+
J1-8	DTR/DSR-		—>	J2-30	TR-
J1-5	DCD/DCD+	Twisted pair no. 3	<—	J2-13	RR+
J1-6	DCD/DCD-		<—	J2-31	RR-
J1-13	TXCE/TXC+	Twisted pair no. 7	—>	J2-17	TT+
J1-14	TXCE/TXC-		—>	J2-35	TT-
J1-15	Circuit_GND	Twisted pair no. 9	—	J2-19	SG
J1-16	Circuit_GND		—	J2-20	RC

Table 4 EIA/TIA-449 DCE Cable Pinout (DB-60 to DB-37)

60-Pin	Signal Name	Note	Direction	37-Pin	Signal Name
J1-49 J1-48	MODE_1 GND	Shorting group	—	—	—
J1-46	Shield_GND	Single	—	J2-1	Shield GND
J1-28 J1-27	RXD/TXD+ RXD/TXD–	Twisted pair no. 11	<— <—	J2-4 J2-22	SD+ SD–
J1-13 J1-14	TXCE/TXC+ TXCE/TXC–	Twisted pair no. 7	—> —>	J2-5 J2-23	ST+ ST–
J1-11 J1-12	TXD/RXD+ TXD/RXD–	Twisted pair no. 6	—> —>	J2-6 J2-24	RD+ RD–
J1-1 J1-2	CTS/RTS+ CTS/RTS–	Twisted pair no. 1	<— <—	J2-7 J2-25	RS+ RS–
J1-24 J1-23	TXC/RXC+ TXC/RXC–	Twisted pair no. 9	—> —>	J2-8 J2-26	RT+ RT–
J1-9 J1-10	RTS/CTS+ RTS/CTS–	Twisted pair no. 5	—> —>	J2-9 J2-27	CS+ CS–
J1-29 J1-30	NIL/LL Circuit_GND	Twisted pair no. 12	—> —	J2-10 J2-37	LL SC
J1-7 J1-8	DTR/DSR+ DTR/DSR–	Twisted pair no. 4	—> —>	J2-11 J2-29	DM+ DM–
J1-3 J1-4	DSR/DTR+ DSR/DTR–	Twisted pair no. 2	<— <—	J2-12 J2-30	TR+ TR–
J1-5 J1-6	DCD/DCD+ DCD/DCD–	Twisted pair no. 3	—> —>	J2-13 J2-31	RR+ RR–
J1-26 J1-25	RXC/TXCE+ RXC/TXCE–	Twisted pair no. 10	<— <—	J2-17 J2-35	TT+ TT–
J1-15 J1-16	Circuit_GND Circuit_GND	Twisted pair no. 8	— —	J2-19 J2-20	SG RC

V.35 Serial Cable Assembly

Figure 7 shows the V.35 serial cable assembly. Table 5 lists the DTE pinout and Table 6 lists the DCE pinout. Arrows indicate signal direction: —> means DTE to DCE and <— means DCE to DTE.

Figure 7 V.35 Serial Cable Assembly**Table 5 V.35 DTE Cable Pinout (DB-60 to Winchester-Type 34-Pin)**

60-Pin	Signal Name	Type	Direction	34-Pin	Signal Name
J1-49 J1-48	MODE_1 GND	Shorting group	—	—	—
J1-50 J1-51 J1-52	MODE_0 GND MODE_DCE	Shorting group	—	—	—
J1-53 J1-54 J1-55 J1-56	TxC/NIL RxC_TxCE RxD/TxD GND	Shorting group	—	—	—
J1-46	Shield_GND	Single	—	J2-A	Frame GND
J1-45 Shield	Circuit_GND —	Twisted pair no. 12	— —	J2-B Shield	Circuit GND —
J1-42 Shield	RTS/CTS —	Twisted pair no. 9	—> —	J2-C Shield	RTS —
J1-35 Shield	CTS/RTS —	Twisted pair no. 8	<— —	J2-D Shield	CTS —
J1-34 Shield	DSR/DTR —	Twisted pair no. 7	<— —	J2-E Shield	DSR —
J1-33 Shield	DCD/LL —	Twisted pair no. 6	<— —	J2-F Shield	RLSD —
J1-43 Shield	DTR/DSR —	Twisted pair no. 10	—> —	J2-H Shield	DTR —
J1-44 Shield	LL/DCD —	Twisted pair no. 11	—> —	J2-K Shield	LT —
J1-18 J1-17	TxD/RxD+ TxD/RxD—	Twisted pair no. 1	—> —>	J2-P J2-S	SD+ SD—
J1-28 J1-27	RxD/TxD+ RxD/TxD—	Twisted pair no. 5	<— <—	J2-R J2-T	RD+ RD—

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Table 5 V.35 DTE Cable Pinout (DB-60 to Winchester-Type 34-Pin) (Continued)

60-Pin	Signal Name	Type	Direction	34-Pin	Signal Name
J1-20	TxCE/TxC+	Twisted pair no. 2	—>	J2-U	SCTE+
J1-19	TxCE/TxC–		—>	J2-W	SCTE–
J1-26	RxC/TxCE+	Twisted pair no. 4	<—	J2-V	SCR+
J1-25	RxC/TxCE–		<—	J2-X	SCR–
J1-24	TxC/RxC+	Twisted pair no. 3	<—	J2-Y	SCT+
J1-23	TxC/RxC–		<—	J2-AA	SCT–

Table 6 V.35 DCE Cable Pinout (DB-60 to Winchester-Type 34-Pin)

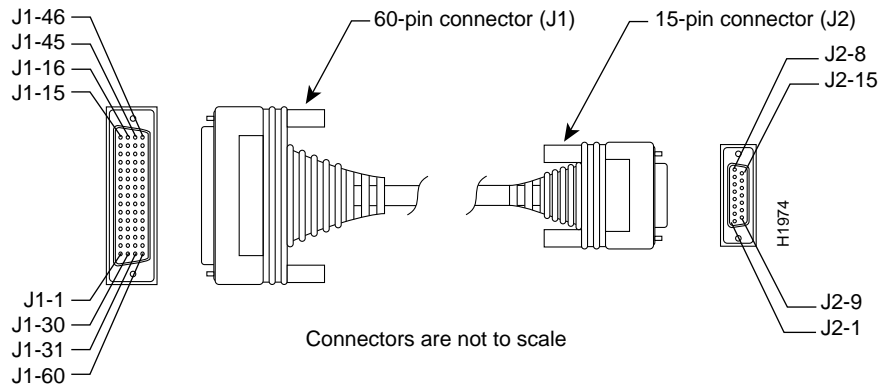
60-Pin	Signal Name	Type	Direction	34-Pin	Signal Name
J1-49	MODE_1	Shorting group	–	–	–
J1-48	GND		–	–	–
J1-50	MODE_0	Shorting group	–	–	–
J1-51	GND		–	–	–
J1-53	TxC/NIL	Shorting group	–	–	–
J1-54	RxC_TxCE		–	–	–
J1-55	RxD/TxD		–	–	–
J1-56	GND		–	–	–
J1-46	Shield_GND	Single	–	J2-A	Frame GND
J1-45	Circuit_GND	Twisted pair no. 12	–	J2-B	Circuit GND
Shield	–		–	Shield	–
J1-35	CTS/RTS	Twisted pair no. 8	<—	J2-C	RTS
Shield	–		–	Shield	–
J1-42	RTS/CTS	Twisted pair no. 9	—>	J2-D	CTS
Shield	–		–	Shield	–
J1-43	DTR/DSR	Twisted pair no. 10	—>	J2-E	DSR
Shield	–		–	Shield	–
J1-44	LL/DCD	Twisted pair no. 11	—>	J2-F	RLSD
Shield	–		–	Shield	–
J1-34	DSR/DTR	Twisted pair no. 7	<—	J2-H	DTR
Shield	–		–	Shield	–
J1-33	DCD/LL	Twisted pair no. 6	<—	J2-K	LT
Shield	–		–	Shield	–
J1-28	RxD/TxD+	Twisted pair no. 5	<—	J2-P	SD+
J1-27	RxD/TxD–		<—	J2-S	SD–
J1-18	TxD/RxD+	Twisted pair no. 1	—>	J2-R	RD+
J1-17	TxD/RxD–		—>	J2-T	RD–
J1-26	RxC/TxCE+	Twisted pair no. 4	<—	J2-U	SCTE+
J1-25	RxC/TxCE–		<—	J2-W	SCTE–
J1-22	NIL/RxC+	Twisted pair no. 3	—>	J2-V	SCR+
J1-21	NIL/RxC–		—>	J2-X	SCR–

Table 6 V.35 DCE Cable Pinout (DB-60 to Winchester-Type 34-Pin) (Continued)

60-Pin	Signal Name	Type	Direction	34-Pin	Signal Name
J1-20	TxCE/TxC+	Twisted pair no. 2	—>	J2-Y	SCT+
J1-19	TxCE/TxC–		—>	J2-AA	SCT–

X.21 Serial Cable Assembly

Figure 8 shows the X.21 serial cable assembly. Table 7 lists the DTE pinout and Table 8 lists the DCE pinout. Arrows indicate signal direction: —> means DTE to DCE and <— means DCE to DTE.

Figure 8 X.21 Serial Cable Assembly**Table 7 X.21 DTE Cable Pinout (DB-60 to DB-15)**

60-Pin	Signal Name	Type	Direction	15-Pin	Signal Name
J1-48	GND	Shorting group	-	-	-
J1-47	MODE_2				
J1-51	GND	Shorting group	-	-	-
J1-52	MODE_DCE				
J1-46	Shield_GND	Single	-	J2-1	Shield GND
J1-11	TXD/RXD+	Twisted pair no. 3	—>	J2-2	Transmit+
J1-12	TXD/RXD–		—>	J2-9	Transmit–
J1-9	RTS/CTS+	Twisted pair no. 2	—>	J2-3	Control+
J1-10	RTS/CTS–		—>	J2-10	Control–
J1-28	RXD/TXD+	Twisted pair no. 6	<—	J2-4	Receive+
J1-27	RXD/TXD–		<—	J2-11	Receive–
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-5	Indication+
J1-2	CTS/RTS–		<—	J2-12	Indication–
J1-26	RXC/TXCE+	Twisted pair no. 5	<—	J2-6	Timing+
J1-25	RXC/TXCE–		<—	J2-13	Timing–
J1-15	Control_GND	Twisted pair no. 4	-	J2-8	Control GND
Shield	-		-	Shield	-

Table 8 X.21 Serial DCE Cable Pinout (DB-60 to DB-15)

60 Pin	Signal Name	Type	Direction	15 Pin	Signal Name
J1-48	GND	Shorting group	—	—	—
J1-47	MODE_2				
J1-46	Shield_GND	Single	—	J2-1	Shield GND
J1-28	RXD/TXD+	Twisted pair no. 6	<—	J2-2	Transmit+
J1-27	RXD/TXD—		<—	J2-9	Transmit—
J1-1	CTS/RTS+	Twisted pair no. 1	<—	J2-3	Control+
J1-2	CTS/RTS—		<—	J2-10	Control—
J1-11	TXD/RXD+	Twisted pair no. 3	—>	J2-4	Receive+
J1-12	TXD/RXD—		—>	J2-11	Receive—
J1-9	RTS/CTS+	Twisted pair no. 2	—>	J2-5	Indication+
J1-10	RTS/CTS—		—>	J2-12	Indication—
J1-24	TXC/RXC+	Twisted pair no. 4	—>	J2-6	Timing+
J1-23	TXC/RXC—		—>	J2-13	Timing—
J1-15	Control_GND	Twisted pair no. 5	—	J2-8	Control GND
Shield	—		—	Shield	—

EIA-530 Serial Cable Assembly

Figure 9 shows the EIA-530 serial cable assembly, and Table 9 lists the pinout. Arrows indicate signal direction: —> means DTE to DCE and <— means DCE to DTE.

The EIA-530 interface cannot be operated in DCE mode, and no DCE cable is available for it.

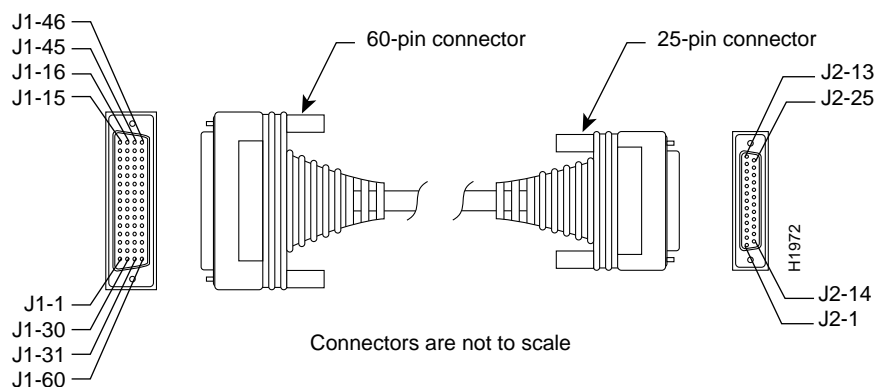
Figure 9 EIA-530 Serial Cable Assembly

Table 9 EIA-530 DTE Cable Pinout (DB-60 to DB-25)

60-Pin	Signal Name	25-Pin	Signal Name	Direction
J1-11	TXD/RXD+	J2-2	BA(A), TXD+	—>
J1-12	TXD/RXD–	J2-14	BA(B), TXD–	—>
J1-28	RXD/TXD+	J2-3	BB(A), RXD+	<—
J1-27	RXD/TXD–	J2-16	BB(B), RXD–	<—
J1-9	RTS/CTS+	J2-4	CA(A), RTS+	—>
J1-10	RTS/CTS–	J2-19	CA(B), RTS–	—>
J1-1	CTS/RTS+	J2-5	CB(A), CTS+	<—
J1-2	CTS/RTS–	J2-13	CB(B), CTS–	<—
J1-3	DSR/DTR+	J2-6	CC(A), DSR+	<—
J1-4	DSR/DTR–	J2-22	CC(B), DSR–	<—
J1-46	Shield_GND	J2-1	Shield	Shorted
J1-47	MODE_2	–	–	
J1-48	GND	–	–	Shorted
J1-49	MODE_1	–	–	
J1-5	DCD/DCD+	J2-8	CF(A), DCD+	<—
J1-6	DCD/DCD–	J2-10	CF(B), DCD–	<—
J1-24	TXC/RXC+	J2-15	DB(A), TXC+	<—
J1-23	TXC/RXC–	J2-12	DB(B), TXC–	<—
J1-26	RXC/TXCE+	J2-17	DD(A), RXC+	<—
J1-25	RXC/TXCE–	J2-9	DD(B), RXC–	<—
J1-44	LL/DCD	J2-18	LL	—>
J1-45	Circuit_GND	J2-7	Circuit_GND	–
J1-7	DTR/DSR+	J2-20	CD(A), DTR+	—>
J1-8	DTR/DSR–	J2-23	CD(B), DTR–	—>
J1-13	TXCE/TXC+	J2-24	DA(A),	—>
J1-14	TXCE/TXC–	J2-11	TXCE+	—>
			DA(B),	
			TXCE–	
J1-51	GND	–	–	Shorted
J1-52	MODE_DCE	–	–	

A/S Serial Module LEDs

All network modules have an enable LED. This LED indicates that the module has passed its self-tests and is available to the router.

Each port on an A/S serial network module also has the additional LEDs shown in Table 10.

Table 10 A/S Serial Network Module LEDs

LED	Meaning
CN/LP	Connect when green, loopback when yellow
RXC	Receive clock
RXD	Receive activity
TXC	Transmit clock
TXD	Transmit activity

Figure 10 shows LEDs for the 4-port A/S serial network module, and Figure 11 shows LEDs for the 8-port A/S serial network module.

Figure 10 4-Port A/S Serial Network Module LEDs

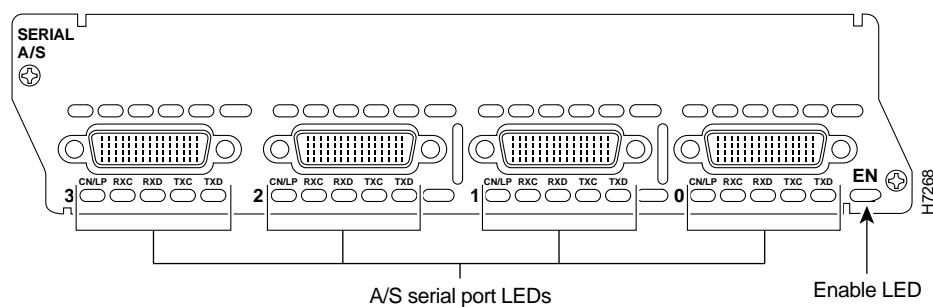
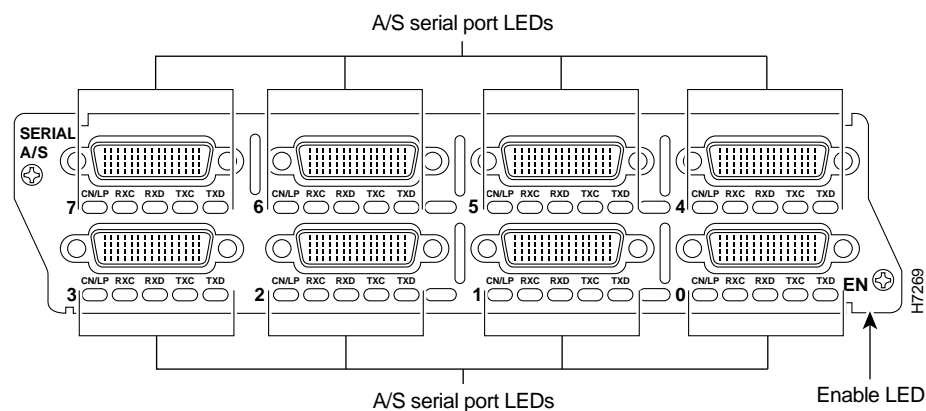


Figure 11 8-Port A/S Serial Network Module LEDs



Configuring the Serial Interfaces

Whenever you install a new interface, or if you want to change the configuration of an existing interface, you must configure the interface. If you replace a module that was already configured, the router recognizes it and brings up the interface in the existing configuration.

Before you configure an interface, have the following information available:

- Protocols you plan to route on the new interface
- IP addresses, subnet masks, network numbers, zones, or other information related to the routing protocol



Timesaver Obtain this information from your system administrator or network plan before you begin router configuration.

You can configure the new interfaces and other router parameters by using any of the following methods:

- Configuration Mode (manual configuration)—Recommended if you are familiar with Cisco Internetwork Operating System (Cisco IOS) commands. Enter the commands at the prompt.
- AutoInstall—Recommended for automatic installation if another router running Cisco IOS software is installed on the network. This configuration method must be set up by someone with experience using Cisco IOS software.
- System Configuration Dialog (setup facility)—Recommended if you are not familiar with Cisco IOS commands. You are prompted for each response.

These procedures are explained in the following sections. If you have questions or need help, refer to the section “Obtaining Service and Support” later in this document for further information.

Configuration Mode

You can configure the serial interfaces on your A/S serial network module manually, by entering Cisco IOS commands on the command line. This method, called configuration mode, provides the greatest power and flexibility.

Before you begin, disconnect all WAN cables from the router to keep it from trying to run the AutoInstall process. The router tries to run AutoInstall whenever you power it ON if there is a WAN connection on both ends and the router does not have a valid configuration file stored in nonvolatile random-access memory (NVRAM) (for instance, when you add a new interface). It can take several minutes for the router to determine that AutoInstall is not connected to a remote Transmission Control Protocol/Internet Protocol (TCP/IP) host.

To enter configuration mode, follow this procedure:

Step 1 Connect a console to the router. If you need instructions for connecting a console, refer to the installation chapter of your router installation and configuration guide. Power up the router.

Step 2 If the current configuration is no longer valid, after about a minute you see the following prompt:

```
Would you like to enter the initial dialog? [yes]:
```

Answer **no**. You now enter the normal operating mode of the router.

Note If the current configuration is valid, you enter the normal operating mode automatically.

- Step 3** After a few seconds you see the user EXEC prompt (Router>). Type **enable** and the password to enter enable mode:

```
Router> enable
Password:
```

Configuration changes can be made only in enable mode. The prompt changes to the privileged EXEC (enable) prompt (Router#):

```
Router#
```

- Step 4** Enter the command **config terminal** to enter configuration mode:

```
Router# config terminal
Router(config)#
```

The router enters global configuration mode, indicated by the Router(config)# prompt.

- Step 5** If you have not configured the router before, or want to change the configuration, configure global parameters, passwords, network management, and routing protocols. In this example, IP routing, AppleTalk routing, and Internetwork Packet Exchange (IPX) routing are all enabled:

```
Router(config)# ip routing
Router(config)# appletalk routing
Router(config)# ipx routing
```

For complete information about global configuration commands, refer to the Cisco IOS configuration guides and command references.

- Step 6** Select the serial interface to configure:

```
Router(config)# interface serial 0/0
Router(config-if)#
```

The prompt changes again to show that you are in interface configuration mode.

- Step 7** Configure routing protocols on the interface. (You must have previously enabled these protocols as part of global configuration.) In this example, IP, AppleTalk, and IPX are being configured on the serial interface:

```
Router(config-if)# ip address 172.16.74.1 255.255.255.0
Router(config-if)# appletalk static cable-range 5-5
Router(config-if)# appletalk zone ZZSerial
Router(config-if)# ipx network B003
```

- Step 8** All serial ports are initially configured as synchronous. If you want to change the port to asynchronous operation, enter the **physical-layer** command:

```
Router(config-if)# physical-layer async
```

Configure other asynchronous parameters according to your needs, for example:

```
Router(config-if)# async mode dedicated
Router(config-if)# async default routing
```

To configure asynchronous line settings, use the **line async** command. A serial port's line number is related to its slot number and unit number in the following way:

$$\text{line-number} = (16 \times \text{slot-number}) + \text{unit-number} + 1$$

For example, serial port 1/2 corresponds to line number $(16 \times 1) + 2 + 1 = 19$. To set this port to a speed of 115,200 bps, you would enter the following commands:

```
line async 19
speed 115200
```

To return an asynchronous port to synchronous operation, enter the following command:

```
Router(config-if)# physical-layer sync
```

- Step 9** Low-speed serial ports configured as DCE can be set to use either controlled carrier mode or constant carrier mode. Controlled carrier mode raises DCD only when data is received. The interface waits for a specified period before transmitting; it then waits for another specified period before dropping DCD. Constant carrier mode (the default for low-speed serial interfaces) raises DCD at all times.

To reset the port from constant carrier mode to controlled carrier mode, enter the **half-duplex** command:

```
Router(config-if)# half-duplex controlled carrier
```

To return to constant carrier mode, enter the **no half-duplex** command:

```
Router(config-if)# no half-duplex controlled carrier
```

- Step 10** Enter **half-duplex timer** commands to specify the time that the interface waits in controlled carrier mode. These commands are listed in Table 11. Time is measured in milliseconds. For example, to configure the Data Carrier Detect (DCD) drop delay to 100 ms, enter the following command:

```
Router(config-if)# half-duplex timer dcd-drop-delay 100
```

Table 11 Half-Duplex Timer Commands

Timer	Syntax	Default Setting (Milliseconds)
CTS delay ¹	half-duplex timer cts-delay	100
CTS drop timeout	half-duplex timer cts-drop-timeout	5000
DCD drop delay	half-duplex timer dcd-drop-delay	100
DCD transmission start delay	half-duplex timer dcd-txstart-delay	100
RTS ² drop delay	half-duplex timer rts-drop-delay	100
RTS timeout	half-duplex timer rts-timeout	2000
Transmit delay	half-duplex timer transmit-delay	0

1. CTS = Clear To Send.

2. RTS = Ready To Send.

- Step 11** All serial interfaces support both DTE and DCE modes. To use a port as a DTE interface, connect a DTE serial cable to the port. When the router detects the cable, it automatically uses the external timing signal. To use a port in DCE mode, connect a DCE serial cable and set the internal transmit clock signal (TXC) speed in bits per second with the **clockrate** command, for example:

```
Router(config-if)# clockrate 72000
```

Acceptable clock rate settings are:

1200	125000
2400	148000
4800	500000
9600	800000
19200	1000000
38400	1300000
56000	2000000
64000	4000000
72000	

Speeds above 64 kbps (64000) are not supported for EIA/TIA-232.

Use the **no clockrate** command to remove the clock rate for DTE operation.

- Step 12** When a port is operating in DCE mode, the default operation is for the DCE to send serial clock transmit (SCT) and serial clock receive (SCR) clock signals to the DTE, and for the DTE to return a serial clock transmit external (SCTE) signal to the DCE. If the DTE does not return SCTE, you must use the **dce-terminal-timing-enable** command to configure the DCE port to use its own clock signal:

```
Router(config-if)# dce-terminal-timing-enable
```

To disable this command, use the **no dce-terminal-timing-enable** command.

- Step 13** Routers that use long cables may experience high error rates when operating at higher transmission speeds, because the clock and data signals can shift out of phase. If a DCE port is reporting a high number of error packets, inverting the clock using the **invert-txc** command can often correct this shift:

```
Router(config-if)# invert-txc
```

Use the **no invert-txc** command to change the clock signal back to its original phase.

- Step 14** All serial interfaces support both nonreturn to zero (NRZ) and nonreturn to zero inverted (NRZI) formats. NRZ is the default; NRZI is commonly used with EIA/TIA-232 connections in IBM environments. To enable NRZI encoding on an interface, enter the **nrzi-encoding** command:

```
Router(config-if)# nrzi-encoding
```

To disable NRZI encoding on a port, enter the **no nrzi-encoding** command.

- Step 15** To configure another serial interface, enter the **exit** command to return to the Router(config)# prompt. Repeat Step 6 through Step 14 of this procedure to configure the next serial interface.

- Step 16** When you are finished configuring interfaces, exit configuration mode and return to the enable prompt by pressing **Ctrl-Z**. To see the current operating configuration, including any changes you just made, enter the **show running-config** command:

```
Router# show running-config
```

To see the configuration currently stored in NVRAM, enter the command **show startup-config** at the enable prompt.

```
Router# show startup-config
```

- Step 17** The results of the **show running-config** and **show startup-config** commands differ from each other if you have made changes to the configuration, but have not yet written them to NVRAM. To write your changes to NVRAM, making them permanent, enter the command **copy running-config startup-config** at the enable prompt:

```
Router# copy running-config startup-config
Building configuration. . .
[OK]
Router#
```

The router is now configured to boot in the new configuration.

AutoInstall

The AutoInstall process is designed to configure the router automatically after it connects to your WAN. For AutoInstall to work properly, a TCP/IP host on your network must be configured to provide the configuration files. The TCP/IP host can reside anywhere on the network if the following two conditions are met:

- The host must be on the remote side of the router's synchronous serial connection to the WAN.
- User Datagram Protocol (UDP) broadcasts to and from the router and the TCP/IP host must be enabled.

This functionality is coordinated by your system administrator at the TCP/IP host site. You should not try to use AutoInstall unless the required files have been installed on the TCP/IP host.

Follow this procedure to prepare your router for the AutoInstall process:

- Step 1** Connect the router to the WAN, following the instructions in the section "Connecting the A/S Serial Module to the Network" earlier in this document.

- Step 2** Turn ON power to the router.

The router loads the operating system image from Flash memory. If the remote end of the WAN connection is connected and properly configured, the AutoInstall process begins.

- Step 3** If AutoInstall succeeds, you should write the configuration data to the router's NVRAM. To do this, enter the **copy running-config startup-config** command at the Router# prompt:

```
Router# copy running-config startup-config
Building configuration. . .
[OK]
Router#
```

Note This step saves the configuration settings that the AutoInstall process created. If you do not do this, your new configuration will be lost the next time you boot the router.

System Configuration Dialog

You can configure the router manually using the System Configuration Dialog facility. Unlike configuration mode, the System Configuration Dialog prompts you for each response.

Before you begin, disconnect all WAN cables from the router to keep it from trying to run the AutoInstall process. The router tries to run AutoInstall whenever you power it ON if there is a WAN connection on both ends and the router does not have a configuration file stored in NVRAM. It can take several minutes for the router to determine that AutoInstall is not connected to a remote TCP/IP host.

This section shows a sample configuration using the System Configuration Dialog. You should enter values appropriate for your router and network.

Many prompts in the System Configuration Dialog include default answers, shown in square brackets following the question. Enter your response, or press **Return** to accept the default answer.

You can request help at any time by entering a question mark (?) at a System Configuration Dialog prompt.

Follow this procedure to configure the router using the System Configuration Dialog:

Step 1 Connect a console to the router. If you need instructions for connecting a console, refer to your router installation and configuration guide. Power up the router.

Step 2 If the current configuration is no longer valid, after about a minute you see the following prompt:

```
Would you like to enter the initial dialog? [yes]:
```

Press **Return** or enter **yes** to enter the System Configuration Dialog.

Note You can enter the System Configuration Dialog at any time from the enable prompt (Router#) by entering the **setup** command.

Step 3 When the System Configuration Dialog asks whether you want to view the current interface summary, press **Return** or enter **yes**:

```
First, would you like to see the current interface summary? [yes]:
```

```
Any interface listed with OK? value "NO" does not have a valid configuration
```

Interface	IP-Address	OK?	Method	Status	Protocol
Serial0/0	unassigned	NO	unset	down	down
Serial0/1	unassigned	NO	unset	down	down
Serial0/2	unassigned	NO	unset	down	down
Serial0/3	unassigned	NO	unset	down	down

Step 4 If you have not configured the router before, or want to change the configuration, you should now configure global parameters, passwords, network management, and routing protocols. Refer to the procedures in the Cisco IOS configuration guides and command references. Press **Return** if you want to accept the default values.

- Step 5** The System Configuration Dialog prompts you to configure network interfaces. When you reach the first serial interface, determine which protocols you want on the interface and enter the appropriate responses. (You must have previously enabled these protocols as part of global configuration.) In the following example, the interface is being configured for IP, AppleTalk, and IPX:

```
Configuring interface Serial0/0:
  Is this interface in use? [yes]:
Configure IP on this interface? [yes]:
  Configure IP unnumbered on this interface? [no]:
    IP address for this interface: 172.16.74.1
    Number of bits in subnet field [8]:
    Class B network is 172.16.0.0, 8 subnet bits; mask is
    255.255.255.0
  Configure AppleTalk on this interface? [no]: yes
    Extended AppleTalk network? [yes]:
    AppleTalk starting cable range [2]: 5
    AppleTalk ending cable range [3]: 5
    AppleTalk zone name [myzone]: ZZSerial
    AppleTalk additional zone name:
  Configure IPX on this interface? [no]: yes
    IPX network number [2]: B003
```

- Step 6** Repeat Step 5 for the remaining serial interfaces.

- Step 7** The configuration you entered is displayed as a command script and you are asked if you want to use it. If you enter **no**, the information you just entered is discarded and you can begin the configuration again. If you enter **yes**, the configuration is saved in the startup configuration:

```
Use this configuration? [yes/no]: yes
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.
```

Press RETURN to get started!

The configuration is saved. If you added an interface, the router reboots in the new configuration when you press **Return**.

All serial ports are initially configured as synchronous. You can configure serial ports you plan to use as asynchronous or make other changes to the configuration in configuration mode, explained in the section “Configuration Mode” earlier in this document.

Obtaining Service and Support

For service and support for a product purchased from a reseller, contact the reseller. Resellers offer a wide variety of Cisco service and support programs, which are described in the section “Service and Support” in the information packet that shipped with your chassis.

Note If you purchased your product from a reseller, you can access Cisco Connection Online (CCO) as a guest. CCO is Cisco Systems’ primary, real-time support channel. Your reseller offers programs that include direct access to CCO’s services.

For service and support for a product purchased directly from Cisco, use CCO.

Cisco Connection Online

CCO is Cisco Systems' primary, real-time support channel. SMARTnet customers and partners can self-register on CCO to obtain additional content and services.

Note If you purchased your product from a reseller, you can access CCO as a guest. Your reseller offers programs that include direct access to CCO's services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

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- WWW: <http://www-china.cisco.com>.
- Telnet: cco.cisco.com.
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

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This document is to be used in conjunction with your router installation and configuration guide and the *Regulatory Compliance and Safety Information* document for your router.

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