# AR400 Series Router
# **Hardware Reference**

AR415S
AR440S
AR441S
AR442S
AR450S

Allied Telesis

AR400 Series Router Hardware Reference
Document Number C613-03086-00 REV G

# Contents

# Devices Covered By This Document

This Hardware Reference includes information on the following devices:

- AR415S

- AR440S

- AR441S

- AR442S

- AR450S

Hardware Reference updates can be found at
www.alliedtelesis.com/support/software/ .

# Hardware Overview

The AR400 Series routers are high-performance broadband routers based around 10BASE-T/100BASE-TX switch ports. The AR440S and AR441S routers include an ADSL port, while the AR442S provides an SHDSL port. AR415S, AR440S, AR441S and AR442S routers all include a Port Interface Card (PIC) bay. The PIC bay adds expansion flexibility by allowing you to install a PIC card, available with ISDN (PRI E1/T1, BRI S/T, or BRI U), Ethernet, Voice over IP, synchronous, or asynchronous ports. The AR415S has an Eth port that can be used for a dedicated WAN connection. The AR450S has dedicated WAN and DMZ eth ports, and two asynchronous ports.

# AR415S Secure Modular Router

Each AR415S router provides:

■ four 10/100 Mbps full duplex, Layer 2 LAN Ethernet switch ports

■ one 10/100 Mbps full duplex, WAN Ethernet port

All LAN and WAN ethernet ports autonegotiate speed, duplex mode and MDI/MDI-X. However, on the LAN switch ports you can use the software to set these to a fixed configuration. If you turn off the Auto-MDI feature, the ports are hard-wired as MDI-X. Software can also force a switch port to either MDI or MDI-X.

■ one asynchronous port (ASYN0)

The RS-232 (V.24) asynchronous serial port (ASYN0) has an RJ-45 connector, is wired as a DTE port, and can be used as a general purpose port for terminals, printers or modems. For pin wiring and default communication settings, see .

■ one PIC bay

Front and rear panels of the AT-AR415S router are shown in the following figure.
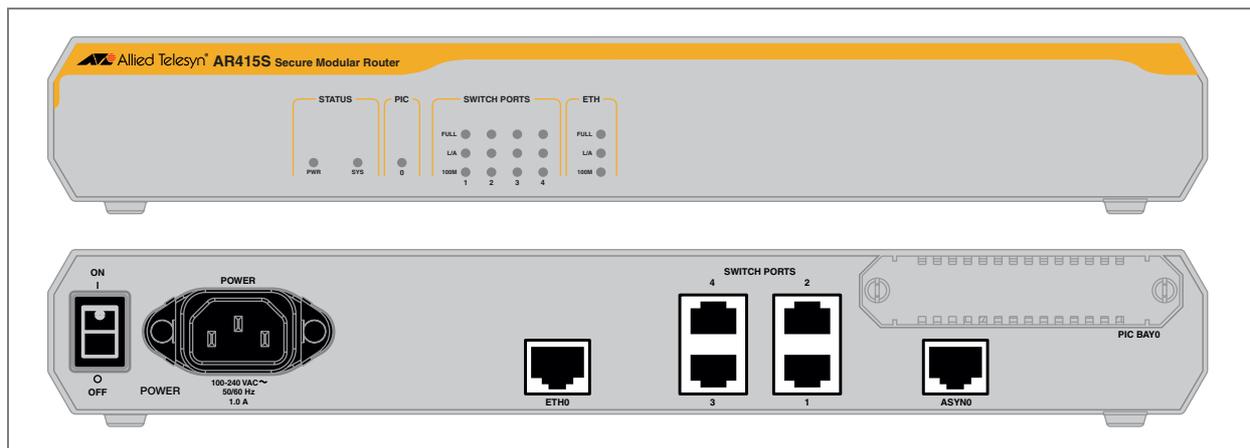


## Hardware Features

■ 266 MHz RISC processor

■ 32 MBytes of SDRAM

■ 16 MBytes of flash memory (1 MByte reserved for boot block code)

■ 802.1Q tagged VLAN support

■ universal AC power supply

■ on-board hardware encryption processor for DES, 3DES and AES (Some encryption options may require feature licenses.)

**Port Interface Card bay**

The PIC bay can accommodate any of the following PICs:

• AT-AR020 PRI E1/T1 PIC, one primary rate E1/T1 port

• AT-AR021S (V2) BRI-S/T PIC, one basic rate ISDN S/T port

• AT-AR022 ETH PIC, one Ethernet LAN AUI/10BASE-T port

- AT-AR023 SYN PIC, one synchronous port with universal 50-way AMPLIMITE connector

  When installed in an AR415S router and operating in V.35 mode, synchronous PICs have full V.35 functionality, but their output voltages may not be within the voltage range set by the V.35 specification.

  Synchronous PICs installed in an AR415S cannot be fully tested with Syntester.

- AT-AR024 ASYN4 PIC, four asynchronous ports with RJ-45 connectors

  The pinout for these asyn ports is different from the pinout of the AR415S base asyn port. See the *Port Interface Card Hardware Reference*.

- AT-AR026 4ETH PIC, four 10BASE-T/100 BASE-TX auto-negotiating ports with RJ-45 connectors

- AT-AR027 VoIP-FXS PIC, two Foreign Exchange Subscriber (FXS) ports with RJ-11 connectors

## Environmental Conditions

■ operating temperature range: 0 ºC to 40 ºC (32 ºF to 104 ºF)

■ storage temperature range: -25 ºC to 70 ºC (-13 ºF to 158 ºF)

■ relative humidity range—storage: 5 to 95% non-condensing

■ relative humidity range—operating: 5 to 80% non-condensing

■ operational altitude: 3000 metres maximum (10 000 feet)

## Power Supply

The router has a universal AC input connector and a power switch on the rear panel. The router requires a power input of 100 VAC to 240 VAC and 50 Hz to 60 Hz.

⚠ **Caution**  Some interfaces that may be installed in the router are not transformer isolated. This means they will be referenced to the frame ground of the equipment and may be damaged if connected to an interface on another piece of equipment which is at a different ground potential.

## LEDs and What They Mean

The following table shows functions of the AR415S router LEDs.

| LED | State | Function |
| --- | --- | --- |
| PWR | Green | The router is receiving power and the power switch is ON. |
| SYS | Amber | Lit briefly during router start up, or the router is malfunctioning. |
| | Off | Normal operation. |
| PIC 0 | Green | A port interface card (PIC) is correctly installed and has been detected by the router. |
| | Off | No PIC is installed, or the router has not recognised the PIC. |
| Full | Green | The link is in full-duplex mode. |
| | Off | The link is in half-duplex mode. |
| L/A | Green | A link has been established. |
| | Flashing | Data is being transmitted. |
| | Off | There is no link. |
| 100M | Green | The link is at 100 Mbps speed. |
| | Off | The link is at 10 Mbps speed. |

# AR440S and AR441S ADSL Routers

Each AR440S or AR441S router provides:

■ AR440S: One Asynchronous Digital Subscriber Line (ADSL) Annex A port

■ AR441S: One Asynchronous Digital Subscriber Line (ADSL) Annex B port

■ five 10/100 Mbps full duplex, Layer 2 switched Ethernet LAN ports

  All LAN ports have Auto-MDI, however if Auto-MDI is turned off, then all ports are hard-wired as MDI-X. Software can also force a port to either MDI or MDI-X.

■ one asynchronous port (ASYN0)

  The RS-232 (V.24) asynchronous serial port (ASYN0) has a DB9 male connector, is wired as a DTE port, and can be used as a general purpose port for terminals, printers or modems. For pin wiring and default communication settings, see "Asynchronous Interfaces" on page 17.

■ one PIC bay

Front and rear panels of the AT-AR440S router are shown in the following figure. The AR441S front and rear panels look the same, except for the name on the front panel.
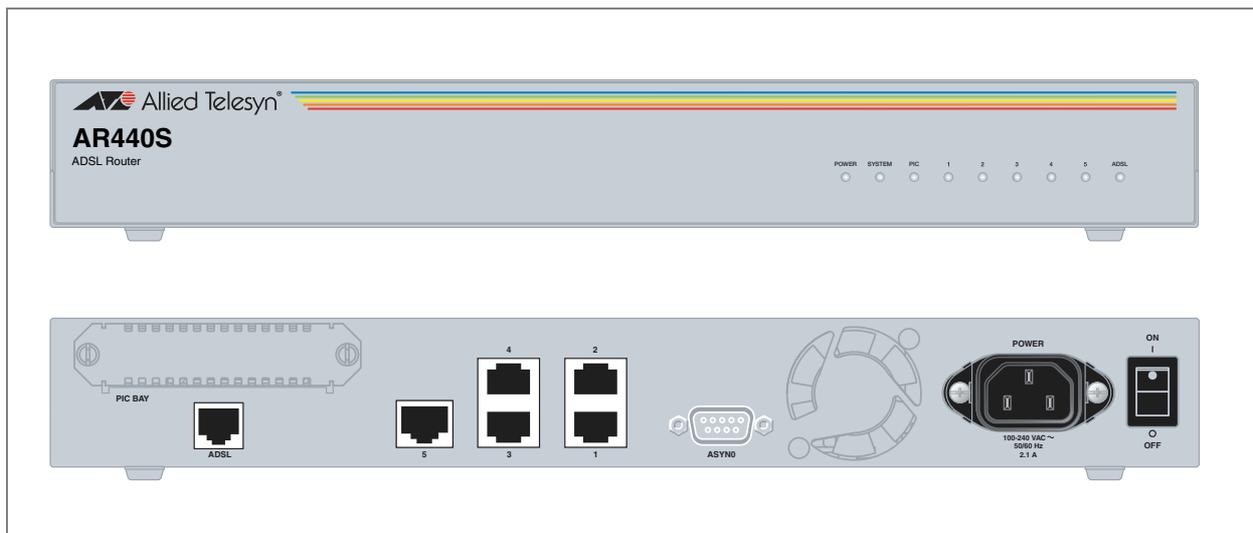


## Hardware Features

■ 300 MHz RISC processor

■ 64 MBytes of SDRAM

■ 16 MBytes of flash memory (1 MByte reserved for boot block code)

■ 802.1Q tagged VLAN support

■ universal AC power supply

■ on-board hardware encryption processor for DES, 3DES and AES (Some encryption options may require feature licenses.)

**ADSL interfaces**   The ADSL port has an RJ-11 connector, and supports Dying Gasp. The speed depends on the DSLAM to which the router is connected, and the length and interference on the cable connecting them. The following table shows the pin wiring for the ADSL interface.

| Pin* | Function |
|------|----------|
| 1 | *Not connected* |
| 2 | *Not connected* |
| 3 | ADSL+ |
| 4 | ADSL- |
| 5 | *Not connected* |
| 6 | *Not connected* |

*Pins are numbered from left to right.

**Port Interface Card bay**   The PIC bay can accommodate any of the following PICs:

- AT-AR020 PRI E1/T1 PIC, one primary rate E1/T1 port

- AT-AR021(S) BRI-S/T PIC, one basic rate ISDN S/T port

- AT-AR021(U) BRI-U PIC, one basic rate ISDN U port

- AT-AR022 ETH PIC, one Ethernet LAN AUI/10BASE-T port

- AT-AR023 SYN PIC, one synchronous port with universal 50-way AMPLIMITE connector

  When installed in an AR440S or AR441S router and operating in V.35 mode, synchronous PICs have full V.35 functionality, but their output voltages may not be within the voltage range set by the V.35 specification.

  Synchronous PICs installed in an AR440S or AR441S cannot be fully tested with Syntester.

- AT-AR024 ASYN4 PIC, four asynchronous ports with RJ-45 connectors

- AT-AR026 4ETH PIC, four 10BASE-T/100 BASE-TX auto-negotiating ports with RJ-45 connectors

- AT-AR027 VoIP-FXS PIC, two Foreign Exchange Subscriber (FXS) ports with RJ-11 connectors

## Environmental Conditions

- operating temperature range: 0 ℃ to 50 ℃ (32 ℉ to 122 ℉)

- storage temperature range: -25 ℃ to 70 ℃ (-13 ℉ to 158 ℉)

- relative humidity range—storage: 5 to 95% non-condensing

- relative humidity range—operating: 5 to 80% non-condensing

- operational altitude: 3000 metres maximum (10 000 feet)

## Power Supply

The routers have a universal AC input connector and a power switch on their rear panel. The routers require a power input of 100 VAC to 240 VAC and 50 Hz to 60 Hz.

⚠️  **Caution**  Some interfaces that may be installed in the router are not transformer isolated. This means they will be referenced to the frame ground of the equipment and may be damaged if connected to an interface on another piece of equipment which is at a different ground potential.

## LEDs and What They Mean

The following table shows functions of the AR440S and AR441S router LEDs.

| LED | State | Function |
| --- | --- | --- |
| Power | Green | The router is receiving power and the power switch is ON. |
| System | Red | Lit briefly during router start up, or the router is malfunctioning. |
| | Red flashing | The fan has failed. |
| | Off | Normal operation. |
| PIC | Green | A port interface card (PIC) is correctly installed and has been detected by the router. |
| | Off | No PIC is installed, or the router has not recognised the PIC. |
| 1 - 5 | Green | A 100 Mbps link has been established through the corresponding switch port. |
| | Green flashing | Data is being transmitted through the corresponding switch port at 100 Mbps. |
| | Amber | A 10 Mbps link has been established through the corresponding switch port. |
| | Amber flashing | Data is being transmitted through the corresponding switch port at 10 Mbps. |
| | Off | No link is present through the corresponding port. |
| ADSL | Green | A link has been established through the ADSL port. It is ready to send or receive data. |
| | Green flashing fast | Data is being transmitted or received through the ADSL port. |
| | Green flashing slow (1 sec) | The ADSL port is in Loopback mode. |
| | Amber | The ADSL DSP is initialised and the port handshakes (looking for tones) or is physically disconnected. |
| | Amber flashing | The ADSL port has found tones, and is training to negotiate the link. |
| | Green and amber alternating | There is a fault in the ADSL port. |
| | Off | The ADSL port is disabled, or the ADSL DSP is initialising |

# AR442S SHDSL Router

Each AR442S router provides:

■ One 2-pair (4-wire) SHDSL port (Single-pair High-speed Digital Subscriber Line, also known as Symmetric High bit-rate Digital Subscriber Loop)

■ Five 10/100 Mbps full duplex, Layer 2 switched Ethernet LAN ports. All LAN ports have Auto-MDI, however if Auto-MDI is turned off, then all ports are hard-wired as MDI-X. Software can also force a port to either MDI or MDI-X

■ One asynchronous (ASYN0) port

The RS-232 (V.24) asynchronous serial port (ASYN0) has a DB9 male connector, is wired as a DTE port and can be used as a general purpose port for terminals, printers or modems. For pin wiring and default communication settings, see "Asynchronous Interfaces" on page 17.

■ One PIC bay

The following figure shows the front and rear panels of the AT-AR442S router.
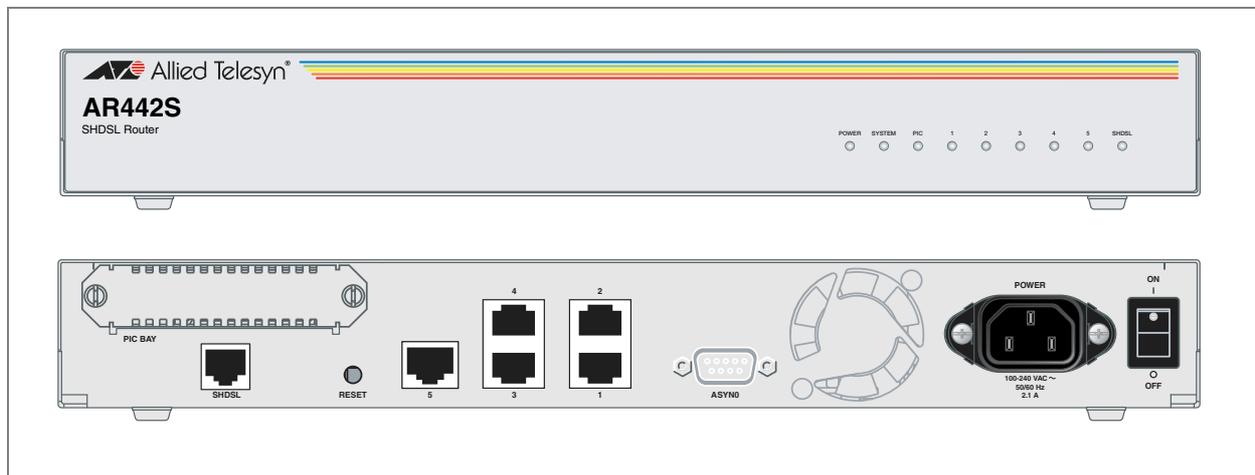


## Hardware Features

■ 300 MHz RISC processor

■ 128 MBytes of SDRAM

■ 16 MBytes of flash memory (1 MByte reserved for boot block code)

■ 802.1Q tagged VLAN support

■ universal AC power supply

■ on-board hardware encryption processor for DES, 3DES and AES (Some encryption options may require feature licenses.)

**SHDSL interface**     The SHDSL interface transmits and receives data compliant with ITU-T G.991.2 recommendations as either CPE or CO. The data rates depend on the DSLAM to which the router is connected, and the length and interference on the cable connecting them. On an ideal line, two-wire mode gives symmetric data rates of up to 2.3 Mbps; four-wire mode gives a maximum data rate of 4.6 Mbps. The SHDSL interface supports power back off and Power Status (Dying Gasp).

The following table shows the pin wiring for the SHDSL interface.

| Pin* | Function |
|------|----------|
| 1 | — |
| 2 | Pair 2 Tip |
| 3 | Pair 1 Ring |
| 4 | Pair 1 Tip |
| 5 | Pair 2 Ring |
| 6 | — |

*Pins are numbered from left to right.

Figure 1: Cable wiring for AR442S SHDSL port connection
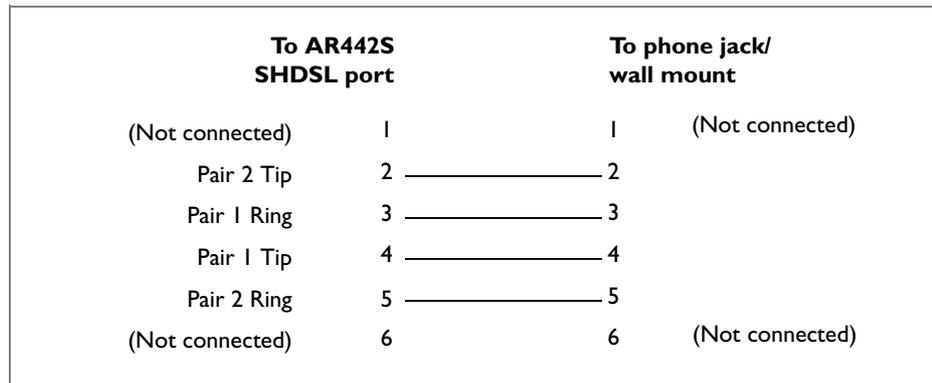


**Port Interface Card bay**     The PIC bay can accommodate any of the following Port Interface Cards:

- AT-AR020 PRI E1/T1 PIC, one primary rate E1/T1 port
- AT-AR021(S) BRI-S/T PIC, one basic rate ISDN S/T port
- AT-AR021(U) BRI-U PIC, one basic rate ISDN U port
- AT-AR022 ETH PIC, one Ethernet LAN AUI/10BASE-T port
- AT-AR023 SYN PIC, one synchronous port with universal 50-way AMPLIMITE connector
- AT-AR024 ASYN4 PIC, four asynchronous ports with RJ-45 connectors
- AT-AR026 4ETH PIC, four 10BASE-T/100 BASE-TX autonegotiating ports with RJ-45 connectors
- AT-AR027 VoIP-FXS PIC, two Foreign Exchange Subscriber (FXS) ports with RJ-11 connectors

When installed in an AR442S router and operating in V.35 mode, synchronous PICs have full V.35 functionality, but their output voltages may not be within the voltage range set by the V.35 specification.

Synchronous PICs installed in an AR442S cannot be fully tested with Syntester.

## Environmental Conditions

■ operating temperature range: 0 ºC to 50 ºC (32 ºF to 122 ºF)

■ storage temperature range: -25 ºC to 70 ºC (-13 ºF to 158 ºF)

■ relative humidity range - Storage: 5 to 95% non-condensing

■ relative humidity range - Operating: 5 to 80% non-condensing

■ operational altitude: 3000 metres maximum (10 000 feet)

## Power Supply

The router has a universal AC input connector and a power switch on its rear panel. The router requires a power input of 100 VAC to 240 VAC and 50 Hz to 60 Hz.

⚠ Some interfaces that may be installed in the router are not transformer-isolated. This means they will be referenced to the frame ground of the equipment and may be damaged if connected to an interface on another piece of equipment that is at a different ground potential.

## Restart with Default Configuration

To restart the router with the default configuration, either press the Reset button on the rear panel, or use the command:

```
restart router config=none
```

This restarts the router immediately with the default configuration specified in the `boot.cfg` file. The factory-loaded default configuration is shown in the Installation and Safety Guide. If the boot.cfg file has been removed, the router restarts with no configuration. We recommend leaving `boot.cfg` unchanged, so that you can revert to the original configuration if necessary.

To return the router to the previous user configuration, restart the router either by using the command:

```
restart router
```

This restarts the router with the startup configuration file previously specified by the command:

```
set config=filename
```

The **restart reboot** command or a power cycle also reload this user configuration. For information about configuration files, see the *Managing Configuration Files and Software Versions* chapter in the Software Reference.

## LEDs and What They Mean

The following table shows functions of the AR442S LEDs.

| LED | State | Function |
| --- | --- | --- |
| Power | Green | The router is receiving power and the power switch is ON. |
| System | Red | Lit briefly during router start up, or the router is malfunctioning. |
| | Red flashing | The fan has failed. |
| | Off | Normal operation. |
| PIC | Green | A port interface card (PIC) is correctly installed and has been detected by the router. |
| | Off | No PIC is installed, or the router has not recognised the PIC. |
| 1 - 5 (switch ports) | Green | A 100 Mbps link has been established through the switch port. |
| | Green flashing | Data is being transmitted at 100 Mbps. |
| | Amber | A 10 Mbps link has been established. |
| | Amber flashing | Data is being transmitted at 10 Mbps. |
| | Off | No link is present through the port. |
| SHDSL | Green | A link has been established through the SHDSL port. It is ready to send or receive data. |
| | Green flashing fast | Data is being transmitted or received. |
| | Green flashing slow (1 sec) | The port is in Loopback mode. |
| | Amber | SHDSL is enabled and is in handshake mode (looking for tones), or is physically disconnected. |
| | Amber flashing | The port has found tones, and is training to negotiate the link. |
| | Green and amber alternating | There is a fault in the port. |
| | Off | The port is disabled. |

# AR450S Router

Each AR450S provides:

■ five 10/100 Mbps full duplex, Layer 2 switched Ethernet LAN ports

All LAN ports have Auto-MDI, however if Auto-MDI is turned off, then all ports are hard-wired as MDI-X. Software can also force a port to either MDI or MDI-X.

■ two 10/100 Mbps full-duplex Eth WAN ports

■ two asynchronous ports (ASYN0 and ASYN1)

The RS-232 (V.24) asynchronous serial ports (ASYN0, ASYN1) have DB9 male connectors, are wired as DTE ports and can be used as general purpose ports for terminals, printers or modems. For pin wiring and default communication settings, see "Asynchronous Interfaces" on page 17.

The following figure shows the front and rear panels of the AT-AR450S router.
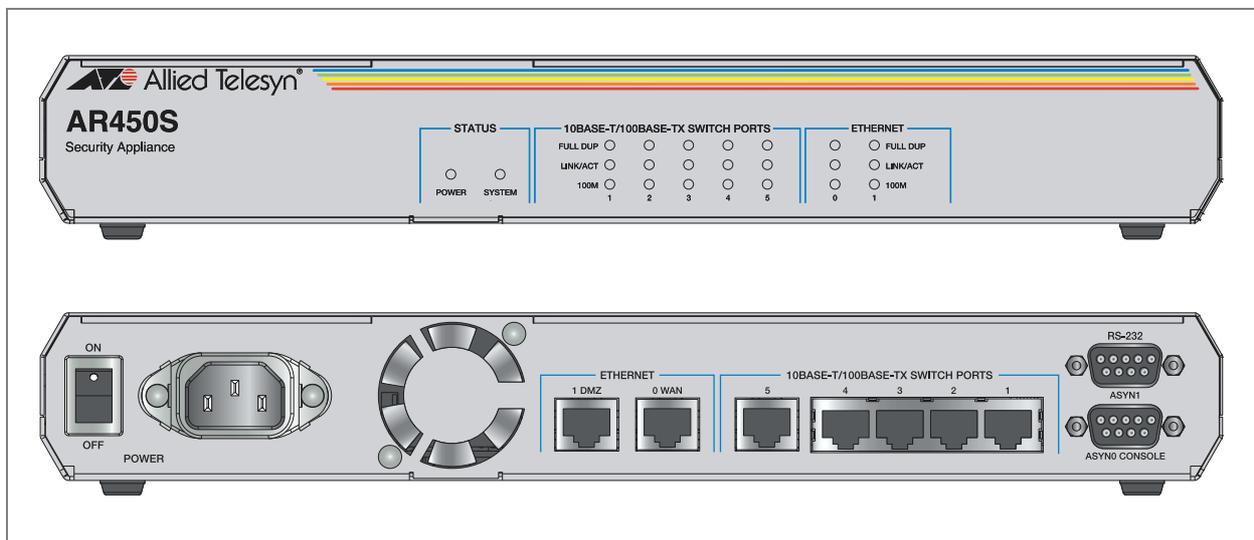


## Hardware Features

■ 400 MHz RISC processor

■ 64 MBytes of SDRAM, expandable to 256 MBytes

■ 16 MBytes of flash memory (1 MByte reserved for boot code)

■ on-board hardware encryption processor

■ 802.1Q tagged VLAN support

■ universal AC power supply

**Random Access Memory (RAM)** The AR450S has 64 MB of SDRAM provided on a single DIMM. 128 MB and 256 MB ECC SDRAM are also supported. See your authorised Allied Telesis distributor or reseller for upgrade options. Other supplier's DIMMs are not approved, and therefore not supported, but may function correctly.

The amount of DRAM present in a router can be checked using the command:

```
show system
```

The *DRAM* and *FLASH* fields show the amounts of DRAM and flash memory, respectively.

**Encryption processor**  Some encryption options require feature licences. The on-board encryption processor has the following features:

- single and triple DES, and AES symmetric encryption algorithms

- SHA-1 and MD-5 hashing support

- RSA and DH public key support

## Environmental Conditions

■ operating temperature range: 0 ºC to 40 ºC (32 ºF to 104 ºF)

■ storage temperature range: -25 ºC to 70 ºC (-13 ºF to 158 ºF)

■ relative humidity range—storage: 5 to 95% non-condensing

■ relative humidity range—operating: 5 to 80% non-condensing

■ operational altitude: 3000 metres maximum (10 000 feet)

## Power Supply

The router has a universal AC input connector and a power switch on its rear panel. The router requires a power input of 100 VAC to 240 VAC and 50 Hz to 60 Hz.

## LEDs and What They Mean

The following table shows functions of the AR450S LEDs.

| LED | State | Function |
| --- | --- | --- |
| Power | Green | The router is receiving power and the power switch is in the ON position |
| System | Amber | Lit briefly during router start up, or the router is malfunctioning. |
| | Amber flashing | The router fan has failed. |
| | Off | Normal operation |
| Full | Green | The corresponding port is operating at full-duplex |
| | Off | The corresponding port is operating at half-duplex |
| Link/ACT | Green | A link has been established through the corresponding port |
| | Flashing | Data is being transmitted through the corresponding port |
| | Off | No link is present through the corresponding port |
| 100M | Green | The corresponding port is operating at 100Mbps |
| | Off | The corresponding port is operating at 10Mbps |

# Asynchronous Interfaces

Asynchronous interfaces on the routers, also known as RS-232 (V.24) terminal ports, follow the RS-232 standard and match most building wiring schemes. They are labelled ASYN0, ASYN1, RS-232 or CONSOLE.

The default communications settings for the router are:

- 9600 bps

- 8 data bits

- 1 stop bit

- no parity

- hardware flow control

You can select a range of speeds using the **set port** command in the *Interfaces* chapter in the Software Reference.

Not all signals need to be connected. In particular, both DCD and CTS are not required unless the interface has been specifically set up to use them. See *the Terminal Server* chapter of your router's Software Reference for more details. A typical terminal connection will only require RXD, TXD and GND, but refer to the equipment manual for the connected device for more specific data.

The pinout for the asyn ports on an AR024 ASYN 4 PIC is different from the pinout of the AR415S base asyn port. For information about asynchronous interfaces on the AR024 ASYN 4 PIC, see the *Port Interface Card Hardware Reference*.

**AR415S** The asynchronous interfaces on the AR415S router. The pin wiring is shown in the following table.

| Pin* | Function | Signal Direction |
|------|----------|------------------|
| 1 | RTS | Output from router |
| 2 | DTR | Output from router |
| 3 | TXD | Output from router |
| 4 | GND | |
| 5 | GND | |
| 6 | RXD | Input to router |
| 7 | DCD | Input to router |
| 8 | CTS | Input to router |

 * Pins are numbered from left to right looking into the socket with the locking tab down.

**AR440S, AR441S,
AR442S, AR450S**

Asynchronous interfaces on the AR440S, AR441S, AR442S, AR450S routers use DB9 male connectors. The pin wiring is shown in the following table.

| Pin* | Function | Signal Direction |
|------|----------|------------------|
| 1 | DCD | Input to router |
| 2 | RXD | Input to router |
| 3 | TXD | Output from router |
| 4 | DTR | Output from router |
| 5 | GND | |
| 6 | DSR | Input to router |
| | *AR450S: Not connected* | |
| 7 | RTS | Output from router |
| 8 | CTS | Input to router |
| 9 | *Not connected* | |

 * Pins are numbered from left to right.

# Expansion Options

You can expand the interface options of your AR440S, AR441S, AR442S, and AR415S routers using Port Interface Cards (PICS).

## Port Interface Cards (PICs)

You can install a PIC (Port Interface Card) in any AR400 Series routers except the AR450S. The sections describing each router model (earlier in this Reference) list the PICs that can be installed in each model. Installation information for PICs is in the *Port Interface Card Installation and Safety Guide.* Detailed PIC hardware information is in the *Port Interface Card Hardware Reference*.

The PIC Quick Install Guide and Hardware Reference are included on the Documentation and Tools CD-ROM bundled with all AR400 Series routers. They can also be downloaded from the Support Site at www.alliedtelesis.com/support/software/.

# Memory Options

Your AR400 Series Router comes with Flash memory installed. This is a non-volatile, reprogrammable, memory storage device for router software versions, allowing upgrades to be remotely loaded from any WAN or LAN port. Flash memory is also used to store other types of data such as patches, logs and configurations.

**Testing flash memory**    There are several ways to check that onboard flash memory is installed and operating correctly. First, check that the router has recognised the flash memory by displaying system information (Figure 2) with the command:

```
show system
```

Figure 2: Example output from the **show system** command for the AT-AR450S router

```
Router System Status                          Time 02:25:09 Date 25-May-2004.
Board       ID  Bay Board Name                     Rev     Serial number
-------------------------------------------------------------------------------
Base        191      AR450                          M1-0   57681308
-------------------------------------------------------------------------------
Memory -   DRAM : 65536 kB    FLASH : 16384 kB
-------------------------------------------------------------------------------
SysDescription
Allied Telesyn AR450 version 2.6.1-00 20-Aug-2003
SysContact

SysLocation

SysName

SysDistName

SysUpTime
310708 ( 00:51:47 )
Boot Image      : 450_107.fbr size 874084 11-May-2004
Software Version: 2.6.1-00 20-Aug-2003
Release Version : 2.6.1-00 20-Aug-2003
Patch Installed : NONE
Territory       : usa
Help File       : help.hlp

Configuration
Boot configuration file: ip.cfg (exists)
Current configuration: ip.cfg

Security Mode   : Disabled

Warning (2048284): No patches found.
```

The second part of the display shows the types and sizes of memory installed in the router. If the flash memory size is lower than expected, then the router's boot process has not correctly detected or recognised the flash memory's presence. If recognition fails, contact your authorised Allied Telesis distributor or reseller.

If the flash is recognised, display flash memory size, device type, and location with the command:

```
show flash physical
```

A typical display is shown in Figure 3 on page 20.

Figure 3: Example output from the **show flash physical** command for an AR450S

```
total size ............ 16 MBytes
    available to FFS ... 15 MBytes
    available to boot .. 1 MBytes
device type .......... 28F128
devices .............. 1
location ............. built in
programming power ..... off
block erase time ...... 1000 milliseconds
total erase blocks .... 128
    FFS erase blocks ... 120
    Boot erase blocks .. 8
erase block size ...... 128 kBytes
erase bit state ....... 1
page buffers ......... 1
size of page buffer ... 32 bytes
```

Lastly, check the Flash File System (FFS) to ensure that it has successfully formatted the flash. Use the command:

```
show file
```

If flash memory has been used in the past, it may already be formatted and contain files. With erased or new flash memory that has been correctly formatted, an 80 byte hidden system file is present. A typical display for an FFS is shown in .

Figure 4: Example output from the **show file** command for an AR450S

```
Filename            Device      Size    Created                 Locks
---------------------------------------------------------------------
450-252a.hlp        flash       140586  09-May-2003 17:01:15    0
54-252.rez          flash       2316676 11-Dec-2003 08:49:27    0
54-261.rez          flash       2424476 21-Aug-2003 12:11:56    0
54252-03.paz        flash       150916  11-Dec-2003 08:55:25    0
config.gui          flash       363     04-Mar-2004 15:16:09    0
config.ins          flash       32      11-Dec-2003 14:00:07    0
d450se02.rsc        flash       2303244 11-Dec-2003 09:00:23    1
feature.lic         flash       39      25-Jun-2003 13:41:29    0
random.rnd          flash       3904    02-Mar-2004 09:14:48    0
release.lic         flash       64      28-Mar-2003 23:29:14    0
ssh.key             flash       321     02-Apr-2003 23:18:14    0
---------------------------------------------------------------------
```

# Cables and Loopback Plugs

This section describes how to make cables for connecting the router's RJ-45 or DB9M DTE asynchronous port to modems, terminals, and printers. It also describes loopback plugs, which are required for testing most router interfaces.

## RS-232 Terminal and Modem Cables

The pinout for the asyn ports on an AR024 ASYN 4 PIC is different from the pinout of the AR415S base asyn port. For information about cables to connect to an AR024 ASYN 4 PIC, see the *Port Interface Card Hardware Reference*.

The RING input is available only on asynchronous ports on a Port Interface Card (PIC). It is not available on asynchronous ports on the base router.

The following tables list the wiring diagrams to follow when constructing terminal and modem cables to connect the asyn port on the router to various connector and port combinations.

| To connect this router ... | To this device ... | That has this port ... | Then use this cable ... |
|---|---|---|---|
| AR415S | modem | DB9 female, DCE | "RJ-45 to DB9 male cable" below |
| | router/PC/terminal | DB9 male, DTE | "RJ-45 to DB9 female cable" on page 22 |
| | modem | DB25 female, DCE | "RJ-45 to DB25 male cable" on page 23 |
| | router/PC/terminal | DB25 male, DTE | "RJ-45 to DB25 female cable" on page 23 |
| | Macintosh | MiniDin, DTE | "RJ-45 to mini DIN-8 cable" on page 24 |
| AR440S, AR441S, AR442S, AR450S | router/PC/terminal | DB9 male, DTE | "DB9 female to DB9 female cable" on page 24 |
| | modem | DB9 female, DCE | "DB9 female to DB9 male cable" on page 25 |
| | router/PC/terminal | DB25 male, DTE | "DB9 female to DB25 female cable" on page 26 |
| | modem | DB25 female, DCE | "DB9 female to DB25 male cable" on page 27 |
| | Macintosh | MiniDin, DTE | "DB9 female to mini DIN-8 cable" on page 27 |

**RJ-45 to DB9 male cable**

To connect the asyn port on an AR415S to a modem with a DB9 female connector wired as DCE, use an RJ-45 to DB9 male cable wired as in the following diagram.
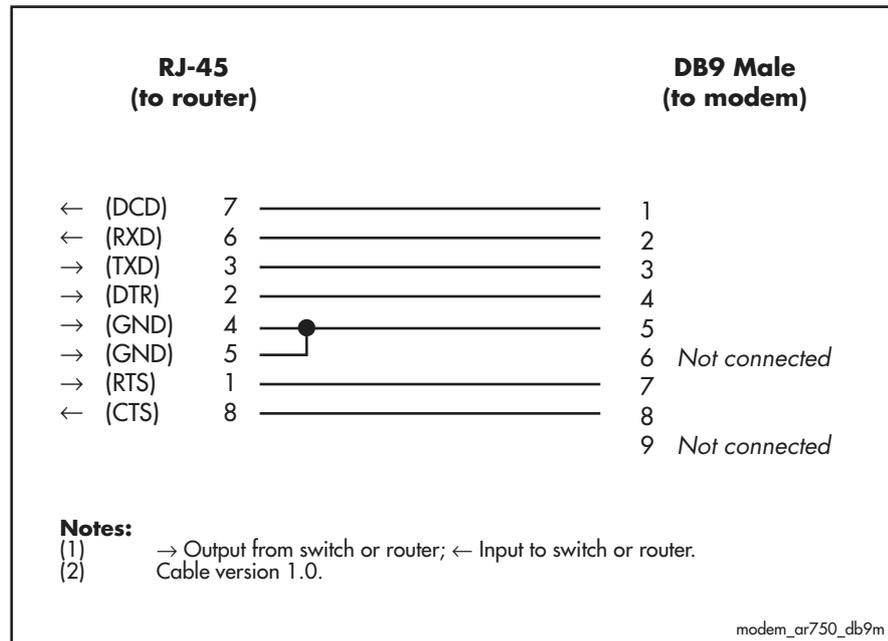
```
RJ-45                                   DB9 Male
(to router)                             (to modem)


←  (DCD)    7  ═══════════════════════  1
←  (RXD)    6  ═══════════════════════  2
→  (TXD)    3  ═══════════════════════  3
→  (DTR)    2  ═══════════════════════  4
→  (GND)    4  ──●                      5
→  (GND)    5  ──┘                      6   Not connected
→  (RTS)    1  ═══════════════════════  7
←  (CTS)    8  ═══════════════════════  8
                                        9   Not connected


Notes:
(1)        → Output from switch or router; ← Input to switch or router.
(2)        Cable version 1.0.

                                        modem_ar750_db9m
```

**RJ-45 to DB9 female cable**

To connect the asyn port on an AR415S to a PC, terminal or router with a DB9 male connector wired as DCE, use an RJ-45 to DB9 female cable wired as in the following diagram.
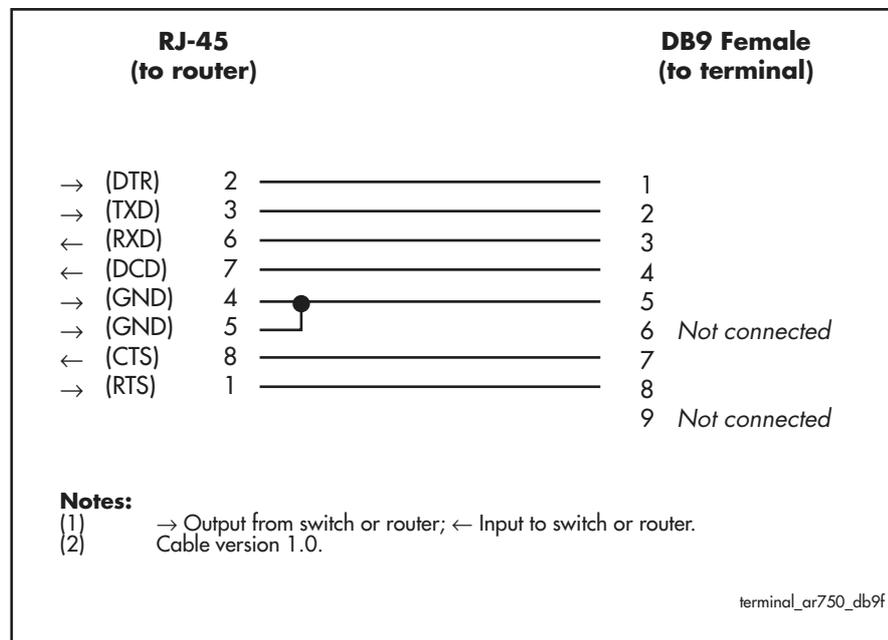
```
RJ-45                                   DB9 Female
(to router)                             (to terminal)


→  (DTR)    2  ═══════════════════════  1
→  (TXD)    3  ═══════════════════════  2
←  (RXD)    6  ═══════════════════════  3
←  (DCD)    7  ═══════════════════════  4
→  (GND)    4  ──●                      5
→  (GND)    5  ──┘                      6   Not connected
←  (CTS)    8  ═══════════════════════  7
→  (RTS)    1  ═══════════════════════  8
                                        9   Not connected


Notes:
(1)        → Output from switch or router; ← Input to switch or router.
(2)        Cable version 1.0.

                                        terminal_ar750_db9f
```

An alternative method, for both terminal and modem cables, is to wire an RJ-45 patch cord (a straight pin-to-pin cable with RJ-45 connectors on both ends) and then use an RJ-45-to-DB9 adaptor wired internally as a crossed cable. These adaptors are available in both DB9 female and male versions from data cabling suppliers, and are supplied with wires terminated on the RJ-45 socket and pins on the free ends. The pins are inserted into the appropriate positions in the DB9 shell.

**RJ-45 to DB25 male cable**

To connect the asyn port on an AR415S to a modem with a DB25 female connector wired as DCE, use an RJ-45 to DB25 male cable wired as in the following diagram.
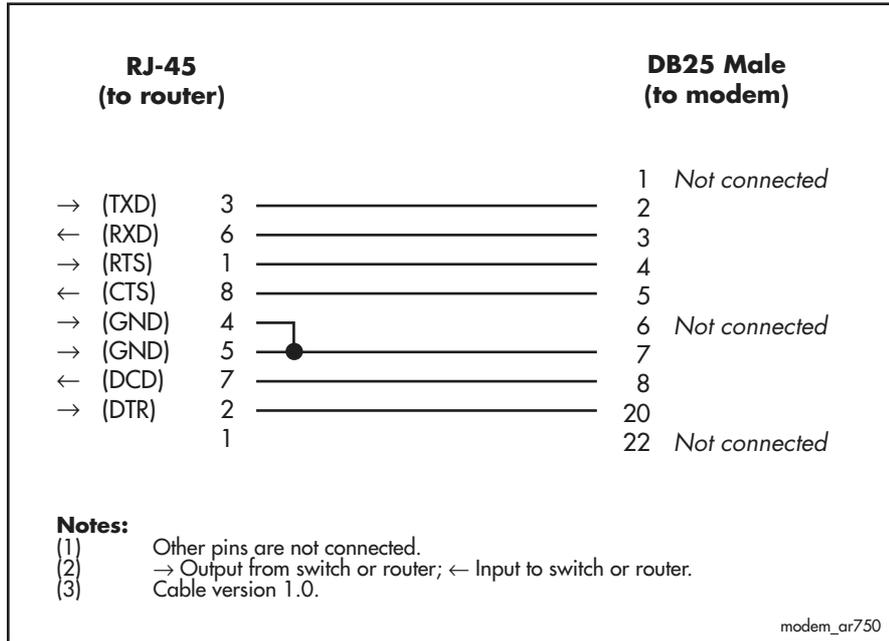
```
            RJ-45                                    DB25 Male
          (to router)                                (to modem)


                                              1    Not connected
      →  (TXD)    3  ─────────────────────    2
      ←  (RXD)    6  ─────────────────────    3
      →  (RTS)    1  ─────────────────────    4
      ←  (CTS)    8  ─────────────────────    5
      →  (GND)    4  ┐                        6    Not connected
      →  (GND)    5  ●───────────────────    7
      ←  (DCD)    7  ─────────────────────    8
      →  (DTR)    2  ─────────────────────    20
                  1                           22   Not connected


    Notes:
    (1)        Other pins are not connected.
    (2)        → Output from switch or router; ← Input to switch or router.
    (3)        Cable version 1.0.
                                                        modem_ar750
```

**RJ-45 to DB25 female cable**

To connect the asyn port on an AR415S to a PC, terminal or router with a DB25 male connector wired as DCE, use an RJ-45 to DB25 female cable wired as in the following diagram.
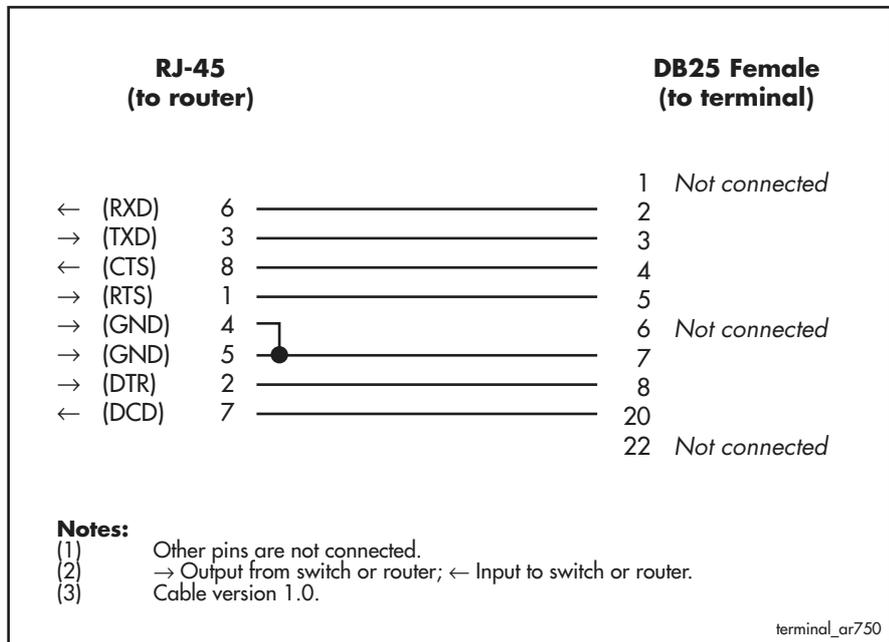
```
            RJ-45                                   DB25 Female
          (to router)                               (to terminal)


                                              1    Not connected
      ←  (RXD)    6  ─────────────────────    2
      →  (TXD)    3  ─────────────────────    3
      ←  (CTS)    8  ─────────────────────    4
      →  (RTS)    1  ─────────────────────    5
      →  (GND)    4  ┐                        6    Not connected
      →  (GND)    5  ●───────────────────    7
      →  (DTR)    2  ─────────────────────    8
      ←  (DCD)    7  ─────────────────────    20
                                              22   Not connected


    Notes:
    (1)        Other pins are not connected.
    (2)        → Output from switch or router; ← Input to switch or router.
    (3)        Cable version 1.0.
                                                        terminal_ar750
```

An alternative method, for both terminal and modem cables, is to wire an RJ-45 patch cord (a straight pin-to-pin cable with RJ-45 connectors on both ends) and then use an RJ-45-to-DB25 adaptor wired internally as a crossed cable. These adaptors are available in both DB25 female and male versions from data cabling suppliers, and are supplied with wires terminated on the RJ-45 socket and pins on the free ends. The pins are inserted into the appropriate positions in the DB25 shell.

**RJ-45 to mini DIN-8 cable**

To connect the asyn port on an AR415S to a Macintosh mini DIN-8 port, use an RJ-45 to mini DIN-8 cable wired as in the following diagram.
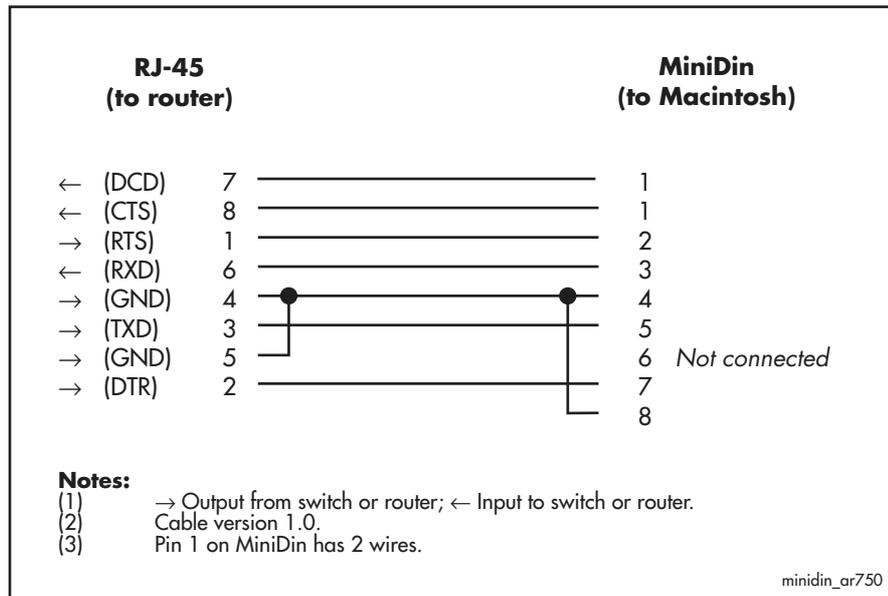
```
                    RJ-45                                      MiniDin
                 (to router)                                (to Macintosh)


        ←  (DCD)    7  ══════════════════════  1
        ←  (CTS)    8  ══════════════════════  1
        →  (RTS)    1  ══════════════════════  2
        ←  (RXD)    6  ══════════════════════  3
        →  (GND)    4  ●───────────────────●   4
        →  (TXD)    3  ══════════════════════  5
        →  (GND)    5  ┘                    6   Not connected
        →  (DTR)    2  ══════════════════════  7
                                              8
```

**Notes:**
(1)  → Output from switch or router; ← Input to switch or router.
(2)  Cable version 1.0.
(3)  Pin 1 on MiniDin has 2 wires.

minidin_ar750

**DB9 female to DB9 female cable**

To connect the DB9 male asyn port on an AR440S, AR441S, AR442S, or AR450S to a PC, terminal or router with a DB9 male connector wired as DCE, use a DB9 female to DB9 female null modem cable wired as in the following diagram.

```
            DB9 Female                              DB9 Female
         (to router/DTE)                        (to PC/terminal/DTE)


      ←  (DCD)    1  ──────────────────●     4
                                        └─────  6

      ←  (RXD)    2  ──────────────────────  3
      →  (TXD)    3  ──────────────────────  2
      →  (DTR)    4  ───────●                1
      ←  (DSR)    6  ───────┘
         (GND)    5  ──────────────────────  5
      →  (RTS)    7  ──────────────────────  8
      ←  (CTS)    8  ──────────────────────  7
   Not Connected  9                          9
```

```
        Pin 5    Pin 1                          Pin 5    Pin 1
      ┌──────────────┐      Cable            ┌──────────────┐
      │ ○  °°°°°  ○ │──────────────────────│ ○  °°°°°  ○ │
      │    °°°°     │                        │    °°°°     │
      └──────────────┘                        └──────────────┘
        Pin 9    Pin 6                          Pin 9    Pin 6
     DB9 Female — Pin View                   DB9 Female — Pin View
```

**Notes:**
(1)  → Output from router; ← Input to router.

DB9FDB9F_3
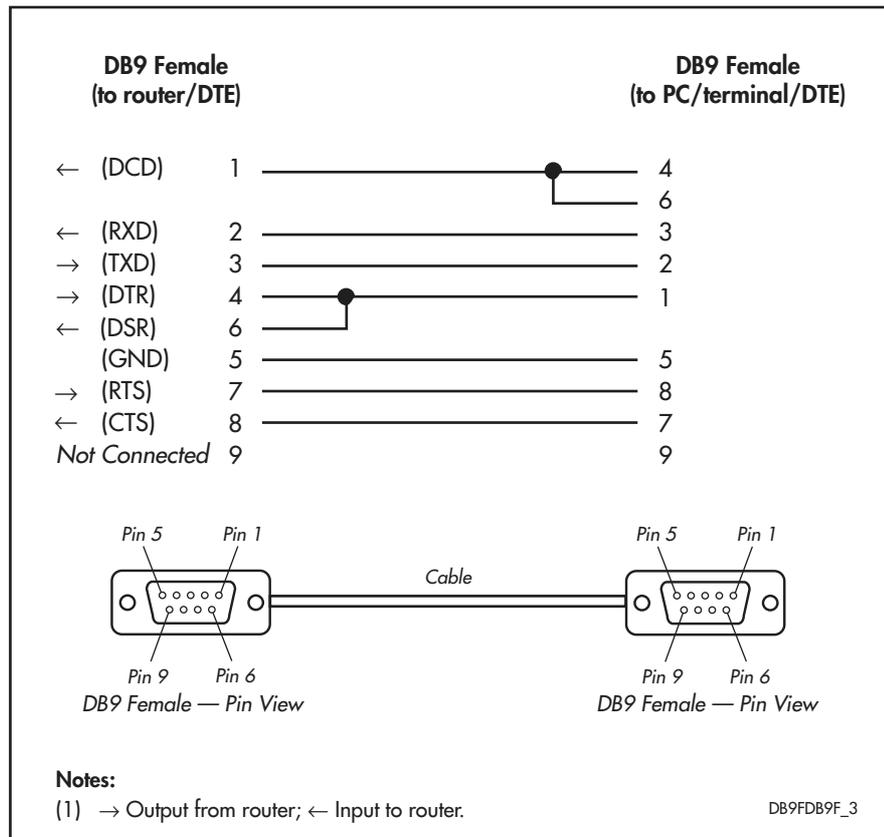
**DB9 female to DB9 male cable**  To connect the DB9 male asyn port on an AR440S, AR441S, AR442S, or AR450S to a modem with a DB9 female connector wired as DCE, use a straight-through cable wired as in the following diagram.
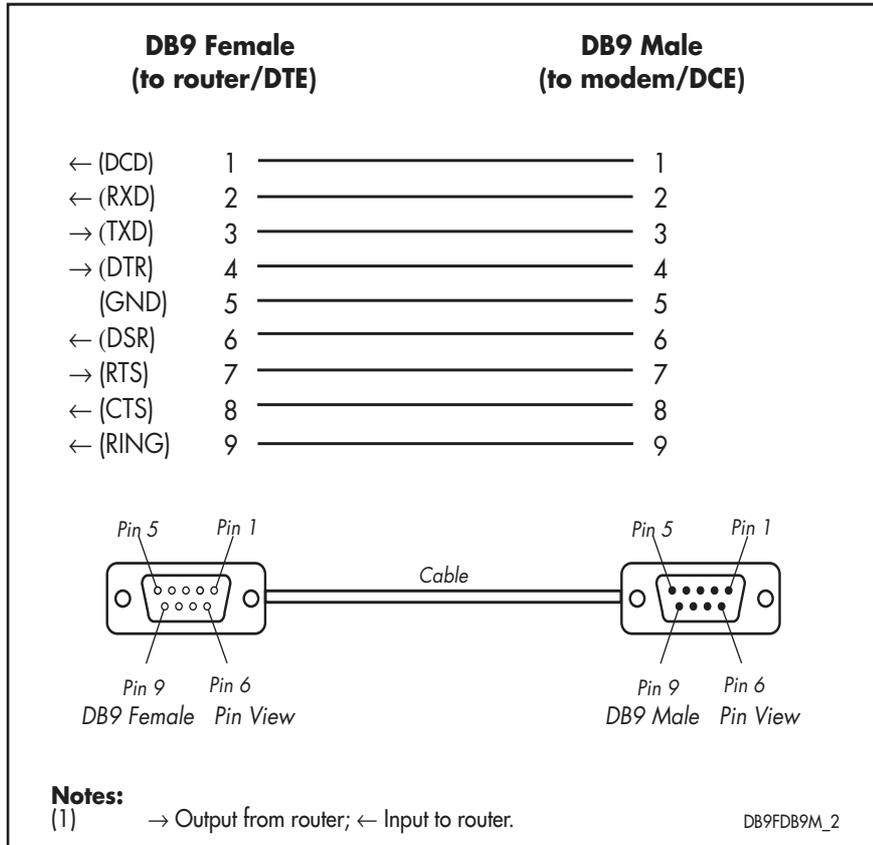
**DB9 Female**
**(to router/DTE)**

**DB9 Male**
**(to modem/DCE)**

| | | |
|---|---|---|
| ← (DCD) | 1 ──────── 1 | |
| ← (RXD) | 2 ──────── 2 | |
| → (TXD) | 3 ──────── 3 | |
| → (DTR) | 4 ──────── 4 | |
| (GND) | 5 ──────── 5 | |
| ← (DSR) | 6 ──────── 6 | |
| → (RTS) | 7 ──────── 7 | |
| ← (CTS) | 8 ──────── 8 | |
| ← (RING) | 9 ──────── 9 | |

Pin 5   Pin 1

Cable

Pin 5   Pin 1

Pin 9   Pin 6

DB9 Female   Pin View

Pin 9   Pin 6

DB9 Male   Pin View

**Notes:**
(1)   → Output from router; ← Input to router.

DB9FDB9M_2

**DB9 female to DB25 female cable**

To connect the DB9 male asyn port on an AR440S, AR441S, AR442S, or AR450S to a PC, terminal or router with a DB25 male connector wired as DCE, use a DB9 female to DB25 female null modem cable wired as in the following diagram.
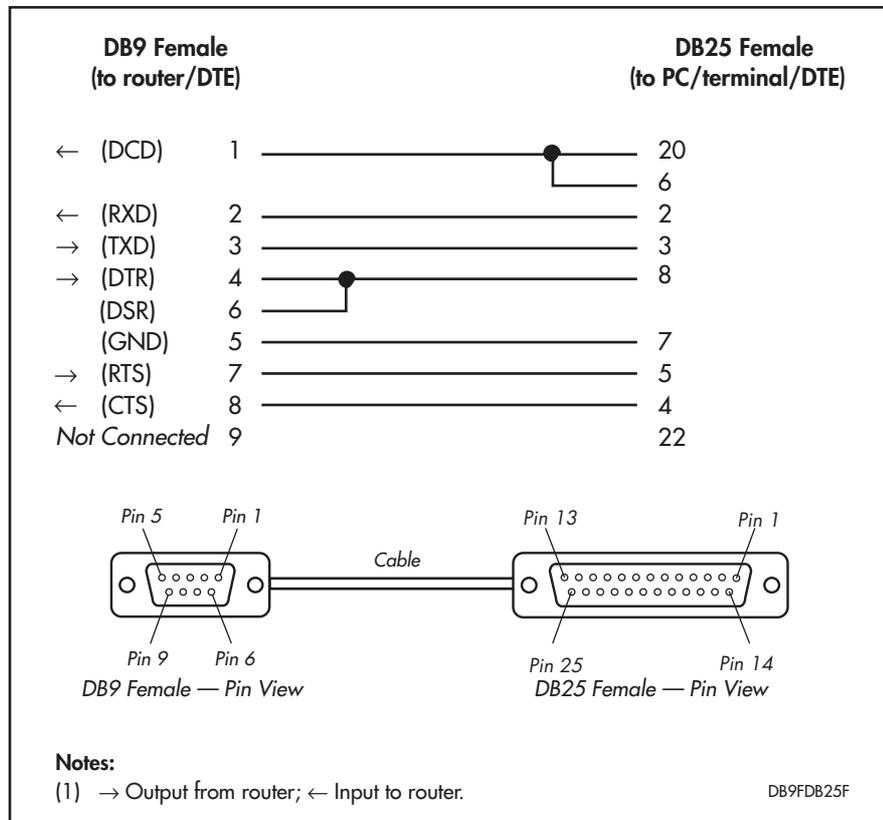


**DB9 Female**
(to router/DTE)

**DB25 Female**
(to PC/terminal/DTE)

| ← | (DCD) | 1 | | 20 |
| | | | | 6 |
| ← | (RXD) | 2 | | 2 |
| → | (TXD) | 3 | | 3 |
| → | (DTR) | 4 | | 8 |
| | (DSR) | 6 | | |
| | (GND) | 5 | | 7 |
| → | (RTS) | 7 | | 5 |
| ← | (CTS) | 8 | | 4 |
| | Not Connected | 9 | | 22 |

Pin 5    Pin 1

Pin 13                          Pin 1

Cable

Pin 9    Pin 6

Pin 25                          Pin 14

DB9 Female — Pin View

DB25 Female — Pin View

**Notes:**
(1)  → Output from router; ← Input to router.                                  DB9FDB25F

**DB9 female to DB25 male cable**

To connect the DB9 male asyn port on an AR440S, AR441S, AR442S, or AR450S to a modem with a DB25 female connector wired as DCE, use a cable wired as in the following diagram.
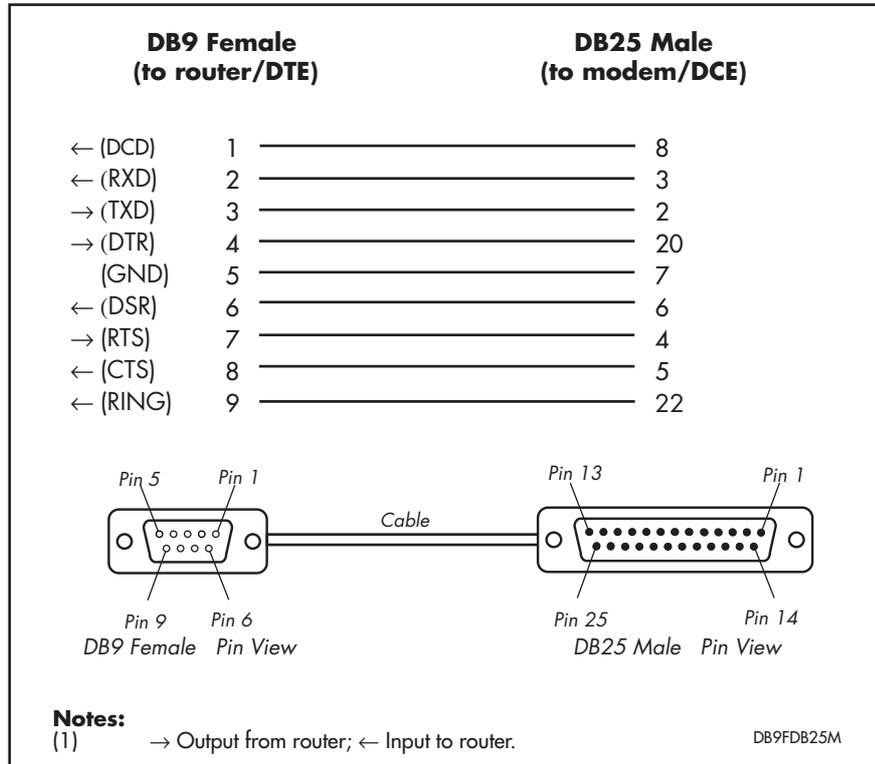


**DB9 Female**
**(to router/DTE)**

**DB25 Male**
**(to modem/DCE)**

| | | | |
|---|---|---|---|
| ← (DCD) | 1 | | 8 |
| ← (RXD) | 2 | | 3 |
| → (TXD) | 3 | | 2 |
| → (DTR) | 4 | | 20 |
| (GND) | 5 | | 7 |
| ← (DSR) | 6 | | 6 |
| → (RTS) | 7 | | 4 |
| ← (CTS) | 8 | | 5 |
| ← (RING) | 9 | | 22 |

Pin 5   Pin 1                          Cable                          Pin 13          Pin 1

Pin 9   Pin 6                                                         Pin 25          Pin 14
DB9 Female   Pin View                                                DB25 Male   Pin View

**Notes:**
(1)        → Output from router; ← Input to router.                              DB9FDB25M

**DB9 female to mini DIN-8 cable**

To connect the DB9 male asyn port on an AR440S, AR441S, AR442S, or AR450S to a Macintosh mini DIN-8 port, use a DB9 female to mini DIN-8 cable wired as in the following diagram.



**DB9 Female**
**(to router/DTE)**

**Mini DIN-8**
**(to Macintosh)**

| | | | |
|---|---|---|---|
| ← (DCD) | 1 | | 1 |
| ← (RXD) | 2 | | 3 |
| → (TXD) | 3 | | 5 |
| → (DTR) | 4 | | 7 |
| (GND) | 5 | | 4 |
| ← (DSR) | 6 | | 8 |
| → (RTS) | 7 | | 2 |
| ← (CTS) | 8 | | |
| | 9 | *Not connected* | |

**Notes:**
(1)        → Output from switch or router; ← Input to switch or router.
(2)        Pin 1 on Mini DIN-8 has 2 wires.                              db9fminidin
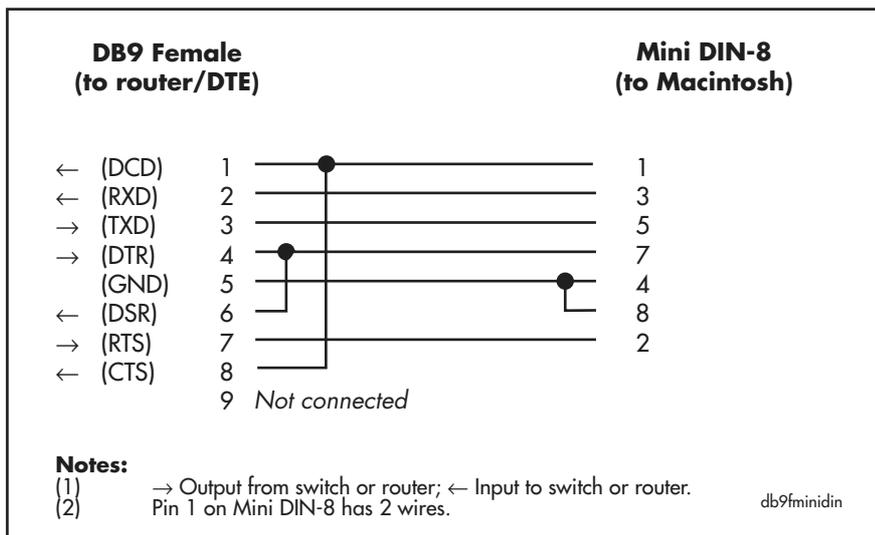
# Loopback Plugs for Testing Interfaces

Loopback plugs are used in conjunction with the Test Facility software (see the *Test Facility* chapter) to test the router's physical interfaces. The purpose of a loopback plug is to connect the output pins on the interface to the input pins so that any data transmitted over the interface is looped back and received at the same interface. This section shows the wiring for the following loopback plugs:

- "Loopback plug for RJ-45 asyn port"
- "Loopback plug for DB9 male asyn port"
- "Loopback plug for RJ-45 switch or eth port" on page 29

On interfaces with control signals, these are also looped back. The data received on the interface is compared with the data transmitted to determine whether or not the interface is functioning correctly. In order to produce a comprehensive test report, most tests performed by the Test Facility require a loopback plug to be inserted in the interface being tested.

Some interfaces (e.g., the synchronous ports) require a specially built external testing device (available from your authorised Allied Telesis distributor or reseller) to be used in conjunction with the Test Facility.

**Loopback plug for RJ-45 asyn port**

To test an asynchronous (RS232/Console) port on an AR415S, use a loopback plug as described in the following figure.
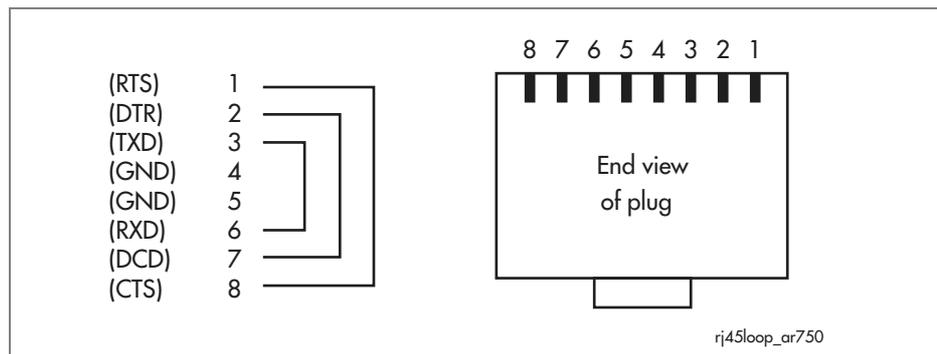


**Loopback plug for DB9 male asyn port**

To test an asynchronous (RS232/Console) port on an AR440S, AR441S, AR442S, or AR450S, use a loopback plug as described in the following figure.
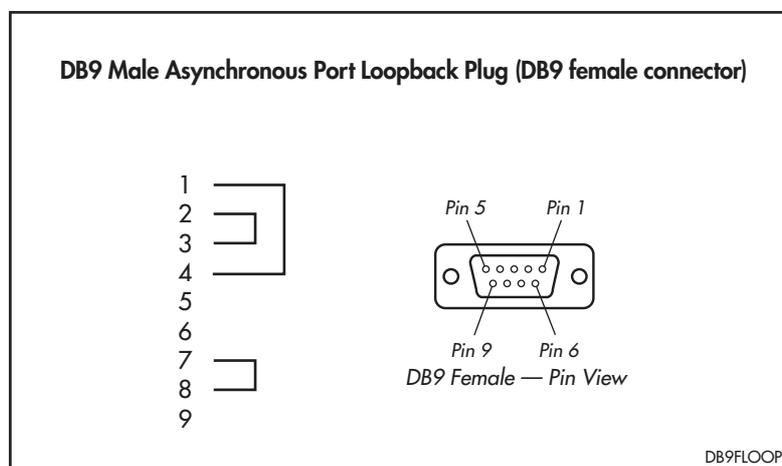
**Loopback plug for RJ-45 switch or eth port**

To test an eth or switch port, use a loopback plug as described in the following figure.

**Twisted Pair (TP) Loopback Plug (RJ45 connector)**

```
                                    8  7  6  5  4  3  2  1
TX+      1 ┐
TX-      2 ┐│                       ┌─────────────────────┐
RX+      3 ┘│                       │   ▮▮▮▮▮▮▮▮          │
         4  │                       │                     │
         5  │                       │     End view        │
RX-      6 ──┘                      │     of plug         │
         7                          │                     │
         8                          └──────┐     ┌────────┘
                                           └─────┘
                                                          TPLOOP
```
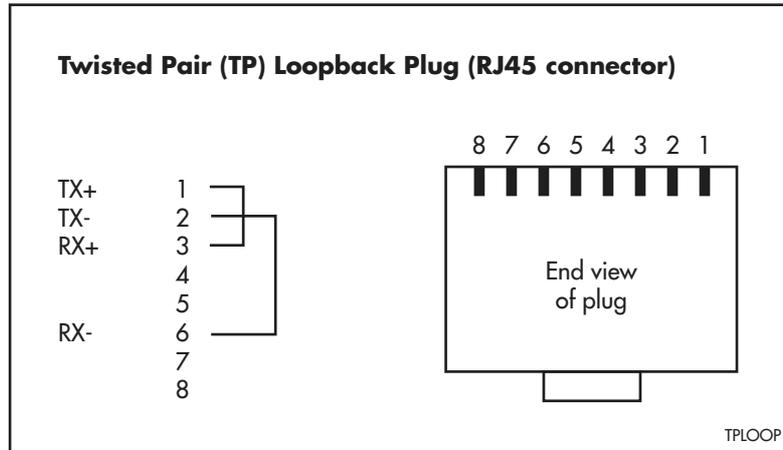
# Using AT-TFTP Server

This section provides information on how to access and use AT-TFTP Server. AT-TFTP Server can be used to transfer configuration files as well as to download software patches and versions.

**To use AT-TFTP Server**

1. **If AT-TFTP Server has not yet been installed.**

   Install it now from the router's Documentation and Tools CD-ROM.

   To install AT-TFTP server, choose AT-TFTP Server from the Start > Programs > Allied Telesis > AT-TFTP Server menu.

2. **To set preferences for the AT-TFTP Server.**

   Select "Options" from the File menu to display the "Set Preferences" dialog box.

   The "Default file transfer directory" field specifies the directory that AT-TFTP Server will read from or write to for file requests that do not include a directory specification.

   To prevent unauthorised access to private directories, enter a path name in the "Restrict to directory" field. AT-TFTP Server will use only the specified directory, even if file requests contain references to other directories.

   Select "Read only" to prevent files being written to the PC. To use the PC to archive router scripts created using the router's **create config** command, select "Read Write".

   Make necessary changes and click "OK".
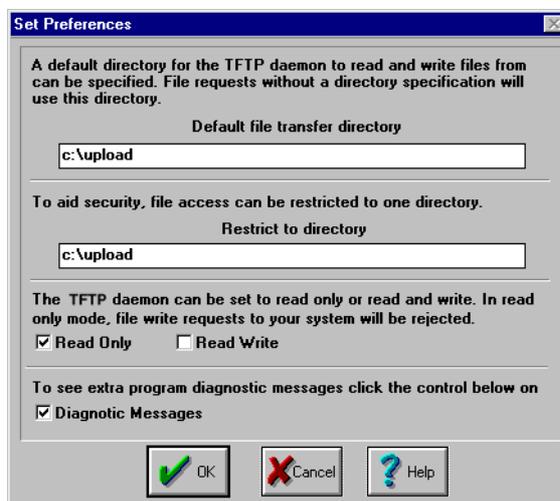


3. **To load a file from AT-TFTP Server to the router.**

   On a terminal connected to the router, type the command:

   ```
   load method=tftp file=filename server=ipadd dest=flash
   ```

   where *filename* is the name of the file to download and *ipadd* is the IP address of the PC running AT-TFTP Server.

4. **To save a TFTP Server log.**

   Select "Save As" from the File menu.

   TFTP requests are logged to the AT-TFTP Server main window.

# Using Windows Terminal and HyperTerminal

You can use a PC running terminal emulation software as the manager console, instead of a terminal. There are many terminal emulation applications available for PCs, but the most readily available are the Terminal and HyperTerminal applications included in Microsoft Windows 98, 2000, and XP Professional. In standard Windows installations, HyperTerminal is available from the Communications submenu.

The key to successful use of terminal emulation software with the router is to configure the software and router with matching communications parameters. The following procedure can be applied to most terminal emulation programs. Dialog boxes in the procedure are from Windows 2000 and XP Professional.

**To configure Windows HyperTerminal for 2000 and XP Professional**

1. Start the program in Windows by doing one of the following:

   • Select Programs > Accessories > Communications > HyperTerminal.

   • Double-click the Hypertrm.exe icon.

2. In the Connection Description dialog box:

   • Enter a name for the connection, such as Admin.

   • Select an icon from the scrollable list and click the OK button.

3.  In the "Connect using" field on the Connect To dialog box, select the COM port on the PC used to connect to the router. and click the OK button.



4.  In the COM*n* Properties dialog box, set port parameters as follows, and click the OK button.
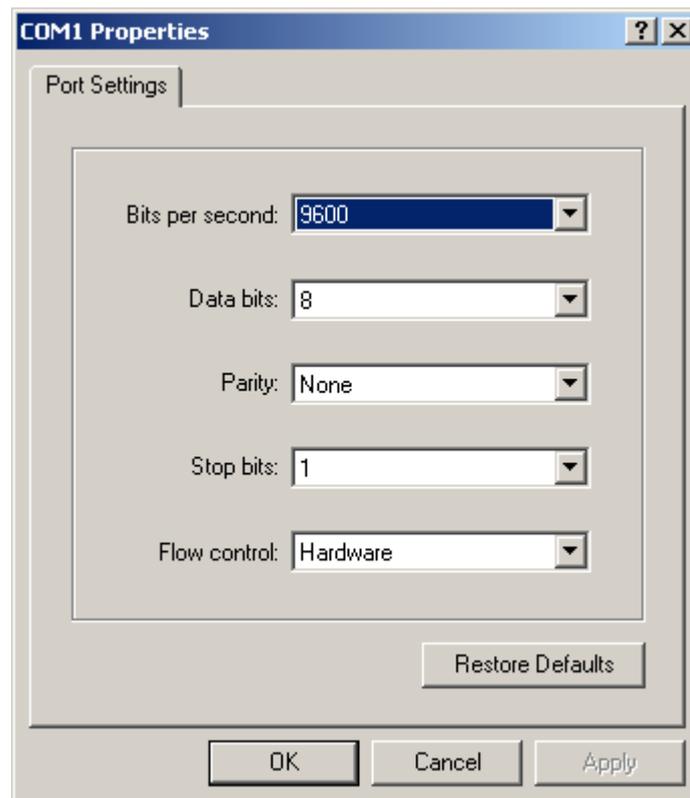
5. From the main HyperTerminal window, select Properties from the File menu. Click the Settings tab, and set the Properties dialog box as follows.
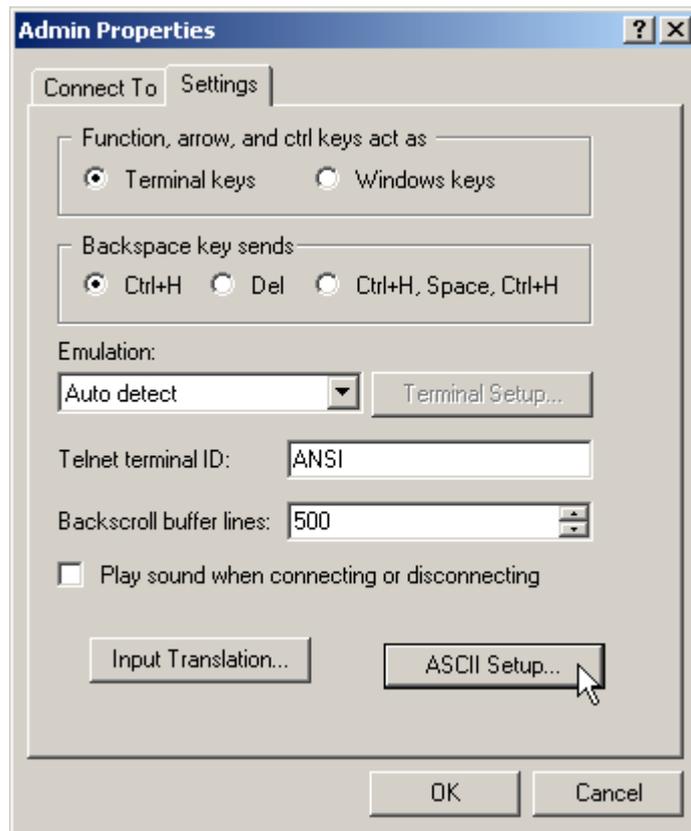


6. Click ASCII Setup to display the ASCII Setup dialog box, and ensure the following options are **not** selected:

   • Echo typed characters locally

   • Append line feeds to incoming line ends

   Set other parameters as necessary and click the OK buttons on both dialog boxes to close them.
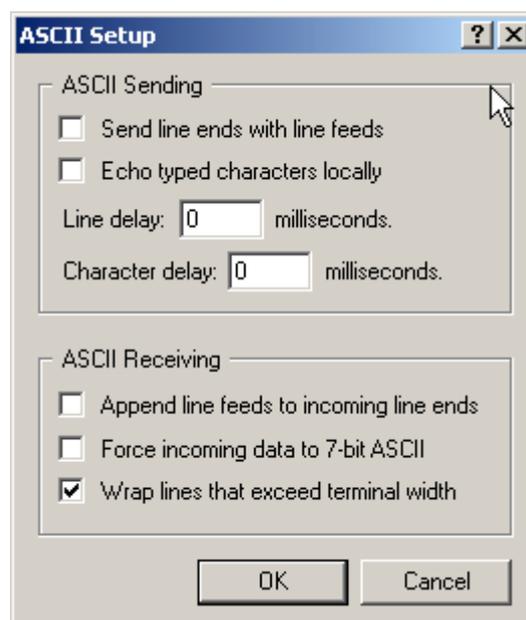
7.  Save the current session by selecting Save from the File menu on the main HyperTerminal window. This creates a connection icon with the name you assigned in the HyperTerminal group.

    To use the configuration, double-click the connection icon. When the HyperTerminal window appears, press the Enter key several times; the router's login prompt is then displayed.

# How the Router Starts Up

At start-up, the manager can choose to run either the software version stored in the flash boot block, or the software version specified by the INSTALL parameters previously set using the **set install** command.

All code is executed out of system RAM. At power-up the boot code is loaded from the flash boot block to RAM. The boot code checks the INSTALL information then reloads RAM with the selected *temporary, preferred,* or *default* install version (stored in flash) and runs this code.

The version is uncompressed as it loads to RAM. This may take 10–30 seconds. At this point, any required patches are loaded from the flash file system. Any patch is also uncompressed as it loads to RAM. This procedure ensures that the code runs at maximum speed, and allows updates to be made to the code. Updates can be downloaded over the network from a TFTP server and stored in the flash file system until required at power-up.

To download software onto the router, see the *Upgrade* chapter in the Software Reference.

All router software, patches, and configuration settings are stored as files in flash memory. Typically, the following files will be present in flash:

■  The current installed software version. Additional software versions may also be present.

■  The current installed patch, if any. Additional patches may also be present.

■  The command line help file. All command help is stored in a separate text file designed to be language independent. The command help file is loaded with a software version.

■  The boot script `boot.cfg`. The boot script contains standard router commands (executed on start-up to configure the router).

■  Additional user-defined configuration scripts containing commands to configure the router for different functions. These scripts are created using the built-in editor, the **add script** command (in the *Scripting* chapter, Software Reference*)*, or the **create config** command (in the *Upgrade* chapter, Software Reference).

Configuration information is stored in flash memory as configuration scripts. These scripts contain standard router commands. When a configuration command is entered at the command prompt from a terminal, terminal emulation program, or Telnet session, the command alters the dynamic configuration only; this is not saved over a power cycle. To ensure that configuration changes resulting from such commands are retained across a power cycle, the dynamic configuration must be saved as a configuration script, using the **create config** command.

**Start-up process**   When the router starts up following either a power cycle or an operator-initiated reboot (using the **restart reboot** command in the *Upgrade* chapter, Software Reference), the following sequence of operations is performed:

1. Perform start-up self tests.

2. Load the flash boot block version as the INSTALL boot into the router's RAM.

3. Prompt the manager for changes to the default start-up procedure:

    ```
    Force EPROM download (Y)?
    ```

    The manager may press one of the keys listed in the table in "Router start-up sequence keystrokes" on page 36 to override the default installation procedure.

4. Check the INSTALL information to determine which version to load and run, according to the INSTALL parameters, and the manager's response to the previous prompt. The INSTALL parameters determine which version and patch the router loads and runs, unless you press one of the keys in the table in "Router start-up sequence keystrokes" on page 36.

5. Load the required version specified by the INSTALL parameters from the flash file system as the main boot.

6. Start the router.

7. Execute the boot configuration script, if one has been configured. The boot configuration script is either a configuration file set using the **set config** command from the *Upgrade* chapter, or the file boot.cfg file, if there is one.)

The router sends a series of start-up messages to asyn0 (the console or terminal port). For an example see the following figure.

**Example start-up messages**

```
INFO: Self tests beginning.
INFO: RAM test beginning.
PASS: RAM test, 65536k bytes found.
INFO: Self tests complete
INFO: Downloading router software.
Force EPROM download (Y) ?
INFO: Initial download successful
INFO: Initialising Flash File System.
INFO: Executing configuration script <flash:boot.cfg>
INFO: Router startup complete

Login:
```

After the self tests are complete, the manager is given the option of forcing a mandatory boot from the flash boot block version. The following message is displayed on the terminal connected to the console port (asyn0) and the router pauses:

```
Force EPROM download (Y)?
```

**Router start-up sequence keystrokes**
If a key is not pressed within a few seconds, the start-up process continues and all steps in the start-up sequence are executed. Pressing certain keys on the terminal immediately after the "Force EPROM download" message is displayed changes the router start-up process as described in the following table.

| Pressing key... | Forces the router to... |
|---|---|
| (no key pressed) | After a few seconds, the router start up process continues. |
| [Y] | Load the version, without any patches, from ROM onto the RAM, and run the full version. |
| [S] | Load and run the version and patch determined by the INSTALL parameters from flash, ignoring any boot script or previous configuration stored in flash memory. |

**Router start-up message classes**
During the start-up process the router generates four different types of messages. All messages are preceded by one of the words INFO, PASS, FAIL, or ERROR. The meaning of these words in the context of the messages is shown in the following table.

| Message | Meaning |
|---|---|
| INFO | An informational message that an action has been taken by the system. |
| PASS | An informational message that a test has been completed successfully. |
| ERROR | An error message that a test has failed, but the system will continue to operate. |
| FAIL | An error message that a fatal error condition has caused the system to halt in an unrecoverable fashion. |
| WARNING | A serious error has occurred, which may indicate hardware failure. |

**Message meanings**
Messages and their meanings are:

```
INFO: Self tests beginning.
```
The code loader tests are about to begin.

```
INFO: RAM test beginning.
```
The RAM tests are about to begin.

```
PASS: RAM test, 65536k bytes found.
```
The RAM test passed, and the indicated amount of memory was found and will be used in the router. (The amount of memory depends on the router model.)

```
ERROR: RAM test 5. Error address = 00345678.
```
A RAM test failed, at the given address. In the example, it was the fifth test run. The RAM test repeats until it passes, so a number of messages like this may appear. This fault means that the memory system is faulty. If the fault continues, contact your distributor or reseller immediately.

```
INFO: Self tests complete.
```
The start-up tests have finished.

```
INFO: Downloading router software.
```
The process of downloading the router software from ROM is about to begin.

```
ERROR: Code load retried.
FAIL: Code load failed.
```
   The load of the code from ROM to RAM failed. The load is retried a
   number of times. Each time a failure occurs the ERROR message is
   displayed. If the maximum number of attempts is reached, the FAIL
   message is displayed.

```
ERROR: Vector load retried.
FAIL: Vector load failed.
```
   The load of the *vector table* from ROM to RAM failed. The load is retried
   a number of times. Each time a failure occurs the ERROR message is
   displayed. If the maximum number of attempts is reached, the FAIL
   message is displayed. Contact your authorised Allied Telesis
   distributor or reseller.

```
INFO: Initial download successful.
```
   The start-up tests and download from ROM are complete, and the
   specified router software is about to be started. It takes a few seconds to
   decompress the software version.

```
FAIL: Unexpected exception. Offset = 40, Addr = 0100045e.
```
   An unexpected exception occurred while the start-up was executing.
   The vector offset and the program counter when the exception occurred
   are given in the message. Contact your distributor or reseller.

```
INFO: Executing configuration script <script-name>
```
   The configuration commands stored in <script-name> are being
   executed. If an error is found in the script, one or more ERROR
   messages will be displayed.

```
INFO: Router startup complete.
```
   The start-up process is complete and the router is now operational.

```
INFO: Initialising Flash (This may take some time)
```
   The flash file system was found to be corrupt. The router is now re-
   initialising the flash device to a "good" state. The process will take at
   least 4 minutes, depending on the router.

# Test Facility

A Test Facility designed to test the router's physical interfaces and expansion
options is built into the router software. The Test Facility can be thought of as a
specialised interface module like PPP or Frame Relay. Although the router can
continue to operate normally during specific tests, any interfaces being tested
are dedicated to the Test Facility. For more information on the Test Facility's
operation, see the *Test Facility* chapter, Software Reference.

⚠️  **Caution**   Do not connect to the router via a port you are testing.

The routers and PICs support a wide range of interface types, including
Ethernet, asynchronous, synchronous, basic rate ISDN and primary rate ISDN.
Each interface type (except Ethernet interfaces on the AT-AR026 PIC) can be
tested independently using the Test Facility software. Most tests, however, will
also require the use of a loopback plug. See "Loopback Plugs for Testing
Interfaces" on page 28.

The following examples show how to test specific interfaces. If a test fails,
contact your authorised Allied Telesis distributor or reseller.

To display test results, use the command:

```
show test
```

The following figure shows sample output from the **show test** command.

Figure 5: Example output from the **show test** command on an AR450S

```
Board       ID  Bay Board Name                            Rev    Serial number
-----------------------------------------------------------------------------
Base        190     AR450                                 M1-0   57687095

                                           Duration       Details
Interface  State    Result          Type  (minutes)  Data( %OK )  Control
-----------------------------------------------------------------------------

  eth0     complete good            trans      0       -     -       -
                                    TP         2     good(100.0)     -
                                    ENDEC      0       -     -       -
                                    MAC        2     good(100.0)     -

  eth1     complete good            trans      0       -     -       -
                                    TP         2     good(100.0)     -
                                    ENDEC      0       -     -       -
                                    MAC        2     good(100.0)     -


  port1    complete good            -          2     good(100.0)     -
  port2    complete good            -          2     good(100.0)     -
  port3    complete good            -          2     good(100.0)     -
  port4    complete good            -          2     good(100.0)     -
  port5    complete good            -          2     good(100.0)     -

  asyn0    complete good            -       1000     good( 99.0)   good

  enco0    no test  -               -          -       -     -       -
-----------------------------------------------------------------------------
```

**Asynchronous interface test**

Asynchronous interfaces require a loopback plug to be installed before the test will operate. See "Loopback Plugs for Testing Interfaces" on page 28 for details of how to make a loopback plug. To start a test of an asynchronous interface, use the command:

```
enable test int=asynn
```

where *n* is the interface number. This runs the test for 4 minutes. Use the **show test** command (*Test Facility* chapter, Software Reference) to observe the test progress.

**Ethernet interface test for eth and switch ports**

A loopback plug is required to run the first part of the Ethernet test. See "Loopback Plugs for Testing Interfaces" on page 28 for details of how to make a loopback plug.

To start a test of an eth interface, use the command:

```
enable test int=ethn
```

where *n* is the Ethernet interface number.

To start a test of a switch port, use the command:

```
enable test int=portn
```

where *n* is the switch port number.

This runs the test for 4 minutes. Use the **show test** command (*Test Facility* chapter, Software Reference) to observe the test progress.

**AT-AR026 PICs**   The Test Facility does not test AT-AR026 4ETH PICs.

**ADSL and SHDSL interface tests**

No loopback plug is required to test an ADSL or SHDSL interface. To start a test of an ADSL interface, use the command:

```
enable test int=adsln
```

To start a test of an SHDSL interface, use the command:

```
enable test int=shdsln
```

where *n* is the interface number. Use the **show test** command (*Test Facility* chapter, Software Reference) to observe the test progress.

**WAN port tests**

To fully test synchronous interfaces, an external tester (available from your authorised Allied Telesis distributor or reseller) is required. A loopback plug is not required to test BRI interfaces.

To start a WAN interface test, use the command:

```
enable test int=synn
```

or

```
enable test int=brin
```

where *n* is the WAN interface number. This runs the test for 4 minutes. Use the **show test** command (*Test Facility* chapter, Software Reference) to observe the test progress.

# Restricted Procedures

**Diagnostics mode**   The router software includes a set of diagnostic programs. These programs perform basic level checks of all system components. They do not run in conjunction with the normal operating code, and require that the system be totally dedicated to their use. A detailed knowledge of the way your router hardware functions is necessary if diagnostics are to be used effectively.

⚠   **Caution**   Diagnostic mode should be used by authorised service personnel only. Unauthorised use of diagnostic mode may cause the router to cease functioning.

**To enable diagnostics mode**

The router does not function as a router while diagnostic mode is running. Diagnostics do not perform checks on AT-AR026 PICs.

1.  **Connect a terminal to the console port.**

    Connect a terminal to the console port (port 0) on the router's rear panel, and set the terminal communications parameters to:

    - 9600bps

    - 8 data bits

    - 1 stop bit

    - No parity

    - Hardware flow control.

2.  **Restart the router.**

    Restart the router, either by switching it off and on again using the power switch on the rear panel, or by using the terminal to login and enter the command:

    ```
    restart reboot
    ```

3.  **Enable diagnostics mode during start-up.**

    During the router start-up process, press [Ctrl/D] on the terminal to enter diagnostics mode when you see the following prompt:

    ```
    Force EPROM download (Y)?
    ```

    A banner page is displayed on the terminal (see figure following). This can be used to check that the terminal is correctly connected.

    ```
    * * * Diagnostic Mode * * *

      version: 1-Jul-2004

    Main Menu:
      0. Restart
      1. Full RAM test
      2. ROM checksum test
    Enter selection ==>
    ```

To run a diagnostic program, enter the corresponding letter or number. There are several sub-menus to cover the different options. The following table lists keys that control the basic operation of the diagnostics.

| Key | Function |
| --- | --- |
| Q | Quits any running tests and displays the banner page. |
| S | Prints a summary of test results so far. |

Diagnostics are designed to be used with all models of the router, and therefore some instances of particular tests are not appropriate for some models. A reasonable level of understanding of the system structure is needed to operate diagnostics and interpret the results. Diagnostics only require the base CPU board to be installed in the system.

To restore the router to normal operation, perform a restart by switching its power switch (rear panel) OFF and ON.

**For more information**   This hardware manual is not intended as a guide to diagnostics. Diagnostics are designed to be run by service personnel only. For more information, contact your authorised Allied Telesis distributor or reseller.

## Lithium Battery Replacement

The routers have a replaceable lithium battery. If replacing the battery, use a 3 V lithium button cell, type CR2032 or equivalent.

The battery should be replaced when the router:

■ has been in storage for more than two years

■ has only been powered up intermittently over a two year period

■ loses its time setting

⚠ **Warning**  Batteries should be replaced by authorised service personnel only. Unauthorised opening of the router lid may cause danger of injury from electric shock, damage to the router, and invalidation of the product warranty.

# For More Information

This Hardware Reference describes the hardware features of AR400 Series router models. Hardware and installation information for Port Interface Cards (PICs) can be found in the *Port Interface Card Installation and Safety Guide* and *Port Interface Card Hardware Reference*. This Hardware Reference does not cover software configuration or software installation procedures. For information on software, refer to the *AR400 Series Router Software Reference*.

## Document Sets

The Documentation and Tools CD-ROM bundled with each router contains the complete document set for your router and, where applicable, its expansion options. The CD-ROM also includes tools for managing your router.

The Document Set includes:

■ the *Installation and Safety Guide* for your router, which provides safety and statutory information, and outlines how to install the router

■ this *AR400 Series Router Hardware Reference*, which provides detailed information on the hardware features of AR400 Series routers

■ the *AR400 Series Software Reference*, which provides detailed information on configuring the router and its software

■ the *Port Interface Card Installation and Safety Guide*, which outlines the procedure for installing PICs

■ the *Port Interface Card Hardware Reference*, which provides detailed information on PICs

These documents can also be downloaded from www.alliedtelesis.com/support/software/ .

## Viewing Documentation on the CD

This section provides a step-by-step guide to accessing documentation on the CD-ROM. Adobe Acrobat Reader must be installed to view the documentation.

To use the CD-ROM, follow these steps:

1. Insert the Documentation and Tools CD in the CD-ROM drive.

   If the browser menu does not appear, select Run from the Start menu. Then type d:\start.exe (where d: is the CD-ROM drive) in the text box, and click the OK button.

2. Install Adobe Acrobat Reader from the CD if necessary. It must be installed in order to view the documentation.

3. To view a specific document, click the document title.

4. To browse PDF documents, use any of the following to page through a document:

   • toolbar buttons, such as the Next Page button

   • keyboard shortcuts, such as arrow keys

   • commands from the Document menu

   • mouse wheel

   To go to a specific section or topic, click a bookmark, thumbnail, or hypertext link.

   Use the Search command to search for keywords or phrases.

   For more information about using the Adobe Acrobat Reader, select Adobe Reader Help from the Help menu.

5. To install one of the tools from the CD, click the link on the browser menu.

## Contacting Us

With locations covering markets in North America, Latin America, Europe, Asia, and the Pacific, Allied Telesis provides local sales and technical support worldwide. To find the representative nearest you, visit Allied Telesis on the Internet at www.alliedtelesis.com.