

# Port Interface Card Hardware Reference



AT-AR020 PRI E1/T1  
AT-AR021 (S) BRI- S/T  
AT-AR021 (U) BRI-U  
AT-AR022 ETH  
AT-AR023 SYN  
AT-AR024 ASYN4  
AT-AR026 4ETH  
AT-AR027 VoIP-FXS

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Download the complete document set from  
[www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software)

Port Interface Card Hardware Reference  
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## Devices Covered By This Document

This Hardware Reference contains information on the following Port Interface Cards (PICs):

- AT-AR020 PRI E1/T1, a single ISDN Primary Rate E1/T1 interface
- AT-AR021 (S) BRI- S/T, a single ISDN Basic Rate S/T interface
- AT-AR021 (U) BRI-U, a single ISDN Basic Rate U interface
- AT-AR022 ETH, a dual Ethernet 10BASE-T/AUI port
- AT-AR023 SYN, a single 2Mbps synchronous interface
- AT-AR024 ASYN4, four asynchronous ports
- AT-AR026 4ETH, four Ethernet 10BASE-T ports
- AT-AR027 VoIP-FXS, two Foreign Exchange Voice over IP ports

You can download the complete document set for PICs, and for your switch or router, from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software). For more information about the document set and other resources, see “[Obtaining Documentation and Resources](#)” on page 47.

## Compatible Switches and Routers

You can install a PIC into a PIC bay on the base unit of your switch or router, or into a PIC bay on an AT-AR040 NSM (*Network Service Module*) installed in your switch or router.

The following table shows which PICs are appropriate for different expansion bays and models of switch and router.

Table 1: Compatible switches and routers for Port Interface Cards (PICs)

This expansion bay ...	Accepts ...
PIC bays in the AR415S, AR440S, AR441S, AR442S, AR725, and AR745 router	All PICs.
PIC bays in the AR750S, AR750S-DP, and AR770S router	AT-AR020, AT-AR021, AT-AR023, and AT-AR024.
AT-AR040 NSM in the AR745 router, Rapier 16fi and Rapier 24i switch	All PICs except AT-AR022 and AT-AR026.
AT-AR040 NSM in the Rapier 48w switch	AT-AR020, AT-AR021v3, and AT-AR024.

The AT-AR021(S) V3 hardware revision, identified by the label “AR021v3” on the board, requires a switch or router running AlliedWare® Operating System version 2.9.1-13 or later.

## Hardware Overview

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This section provides an overview of the hardware features of PICs. PICs provide a cost effective and flexible mechanism for adding new or additional network interfaces to your switch or router. By adding or changing PICs, network interface capabilities can be upgraded without replacing the switch or router. A PIC can provide additional network interfaces, or can be replaced with a different PIC to provide alternative interface types.

Hardware descriptions for your switch or router, Uplink Modules, and Network Service Modules (NSMs) can be found in their respective Hardware References. These documents can be downloaded from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).

### Common Features

The following hardware features are common to all PIC models.

#### Environmental conditions

- Operating temperature range: 0 °C to 40 °C (32 °F to 104 °F)
- Storage temperature range: -25 °C to 70 °C (-13 °F to 158 °F)
- Relative humidity range: 5% to 95% non-condensing

#### Regulatory Standards

- Emissions: EN55022 class A, FCC class A, and VCCI class A, AS/NZS CISPR22
- Immunity: EN55024
- Safety: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, AS/NZS60950.1

## AT-AR020 PRI E1/T1 PIC

The AT-AR020 PRI E1/T1 PIC provides a single G.703/Primary Rate ISDN WAN port with an RJ-45 connector.

The front panel of the AT-AR020 PRI E1/T1 PIC is shown in [Figure 1](#), and the functions of the LEDs are listed in [Table 1](#).

Figure 1: AT-AR020 PRI E1/T1 PIC

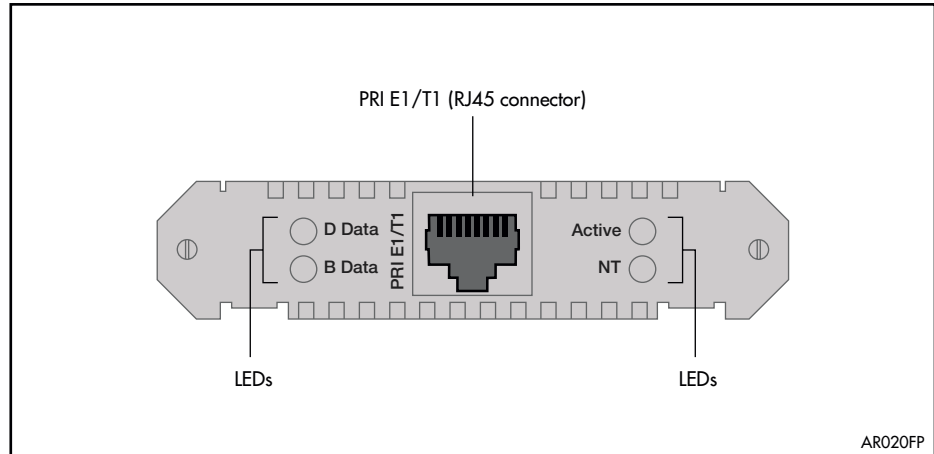


Table 1: AT-AR020 PRI E1/T1 PIC LED functions

LED	Function
D Data	[ISDN mode only] Lit when HDLC packets are being exchanged between the switch or router and the ISDN switch over the D (signalling) channel.
B Data	Lit when HDLC packets are being exchanged between the switch or router and another end system device (normally another switch or router) over any of the B (data) channels.
Active	Lit whenever operational (i.e., no RAI or AIS) frames are being received.
NT	[ISDN mode only] Lit when the PRI1 is operating in NT mode. This LED should not be lit during normal operation.

The AT-AR020 supports both E1 and T1 operation. A jumper selects the required mode. A second jumper selects NT (*Network Terminator*) or TE (*Terminal Equipment*) mode, and the current mode is displayed by the NT LED. This jumper is factory set to TE mode for normal operation and should not be changed without contacting your ISDN service provider, or authorised Allied Telesis distributor or reseller. Earlier versions of this card also have a J3 jumper. If present, this jumper must be installed for E1 mode and removed for T1 mode.

Jumper locations are shown in [Figure 2 on page 7](#), and jumper functions are listed in [Table 2 on page 7](#).

Figure 2: Location of jumpers on the AT-AR020 PRI E1/T1 PIC board

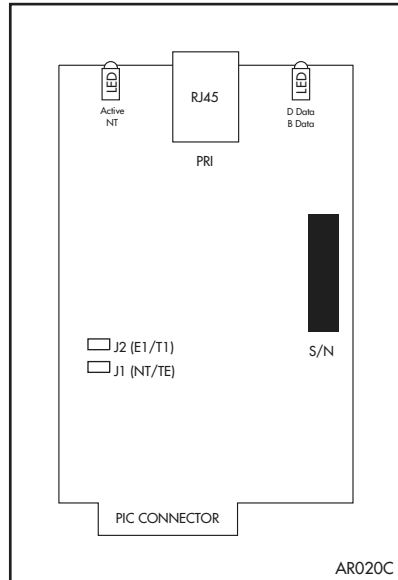


Table 2: Functions of jumpers on the AT-AR020 PRI E1/T1 PIC board

Jumper	Function	Default
J1	Selects ISDN NT mode (installed) or TE mode (not installed).	Not installed.
J2	Selects T1 mode (installed) or E1 mode (not installed).	Installed.
J3	Selects E1 mode (installed) or T1 mode (not installed). Only present on earlier versions of the PIC.	-



**Warning** Do not attempt to install or remove the PIC, or change any jumpers on the PIC, while the switch or router is connected to a power supply or a live network. Disconnect the mains power supply, any redundant power supply, and any cable attached to the WAN port of the PIC. Dangerous voltages may be present on some parts of the PIC board, even if the switch or router is powered off.



## AT-AR021(S) BRI-S/T PIC

The AT-AR021(S) BRI-S/T PIC provides a single Basic Rate ISDN S/T WAN port. The BRI port has an RJ-45 connector.

The front panel of the AT-AR021(S) PIC is shown in [Figure 3](#) and the functions of the LEDs are listed in [Table 3](#).

Figure 3: AT-AR021(S) BRI-S/T PIC

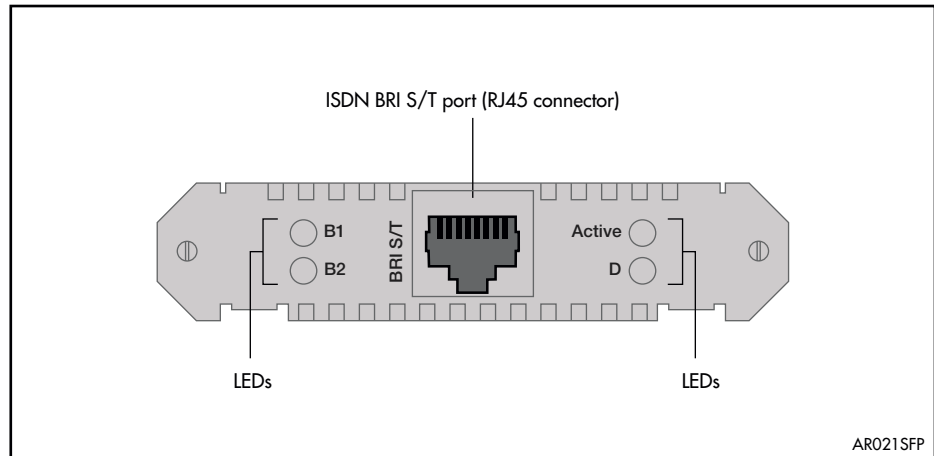


Table 3: AT-AR021(S) BRI-S/T PIC LED functions

LED	Function
B1, B2	For on-demand ISDN, lit when there is a call up over the respective B channel and flashing when data is being exchanged. For permanent circuits, lit when HDLC packets are being exchanged between the switch or router and another TE end system device (normally another switch or router) over the respective B (data) channel.
Active	Lit when the BRI has successfully completed the exchange of INFO 1 and INFO 2 signals, and INFO 3 and INFO 4 signals are present on the link. This means that the ISDN interface is correctly connected to a working NT device.
D	Lit when HDLC packets are being exchanged between the switch or router and the ISDN switch over the D (signalling) channel.

In North America, the S/T interface must be supplied from a UL listed network terminating device such as an NT1, and the cable length between the AR021(S) PIC and the NT1 device must be less than 1000 metres.

Two user-configurable jumpers provide 100Ω line termination. Jumper locations on the AT-AR021(S) V3 hardware revision are shown in [Figure 4 on page 9](#), and jumper functions are listed in [Table 4 on page 9](#). The older V2 hardware revision of the AT-AR021(S) has the same jumpers and functions, but the positions of the jumpers are reversed. The hardware revision is identified by the label "AR021 V2" or "AR021v3" printed on the board.

The V3 hardware revision supports TE mode only. The V2 hardware revision supports both TE and NT mode. Jumper J4, when installed, selects NT mode. The PIC should be configured as a TE for normal operation.

Figure 4: Location of jumpers on the AT-AR021(S) BRI-S/T PIC board

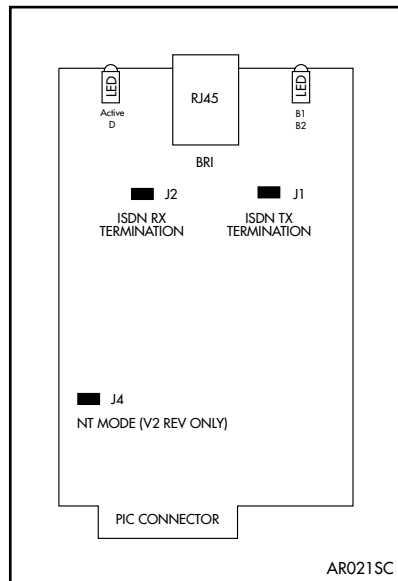


Table 4: Functions of jumpers on the AT-AR021(S) BRI-S/T PIC board

Jumper	Function	Default
J1	100 $\Omega$ termination for TX.	Not installed.
J2	100 $\Omega$ termination for RX.	Not installed.
J4	ISDN NT mode (installed) or TE mode (not installed). Only present on V2 hardware revision of PIC.	Not installed.

You should install the termination jumpers (terminate Rx and Tx) if:

- termination is not provided by the building wiring, and
- the device is the only TE device on a Point-to-Point link between the NT and the TE, or the device is the last device on an S/T bus

You should remove the termination jumpers (not terminate Rx and Tx) if:

- termination is provided by the building wiring, or
- the device is one of a number of devices on an S/T bus, and is not the last device on an S/T bus

If you are unsure of whether to terminate the line or not, contact your ISDN service provider or your authorised Allied Telesis distributor or reseller.



**Warning** Do not attempt to install or remove the PIC, or change any jumpers on the PIC, while the switch or router is connected to a power supply or a live network. Disconnect the mains power supply, any redundant power supply, and any cable attached to the WAN port of the PIC. Dangerous voltages may be present on some parts of the PIC board, even if the switch or router is powered off.

## AT-AR021(U) BRI-U PIC

The AT-AR021(U) BRI-U PIC provides a single Basic Rate ISDN U Interface WAN port. The BRI port has an RJ-45 connector.

The front panel of the AT-AR021(U) PIC is shown in [Figure 5](#), and the functions of the LEDs are listed in [Table 5](#).

Figure 5: AT-AR021(U) BRI-U PIC

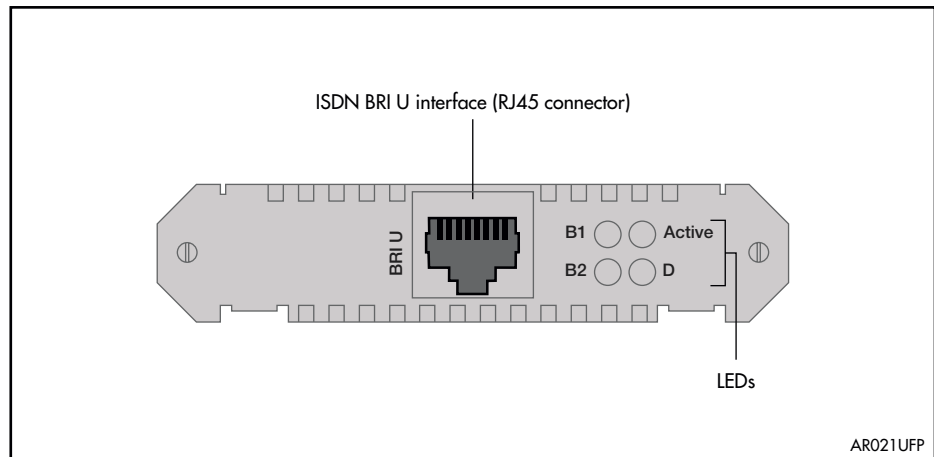


Table 5: AT-AR021(U) BRI-U PIC LED functions

LED	Function
B1, B2	Lit when HDLC packets are being exchanged between the switch or router and another TE end system device (normally another switch or router) over the respective B (data) channel. For ISDN, lit when there is a call up over the respective B channel and flashing when data is being exchanged.
Active	Lit when the U interface is in the <i>Activated</i> state (i.e., it is fully operational at layer 1).
D	Lit when HDLC packets are being exchanged between the switch or router and the ISDN switch over the D (signalling) channel.

There are no user-configurable jumpers on the AT-AR021(U) BRI-U PIC.



**Warning** Do not attempt to install or remove the PIC while the switch or router is connected to a power supply or a live network. Disconnect the mains power supply, any redundant power supply, and any cable attached to the WAN port of the PIC. Dangerous voltages may be present on some parts of the PIC board, even if the switch or router is powered off.

## AT-AR022 ETH PIC

The AT-AR022 ETH PIC provides a dual Ethernet 10BASE-T/AUI port. Only one interface type can be active at any one time and the PIC automatically senses which interface is in use. The 10BASE-T interface uses an RJ-45 connector and the AUI interface uses a DB15 connector.

AT-AR022 ETH PICs are not recommended for use in AT-AR040 NSM PIC bays because performance of these interfaces is likely to be reduced and packet loss may occur.

The front panel of the AT-AR022 ETH PIC is shown in [Figure 6](#), and the functions of the LEDs are listed in [Table 6](#).

Figure 6: AT-AR022 ETH PIC

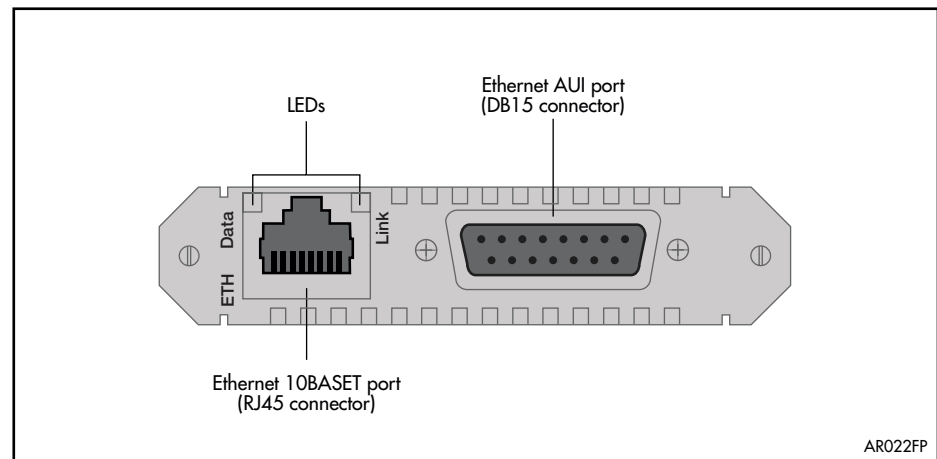


Table 6: AT-AR022 ETH PIC LED functions

LED	Function
Link	Lit when the Ethernet interface is connected to a device (e.g. a hub) which is generating link pulses.
Data	Lit when data is being transmitted or received over the Ethernet interface.

There are no user-configurable jumpers on the AT-AR022 ETH PIC.

## AT-AR023 SYN PIC

The AT-AR023 SYN PIC provides a single synchronous port operating at speeds up to 2Mbps. The synchronous port has a 50-way AMPLIMITE universal connector which supports RS-232/V.28, V.35 and X.21 interface standards in DTE and DCE modes.

A transition cable is required to convert the AMPLIMITE connector to the correct physical interface. The switch or router does not need to be rebooted to change the interface type.

The front panel of the AT-AR023 SYN PIC is shown in [Figure 7](#), and the functions of the LEDs are listed in [Table 7](#).

Figure 7: AT-AR023 SYN PIC

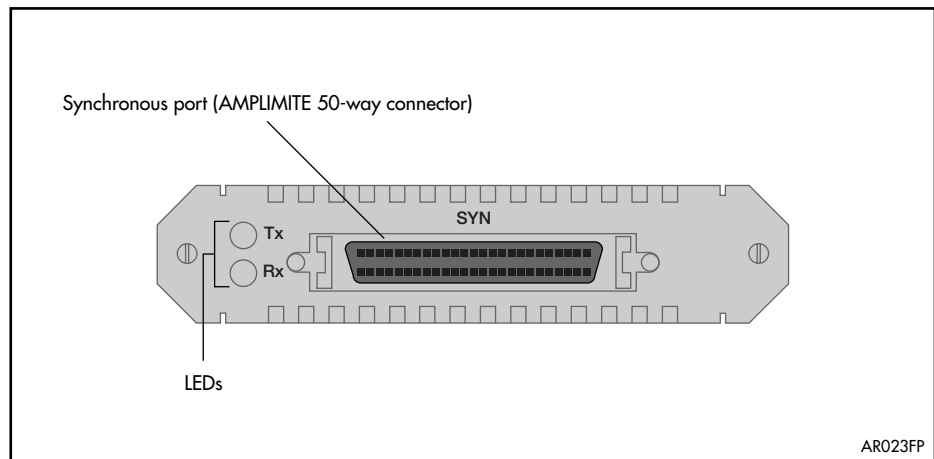


Table 7: AT-AR023 SYN PIC LED functions

LED	Function
Tx	Lit when data is being transmitted over the synchronous interface.
Rx	Lit when data is being received on the synchronous interface.

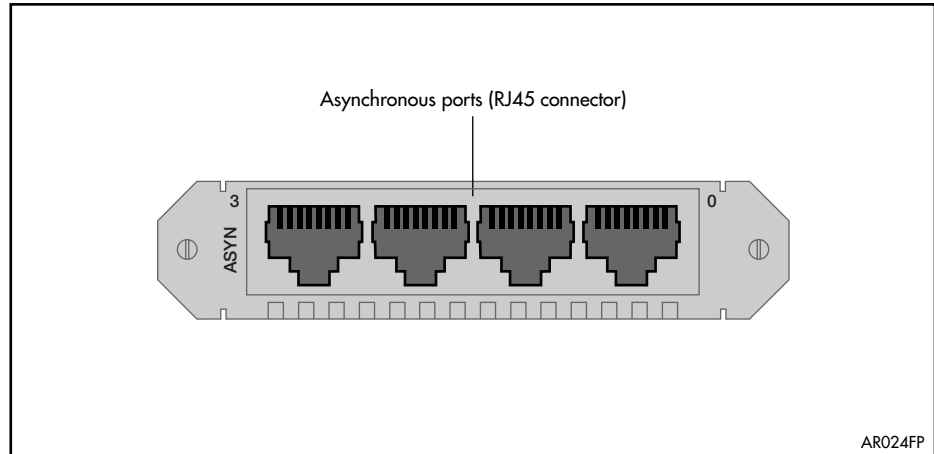
There are no user-configurable jumpers on the AT-AR023 SYN PIC.

## AT-AR024 ASYN4 PIC

The AT-AR024 ASYN4 PIC provides four asynchronous RS-232 ports with RJ-45 connectors for use up to 115 Kbps.

The front panel of the AT-AR024 ASYN4 PIC is shown in [Figure 8](#). The ASYN4 PIC does not have LEDs.

Figure 8: AT-AR024 ASYN4 PIC



There are no user-configurable jumpers on the AT-AR024 ASYN4 PIC.

## AT-AR026 4ETH PIC

The AT-AR026 4ETH PIC provides four 10BASE-T/100 BASE-TX auto-negotiating ports. The ports have RJ-45 connectors and provide wire speed unmanaged layer 2 switching.

AT-AR026 4ETH PICs are not recommended for use in AT-AR040 NSM PIC bays because performance of these interfaces is likely to be reduced and packet loss may occur.

The front panel of the AT-AR026 4ETH PIC is shown in [Figure 9](#), and the functions of the LEDs are listed in [Table 8 on page 14](#).

Figure 9: AT-AR026 4ETH PIC

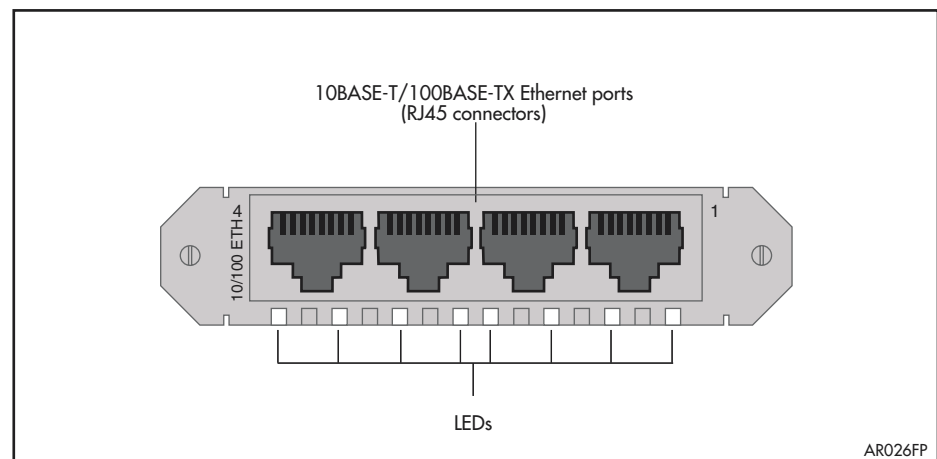


Table 8: AT-AR026 4ETH PIC LED functions (two LEDs per port)

LED	Function
Left	Lit when the port is operating at 100Mbps and full duplex.
Right	Lit when a link has been established. Flashing when data is being transmitted through the port.

The AT-AR026 PIC includes a switch chip that switches independently of the switch, router, or NSM that the PIC is installed in. The **show interface** command will show each correctly installed AT-AR026 as a single interface. The 10/100 “front side” Ethernet ports will not be shown.

AT-AR026 features include:

- Five integrated switch ports with physical layer transceivers—four 10/100 Ethernet switch ports, and one fixed 10 Mbps port acting as the PIC to base unit connector
- 128 kbytes of frame buffering SRAM
- 1.4 Gbps high performance memory bandwidth
- 10BASE-T and 100BASE-TX modes of operation
- LED indicators for link, activity, full/half duplex, and port speed
- Hardware based 10/100, full/half duplex, flow control, and auto-negotiation





Table 9: Configurable links on the AT-AR026 4ETH PIC

Function	Link	Up <sup>1</sup>	Down <sup>2</sup>	Floating <sup>3</sup>	Default
Flow control on all ports	13	Flow control	No flow control	N/A	Up
10BASE-T <sup>4</sup> , 100BASE-TX <sup>4</sup> , or auto-negotiate on port 1	41	100BASE-TX	10BASE-T	Auto-negotiate	Floating
10BASE-T <sup>5</sup> , 100BASE-TX <sup>5</sup> , or auto-negotiate on port 2	42	100BASE-TX	10BASE-T	Auto-negotiate	Floating
10BASE-T <sup>6</sup> , 100BASE-TX <sup>6</sup> , or auto-negotiate on port 3	43	100BASE-TX	10BASE-T	Auto-negotiate	Floating
10BASE-T <sup>7</sup> , 100BASE-TX <sup>7</sup> , or auto-negotiate on port 4	30	100BASE-TX	10BASE-T	Auto-negotiate	Floating
Full duplex <sup>4</sup> , half duplex <sup>4</sup> , or auto-negotiate on port 1	50	Full duplex	Half duplex	Auto-negotiate	Floating
Full duplex <sup>5</sup> , half duplex <sup>5</sup> , or auto-negotiate on port 2	51	Full duplex	Half duplex	Auto-negotiate	Floating
Full duplex <sup>6</sup> , half duplex <sup>6</sup> , or auto-negotiate on port 3	52	Full duplex	Half duplex	Auto-negotiate	Floating
Full duplex <sup>7</sup> , half duplex <sup>7</sup> , or auto-negotiate on port 4	53	Full duplex	Half duplex	Auto-negotiate	Floating
Back-off mode in half duplex	20	Aggressive	Standard	N/A	Up
Back pressure in half duplex	21	Enabled	Disabled	N/A	Up
MAC address ageing	23	Age out addresses after 5 minutes	Don't age out addresses	N/A	Up
Limit on broadcast frames	32	25% of frames	No limit	N/A	Up
Drop packets after collisions	33	Don't drop packets	Drop packets after 16 collisions	N/A	Down
Auto-negotiation on port 1	MCOL	Disable	Enable	N/A	Down
Auto-negotiation on port 2	MRXD 0	Disable	Enable	N/A	Down
Auto-negotiation on port 3	MRXD 1	Disable	Enable	N/A	Down
Auto-negotiation on port 4	MRXD 2	Disable	Enable	N/A	Down
205 buffers per port (max)	10 & 11	NA	1k (link 10), 1k (link 11)	N/A	N/A
512 buffers per port (max)	10 & 11	10k (link 11)	1k (link 10)	N/A	N/A
768 buffers per port (max)	10 & 11	10k (link 10)	1k (link 11)	N/A	N/A
512 buffers per port (adaptive)	10 & 11	10k (link 10), 10k (link 11)	NA	N/A	Up (link 10) Up (link 11)

1. Up = 10kΩ link between pads 1 and 2.

2. Down = 1kΩ link between pads 2 and 3

3. Floating = no link.

4. Requires auto-negotiation on port 1 to be disabled using link MCOL.

5. Requires auto-negotiation on port 2 to be disabled using link MRXD 0.

6. Requires auto-negotiation on port 3 to be disabled using link MRXD 1.

7. Requires auto-negotiation on port 4 to be disabled using link MRXD 2.



**Caution** Links 22, 31, 40, and MRXD 3 are fixed and should not be changed. Changing these links will cause the PIC to cease functioning.

The AT-AR026 PIC does not support the AlliedWare operating system's diagnostic or Test Facility features.

## AT-AR027 VoIP-FXS PIC

The AT-AR027 VoIP-FXS PIC provides two Foreign Exchange Subscriber (FXS) ports. The ports use RJ-11 connectors and can be connected to standard analog telephony equipment such as telephones, fax machines and modems. The FXS interface supplies ring, voltage and dial tone.

The front panel of the AT-AR027 VoIP-FXS PIC is shown in [Figure 11](#), and functions of the LEDs are listed in [Table 10](#) on page 17.

Figure 11: AT-AR027 VoIP-FXS PIC

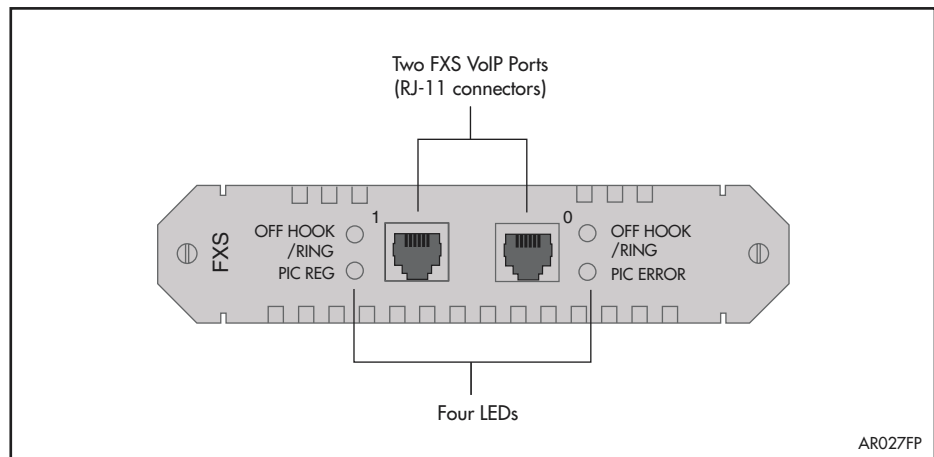


Table 10: AT-AR027 VoIP-FXS PIC LED functions

LED	State	Function
Off Hook/Ring	Off	The port is on-hook.
	Green	The port is off-hook.
	Flashing	An incoming call is present on the port.
PIC Reg	Off	The PIC is not registered with a gatekeeper and external phone calls cannot be made.
	Flashing	The PIC is registered with a gatekeeper or gatekeeper has been set to "None". External calls can only be made if the PIC is registered with a gatekeeper.
PIC Error	Off	The PIC is okay.
	Green	An internal error has occurred. Reset the PIC using the <b>reset voip</b> command.

AT-AR027 features include:

- Settable ring wave form
- Settable tone generation
- Settable port gain/attenuation for transmit and receive on each port
- 600r, 600c, 900c, Cplx and Cplx2 port impedance.
- Frame buffer management

- Voice activation and silence detection
- Compatible with H.233, Session Initiation Protocol (SIP) and Media Gateway Control Protocol (MGCP)

You can install a maximum of four AT-AR027 PICs in an AR745 router fitted with an AT-AR040 NSM.

For more information on VoIP protocols and how to configure them, see the *Voice Over IP (VoIP)* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router. You can download this document from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).

## PIC Interfaces

This section provides detailed information on the physical and operational characteristics of the following PIC interfaces:

- [Asynchronous Interface](#)
- [Synchronous Interface](#)
- [Ethernet Interface](#)
- [Basic Rate ISDN Interface](#)
- [Primary Rate ISDN Interface](#)
- [VoIP FXS Interface](#)

### Asynchronous Interface

The AT-AR024 ASYN4 PIC provides four RS-232 asynchronous interfaces using RJ-45 connectors. [Table 11](#) shows the pinout of the asynchronous interfaces.

Table 11: Pinout of the RJ-45 connectors on the AT-AR024 ASYN4 PIC

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

\*Pins are numbered from left to right.

A range of speeds are selectable using the **set asyn** command. For more information, see the *Interfaces* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router.

Not all signals need to be connected. In particular, DCD and CTS are not required unless the interface has been specifically set up to use them. For more information, see the *Line Printer Daemon (LPD)* and *Stream Printing* chapters of the *AlliedWare® Operating System Software Reference* for your switch or router. 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.

If LPD-based printer ports are required, then the switch or router may expect to see the DTR signal from the printer connected to the DCD pin of the switch. This is used to detect that the printer is powered on and online. This prevents print jobs being sent to a disconnected printer and lost. For more information, see the *Line Printer Daemon (LPD)* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router.

## Synchronous Interface

The AT-AR023 SYN PIC provides a synchronous interface with a single AMPLIMITE 50-way port. The AMPLIMITE port is wired as a universal connector for RS-232/V.28, V.35 and X.21 interface standards in both DTE and DCE modes. A transition cable is required to convert the AMPLIMITE to the correct physical interface for the standard required (e.g., DB15 for X.21). The transition cable can be ordered from your supplier, or you can construct your own cable.

The transition cable does more than simply change the physical connector. The interface hardware reads the cable type from the AMPLIMITE plug and enables or disables the internal driver electronics as required. To function correctly, the cables must be identical to the cables described in [“Cables and Loopback Plugs for PICs” on page 23](#).

The DCE cable type reverses the direction of the data lines as well as the clock lines. This cable is intended to be used when the switch or router supplies the clock for the attached device. This is commonly used when the switch or router is connected to the synchronous interface of another device or a host, without using an intermediate modem or NTU (*Network Terminating Unit*). Therefore, the DCE cable must only be connected to a switch or router interface that is set to generate the clock. For more information, see the *Interfaces* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router.

The transition cable can be changed at any time. It is not necessary to power-down the switch or router.

When an RS-232 DCE transition cable is connected to a synchronous interface configured to generate clocks, the maximum clock speed is 38400 bps. When an X.21 DCE or V.35 DCE transition cable is connected to a synchronous interface configured to generate clocks, the maximum clock speed is 2 Mbps.

## Ethernet Interface

The AT-AR022 ETH PIC has a dual 10BASE-T/AUI Ethernet interface. Only one Ethernet interface type can be active at any one time. The PIC auto-senses which Ethernet interface type is in use.

The AT-AR026 4ETH PIC has four 10BASE-T/100BASE-TX ports with RJ-45 connectors. Port characteristics such as speed, flow control, half/full duplex, and auto-negotiation can be set by configuring links on the PIC's PCB. See [“AT-AR026 4ETH PIC” on page 14](#) for more information.

For performance reasons, the AT-AR022 and AT-AR026 PICs should not be installed in the AT-AR040 NSM.

## Basic Rate ISDN Interface

The AT-AR021(S) BRI-S/T and AT-AR021(U) PICs provide Basic Rate ISDN (BRI) interfaces. In both cases the connector type is RJ-45. The interfaces support two 64K B channels and one D channel. [Table 12 on page 21](#) shows the pinout of the BRI interface.

Table 12: Pinout of the Basic Rate ISDN interface

Pin	S/T Interface Functions	U Interface Functions
1	-	-
2	-	-
3	TX+	-
4	RX+	positive (+)
5	RX-	negative (-)
6	TX-	-
7	-	-
8	-	-

The V2 hardware revision of the AT-AR021(S) PIC supports both TE and NT operational modes. A jumper is used to select the operational mode. See [“AT-AR021\(S\) BRI-S/T PIC” on page 8](#) for more information. The V3 hardware revision of the AT-AR021(S) PIC and the AT-AR021(U) PIC support TE mode only. The hardware revision is identified by the label “AR021 V2” or “AR021v3” printed on the board. The *Integrated Services Digital Network (ISDN)* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router has detailed descriptions of the two operational modes. Your switch or router should be configured as a TE for normal operation.

The AT-AR021(S) PIC can be configured using jumpers to provide 100Ω line termination. See [“AT-AR021\(S\) BRI-S/T PIC” on page 8](#) for more information.

## Primary Rate ISDN Interface

The AT-AR020 PRI E1/T1 PIC provides a Primary Rate ISDN interface with a single RJ-45 connector. The interface supports connection to either 100Ω T1 or 120Ω E1 networks. [Table 2 on page 7](#) lists the jumper settings for E1 and T1 networks. [Table 13](#) shows the pinout of the PRI interface.

Table 13: Connection standard for Primary Rate ISDN RJ-45 connectors

Pin*	Signal
1	RX+
2	RX-
3	RX ground selection from jumper
4	TX+
5	TX-
6	TX ground selection from jumper
7	<i>Not connected</i>
8	<i>Not connected</i>

\*Pins are numbered from left to right, with latch down, as viewed from the rear.

## VoIP FXS Interface

The AT-AR027 VoIP-FXS PIC uses standard RJ-11 telephone sockets that provide a Tip and Ring A/B pair (Table 14). An RJ-11 to BT adaptor cable can be used to connect telephones with BT-style plugs to the RJ-11 ports (Figure 20 on page 32).

Table 14: Pinout of the voice port RJ-11 connectors

Pin	Function
1	<i>Not connected</i>
2	<i>Not connected</i>
3	RING
4	TIP
5	SHUNT
6	<i>Not connected</i>

## Cables and Loopback Plugs for PICs

---

This section describes how to make cables for connecting PIC interfaces to other devices, and loopback plugs for testing PIC interfaces.

The following topics are covered:

- [Transition Cables for the AT-AR023 PIC](#)
- [ISDN Interface Cables](#)
- [BT Adaptor Cable for the AT-AR027 PIC](#)
- [Terminal and Modem Cables](#)
- [Ethernet Transceivers and AUI Cables](#)
- [Loopback Plugs for Testing Interfaces](#)

### Transition Cables for the AT-AR023 PIC

The synchronous port on the AT-AR023 SYN PIC uses an AMPLIMITE 50-way connector wired as a universal connector to support RS-232/V.28, V.35 and X.21 interface standards in DTE and DCE modes.

A transition cable is required to convert the AMPLIMITE to the correct physical interface for the standard required (e.g. DB15 for X.21). The transition cable can be ordered from your distributor or reseller, or you can construct your own cable by following the wiring diagrams in this section.

The transition cable does more than simply change the physical connector. The switch or router hardware 'reads' the cable type from the AMPLIMITE plug and enables or disables the internal driver electronics as required. To function correctly, the cables must be identical to the cables described in this section.

The DCE cable type reverses the direction of the data lines as well as the clock lines. This cable is intended to be used when the switch or router supplies the clock for an attached device. This is commonly used when the switch or router is connected to the synchronous port of another switch, router, or host, without using an intermediate modem or NTU (Network Terminating Unit). Therefore, the DCE cable must only be connected to a port which is set to generate the clock. The Interfaces chapter of the *AlliedWare® Operating System Software Reference* for your switch or router has more information. The AMPLIMITE connector supports both DTE and DCE modes for all three physical standards.

The switch or router interface is fully compliant with V.35 but many DCE (DSU/CSU) devices are not. Therefore, pay particular attention to V.35 connections. Because of the low signal levels used for V.35 (500mV point-to-point), issues such as ground loops and excess cable length become more important than with X.21. In particular, some DCE devices connect the cable ground to chassis or safety ground. This can create an earth loop condition through the shield wire of the V.35 interface. The symptom of this condition is unexpectedly high received packet errors (CRC, Abort etc.) as seen in the output of the **show syn counters** command. In these cases the suggested remedy is to break the earth loop by disconnecting (and isolating) pin A inside the M34 connector. This action does not compromise the safety of the product in any way.

The transition cable can be changed at any time. It is not necessary to power-down the switch or router.



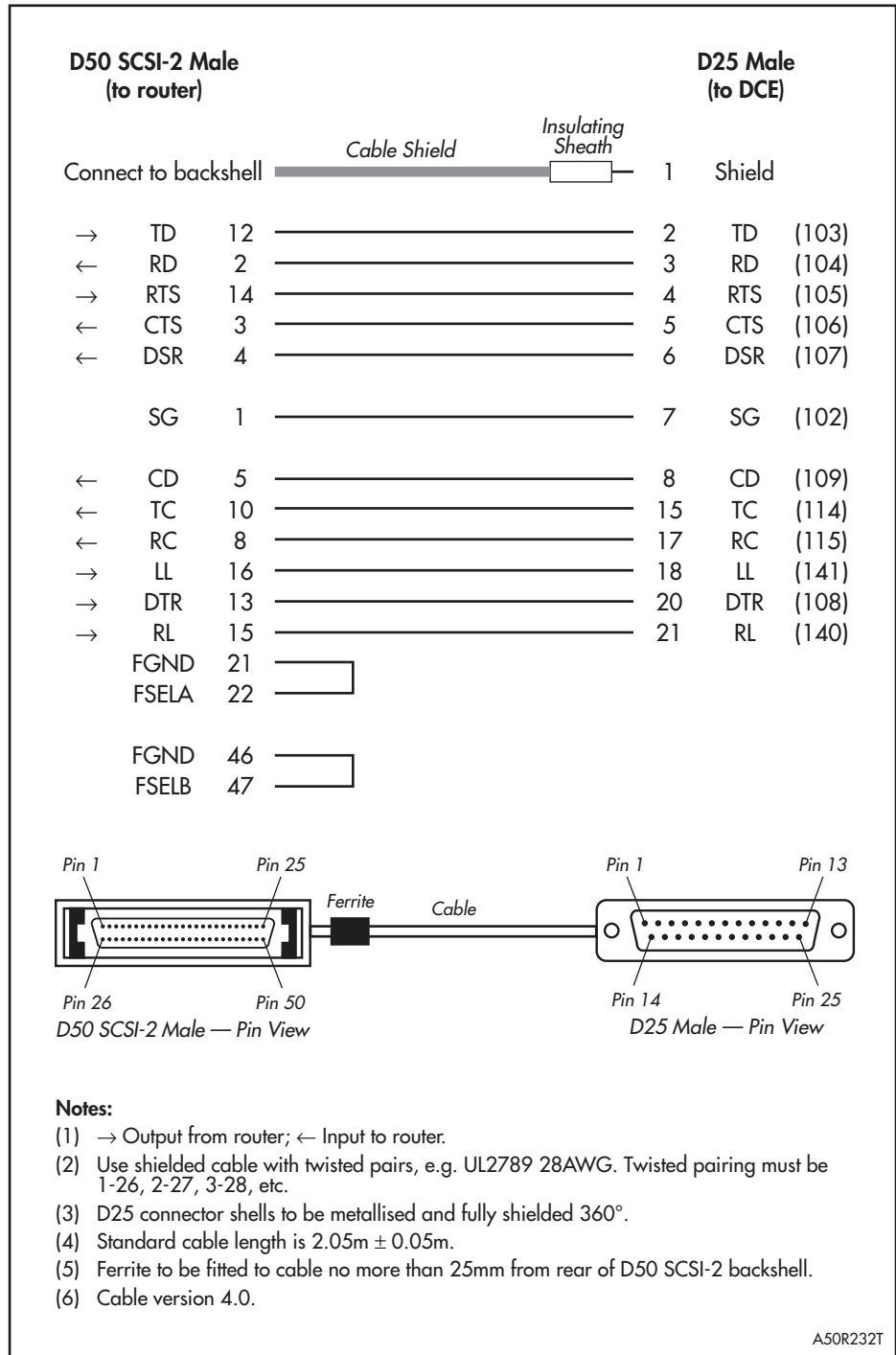
Good quality, data-grade cables should be used for all cables. Transition cables must be made from paired cable with an overall foil shield. Metalised backshells must also be used. Poor quality cables limit the maximum speed or the maximum length of the cable, or both.

It is very important that cables do not degrade the EMC emission standards of the switch, router, or PIC (e.g., FCC, CISPR). The cable foil shield must be connected to the AMPLIMITE metalised backshell with a 360 degree ferrule. In addition, on specified cables, a clip-on cable ferrite must be attached to the cable at the AMPLIMITE end, no more than 25 mm from the rear of the backshell of the AMPLIMITE connector. Contact your authorised Allied Telesis distributor or reseller for a list of approved ferrites.

Use the following pin wiring diagrams when constructing transition cables for each physical interface standard.

<b>For this physical interface type ...</b>	<b>Follow this pin wiring diagram ...</b>
RS-232 DTE	<a href="#">Figure 12 on page 25</a>
RS-232 DCE	<a href="#">Figure 13 on page 26</a>
V.35 DTE	<a href="#">Figure 14 on page 27</a>
V.35 DCE	<a href="#">Figure 15 on page 28</a>
X.21 DTE	<a href="#">Figure 16 on page 29</a>
X.21 DCE	<a href="#">Figure 17 on page 30</a>

Figure 12: Pin wiring diagram for an RS-232 DTE transition cable



A50R232T

Figure 13: Pin wiring diagram for an RS-232 DCE transition cable

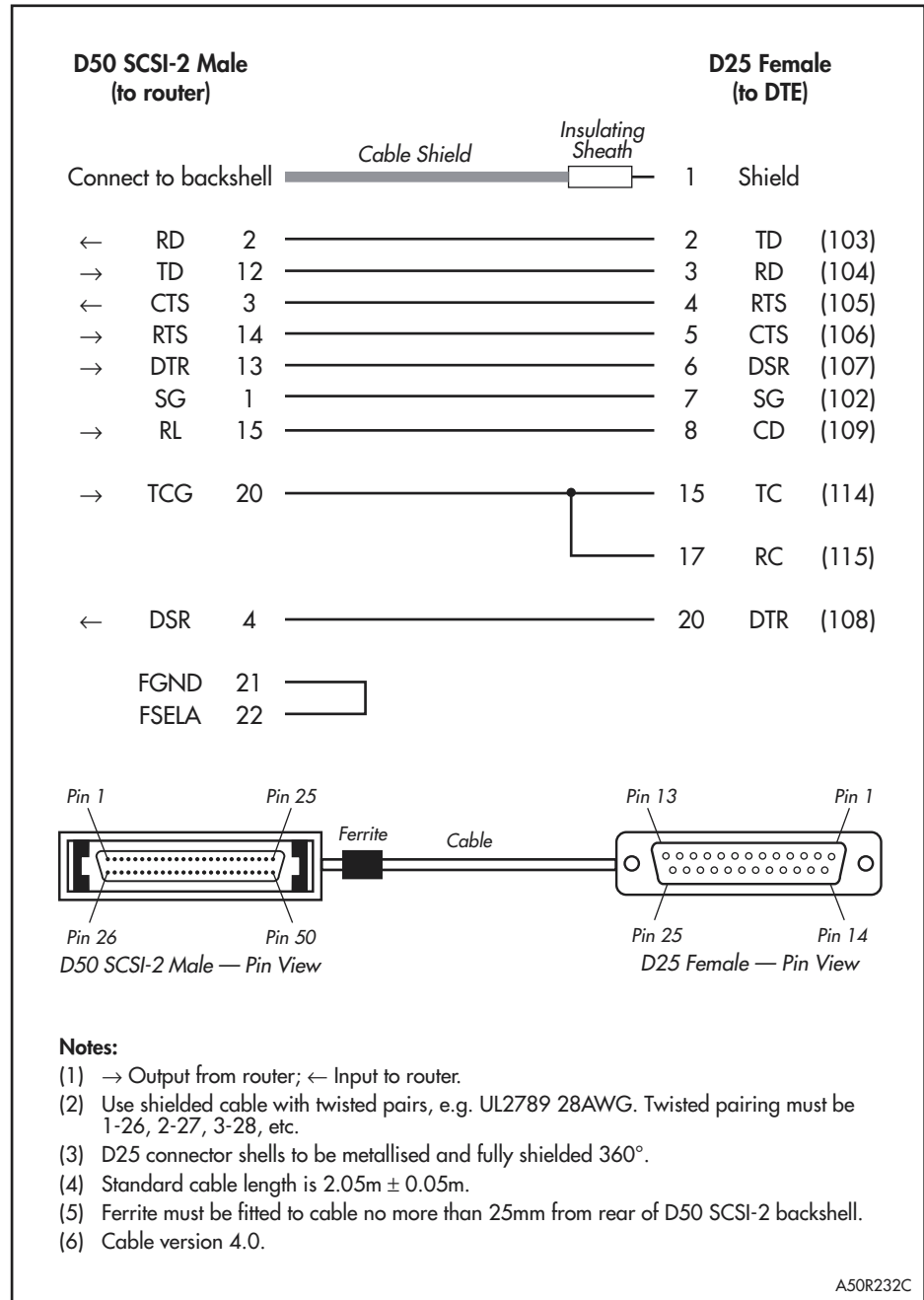


Figure 14: Pin wiring diagram for a V.35 DTE transition cable

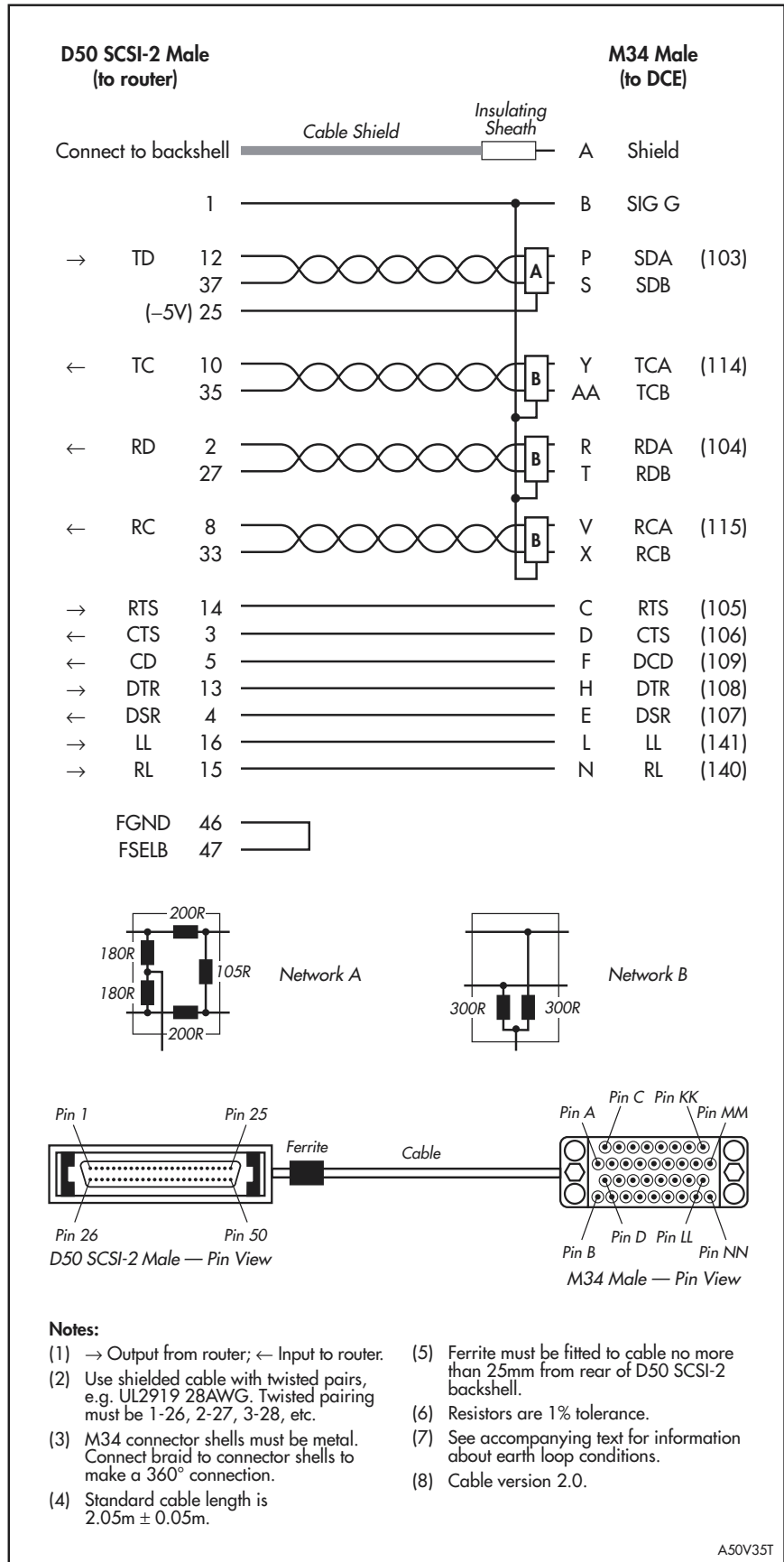


Figure 15: Pin wiring diagram for a V.35 DCE transition cable

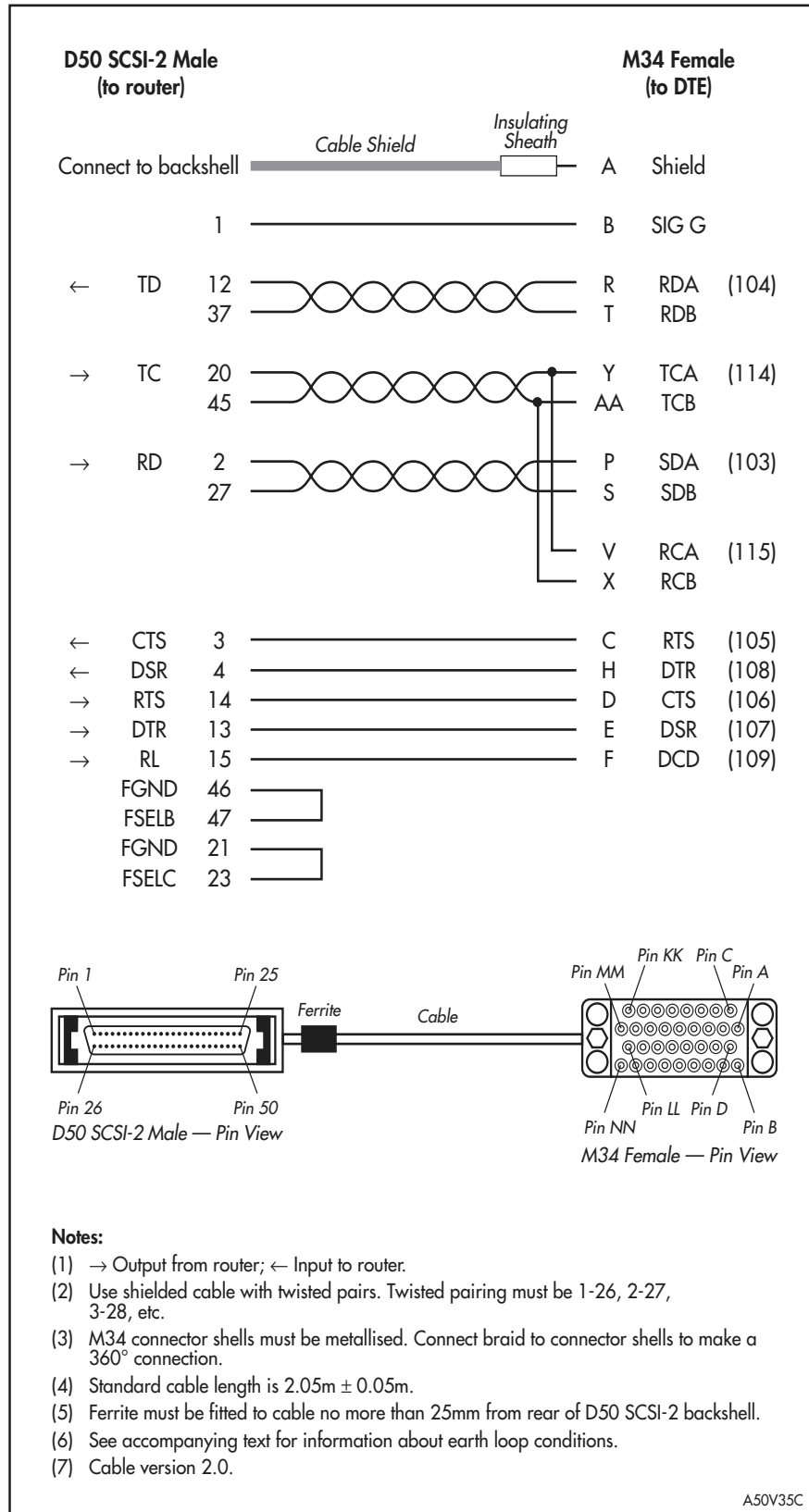


Figure 16: Pin wiring diagram for an X.21 DTE transition cable

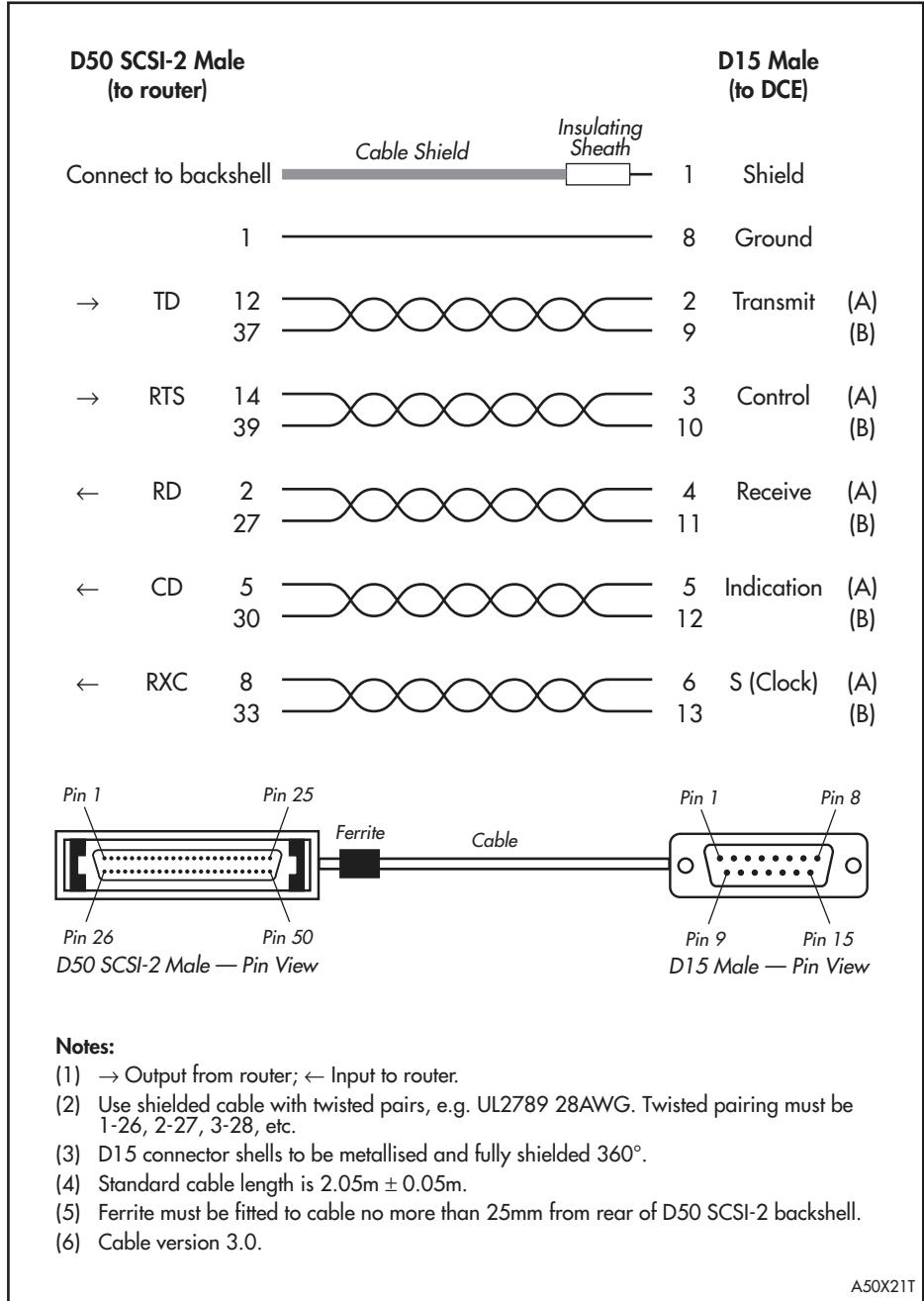
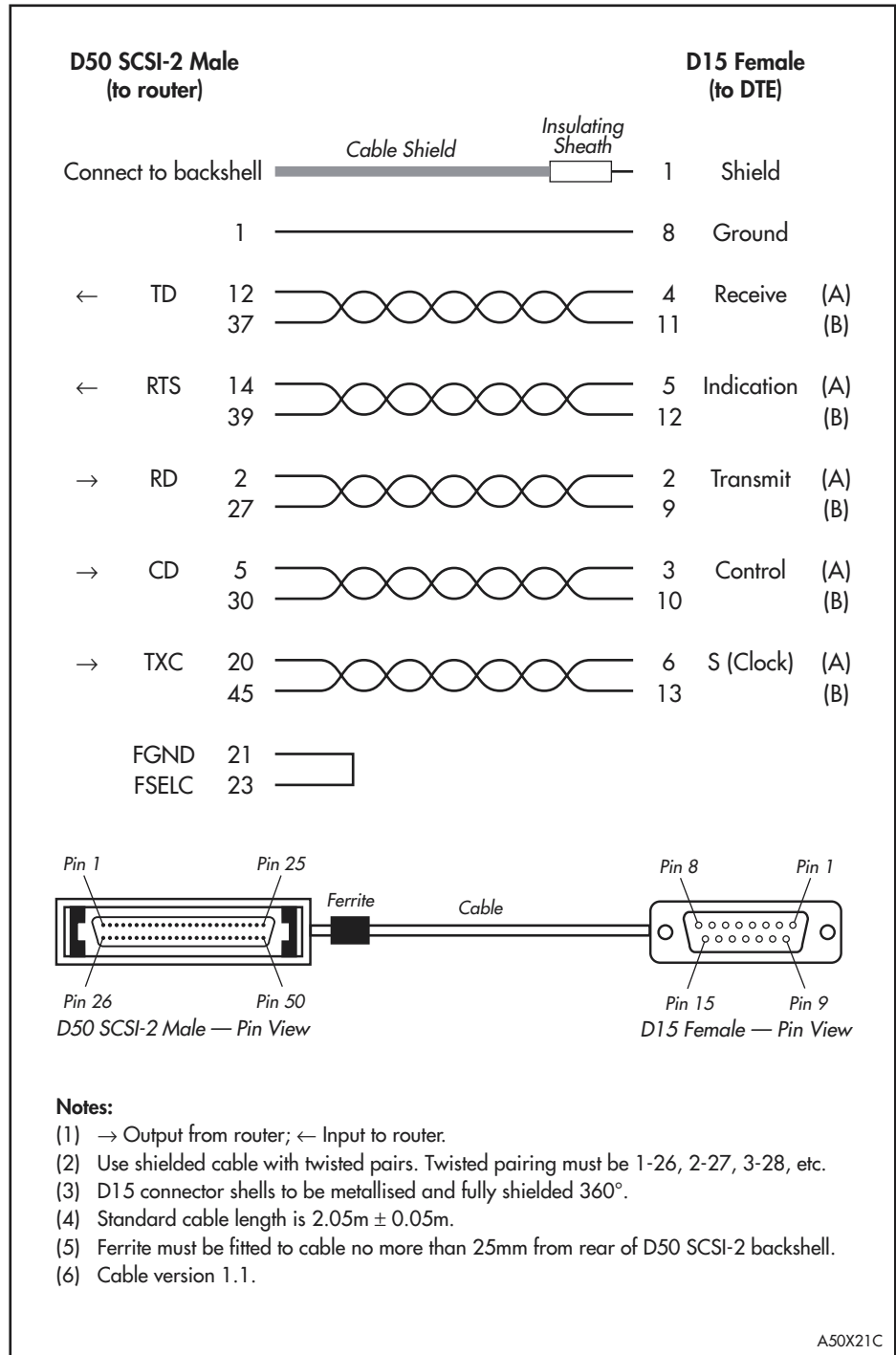


Figure 17: Pin wiring diagram for an X.21 DCE transition cable



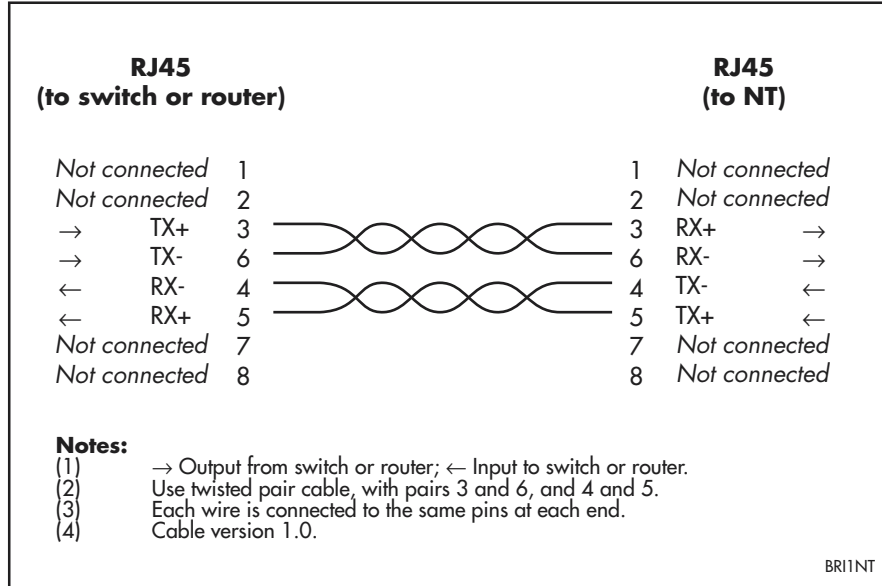
## ISDN Interface Cables

The AT-AR021(S) BRI-S/T and AT-AR021(U) BRI-U PICs provide Basic Rate ISDN interfaces, while the AT-AR020 PRI E1/T1 provides a Primary Rate ISDN interface.

### ISDN Basic Rate Cable

Figure 18 shows how to wire a cable to connect a Basic Rate Interface (BRI) to the ISDN network terminating equipment (NT).

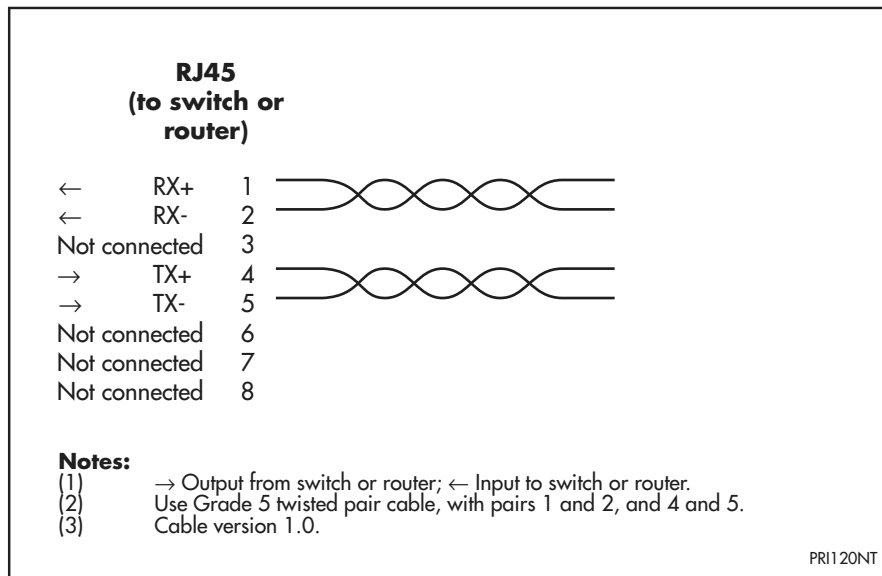
Figure 18: Pin wiring diagram for an ISDN Basic Rate straight-through interface cable



### ISDN Primary Rate Cable

Figure 19 shows how to wire a cable to connect to the RJ-45 connector of a Primary Rate Interface (PRI). Currently there is no accepted standard for the connector at the network termination end, so only the switch end of the cable is shown. Consult you ISDN service provider for more information.

Figure 19: Pin wiring diagram for an ISDN Primary Rate interface (120Ω) cable

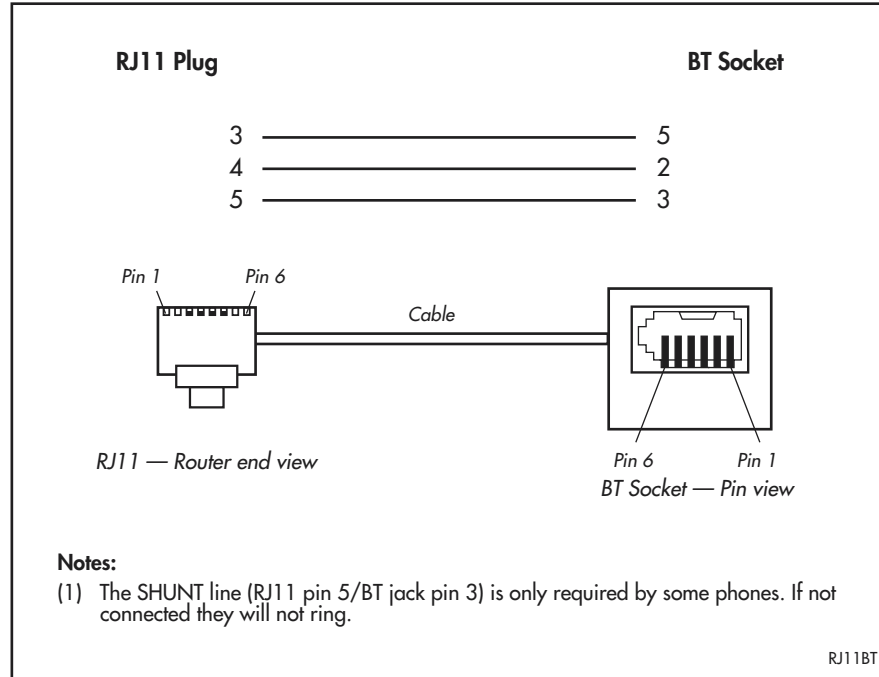




## BT Adaptor Cable for the AT-AR027 PIC

The AT-AR027 VoIP-FXS PIC uses a standard RJ-11 connector. To connect telephones with a BT-style connector, use an RJ-11 to BT adaptor cable (Figure 20).

Figure 20: Pin wiring diagram for an RJ-11 to BT adaptor cable



## Terminal and Modem Cables

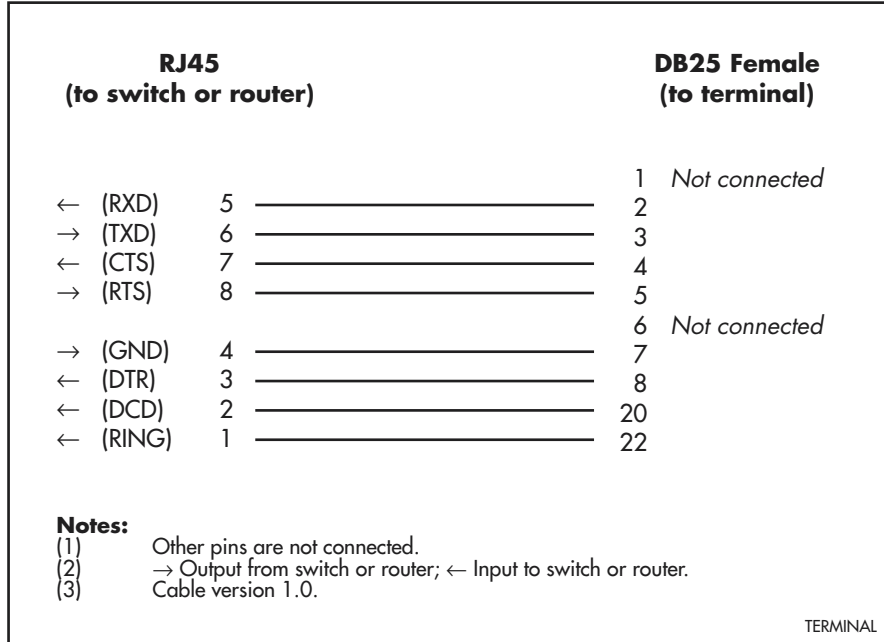
The following terminal and modem cables are described in this section:

- **RJ-45 terminal cable**
- **Modem cable**
- **Macintosh serial cable**

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.

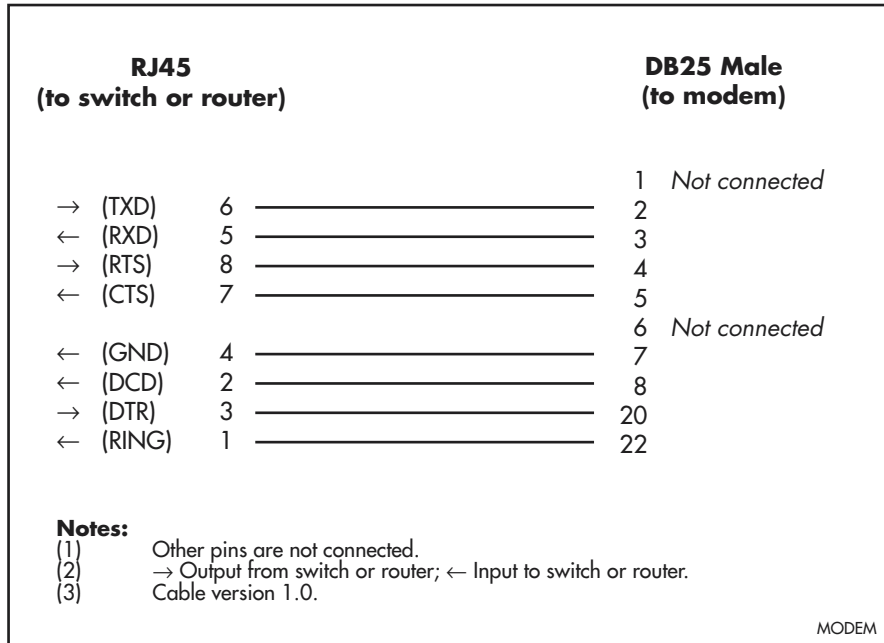
**RJ-45 terminal cable** Figure 21 shows how to wire a cable to connect a standard VT100-compatible terminal to an asynchronous (RJ-45) port. Some terminals are fitted with a DB25 female connector rather than a DB25 male connector. In this case the cable should be fitted with a DB25 male connector.

Figure 21: Pin wiring diagram for a standard RJ-45 terminal cable



**Modem cable** Figure 22 shows how to wire a cable to connect an asynchronous (RJ-45) port to a modem.

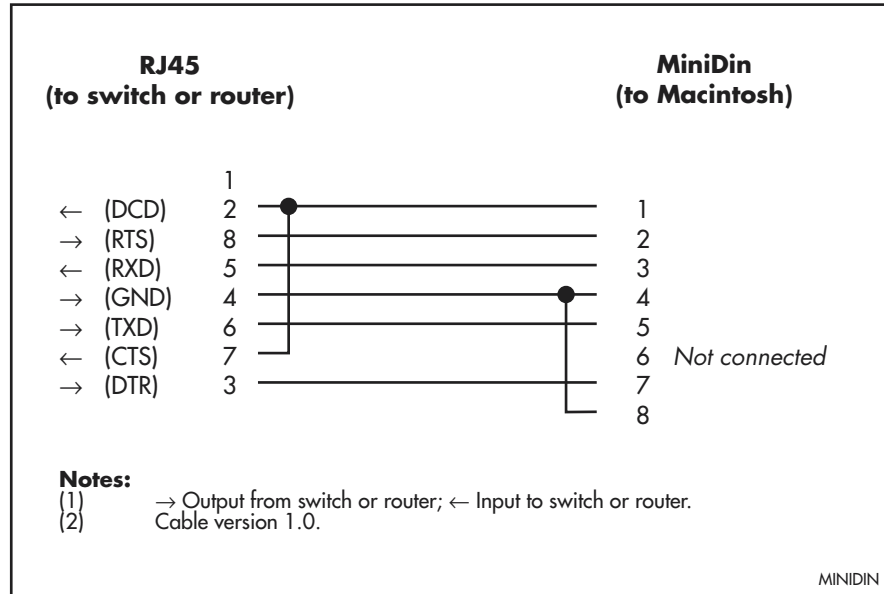
Figure 22: Pin wiring diagram for a standard modem cable



## Macintosh serial cable

Figure 23 shows how to wire a cable to connect an asynchronous (RJ-45) port on the router or switch to the COM port on a Macintosh.

Figure 23: Pin wiring diagram for a Macintosh serial cable



## Ethernet Transceivers and AUI Cables

There are four types of Ethernet transceiver available (Table 15). The 10BASE-5 thick Ethernet transceiver will be remote from the router, due to the nature of the coaxial cable, and will therefore require an AUI cable. The other types of transceiver may be connected using an AUI cable or, if the transceiver is small and lightweight, it may be connected directly to the AUI port on the back of the PIC. Care must be taken to avoid strain on the AUI port connector.

Table 15: Ethernet transceivers, media, and connector types

Transceiver Type	Media	Connector
10BASE-2	Thin Ethernet coaxial cable	BNC
10BASE-T	Twisted pair (category 3 or better)	RJ-45
10BASE-F	Fibre optic (dual)	ST or SMA
10BASE-5	Thick Ethernet coaxial cable	Vampire TAP or "N" type

The router may also be connected to a network via an AUI fanout. This device has multiple AUI ports wired as transceiver AUIs and a single standard AUI for connection of a transceiver. This allows several Ethernet devices to share a single transceiver. An AUI cable is required if this method is used.

Transceivers have a switch or a jumper to enable or disable SQE (*Signal Quality Error*, also known as heartbeat). The router does not require SQE, so it should be disabled.

AUI cables, sometimes known as drop or transceiver cables, are available from data cabling suppliers in a variety of lengths up to a maximum of 40 metres, but are typically one to five metres in length. AUI cables always have one female and one male DB15 connector and are fitted with slide lock retaining clips to ensure a secure attachment.

## Loopback Plugs for Testing Interfaces

Loopback plugs are used in conjunction with the Test Facility in the AlliedWare operating system to test the physical interfaces on all PICs except the AT-AR026 and AT-AR027. For more information about the Test Facility, see “Test Facility” on page 43, and the *Test Facility* chapter of the *AlliedWare® Operating System Software Reference*.

A loopback plug connects the output pins on the interface to the input pins so that any data transmitted over the interface is looped back (hence *loopback* plug) and received at the same interface.

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

Synchronous interfaces require an external test device to be used in conjunction with the Test Facility. Use a loopback test to the local DCE.

BRI S/T interfaces that use an MC145574 transceiver require a loopback plug to test the BRI interface. To determine which type of transceiver a BRI interface uses, use the command:

```
show bri test
```

Figure 24 shows an example of the output screen from the **show bri test** command. The transceiver type is listed in the first line of output.

Figure 24: Example output from the **show bri test** command

Test switches for BRI instance 0 (MC145574 transceiver):		
Number	Action	Status
1	Transceiver B1 GCI Transp Loop .....	no
2	Transceiver B2 GCI Transp Loop .....	no
3	Transceiver 2B+D GCI Transp Loop .....	no
4	Transceiver B1 GCI Non-Transp Loop .....	no
5	Transceiver B2 GCI Non-Transp Loop .....	no
6	Transceiver B1 S/T Transp Loop .....	no
7	Transceiver B2 S/T Transp Loop .....	no
8	Transceiver B1 S/T Non-Transp Loop .....	no
9	Transceiver B2 S/T Non-Transp Loop .....	no
10	Transceiver External S/T Loop .....	no
11	Transceiver 96kHz Test Tone .....	no
12	Transceiver Force Activation .....	no
13	Transceiver Ignore D Channel Procs .....	no
14	Transceiver Map E Channel to GCI .....	no
15	Transceiver GCI Free Run .....	no

BRI S/T interfaces that do not use an MC145574 transceiver, and BRI U interfaces, do not require loopback plugs. The Test Facility will perform an internal loopback test on these interfaces. To perform an external loopback test, an external NT mode device is required. To test NT mode operation on the V2 hardware revision of the AR021(S) PIC, use an external TE device.

Use the following pin wiring diagrams when constructing loopback plugs for each PIC interface type.

For this physical interface type ...	Follow this pin wiring diagram ...
RJ-45 asynchronous	Figure 25
Ethernet AUI	Figure 26
Ethernet TP	Figure 27 on page 37
ISDN Primary Rate	Figure 28 on page 37
ISDN Basic Rate S/T, depending on transceiver	Figure 29 on page 37
ISDN Basic Rate U	No loopback plug required

Figure 25: RJ-45 loopback plug for testing asynchronous interfaces

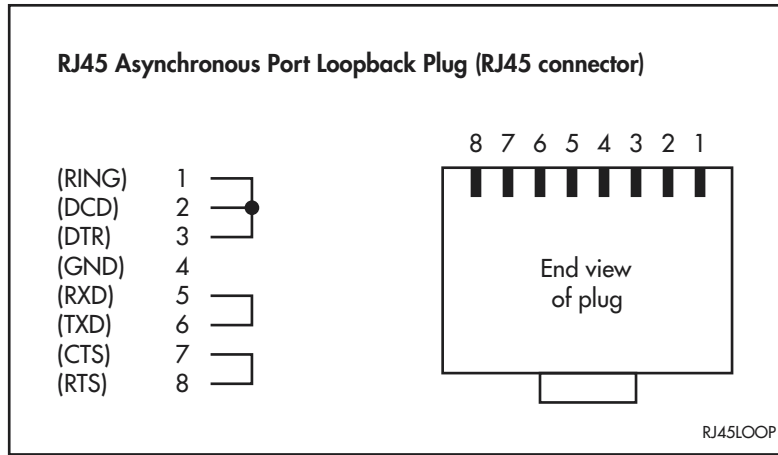


Figure 26: Ethernet AUI loopback plug

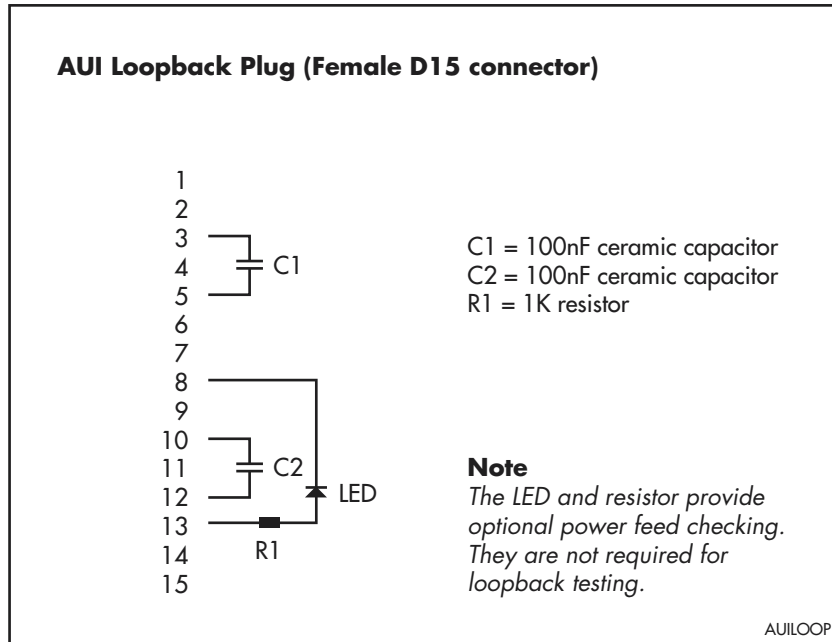


Figure 27: Ethernet twisted pair (TP) loopback plug

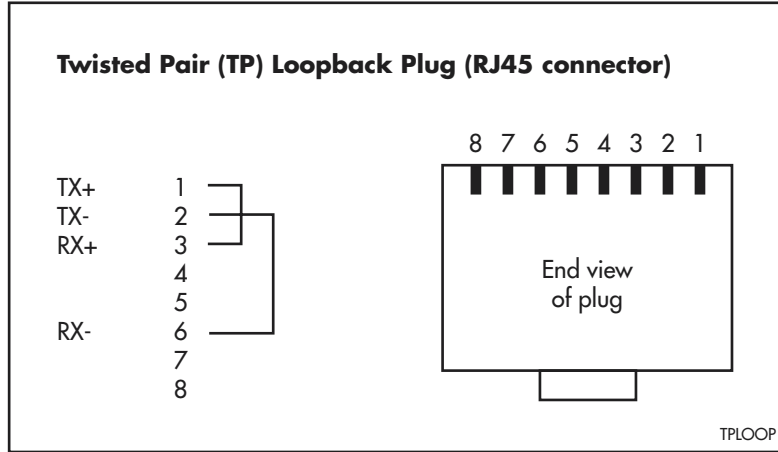


Figure 28: Primary Rate ISDN loopback plug

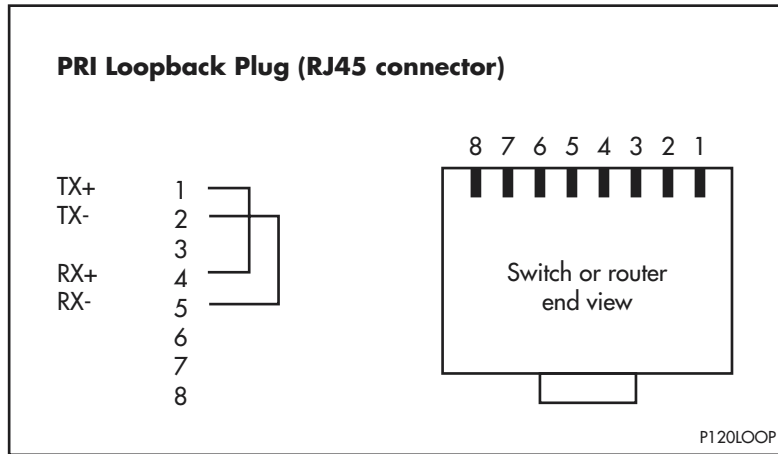
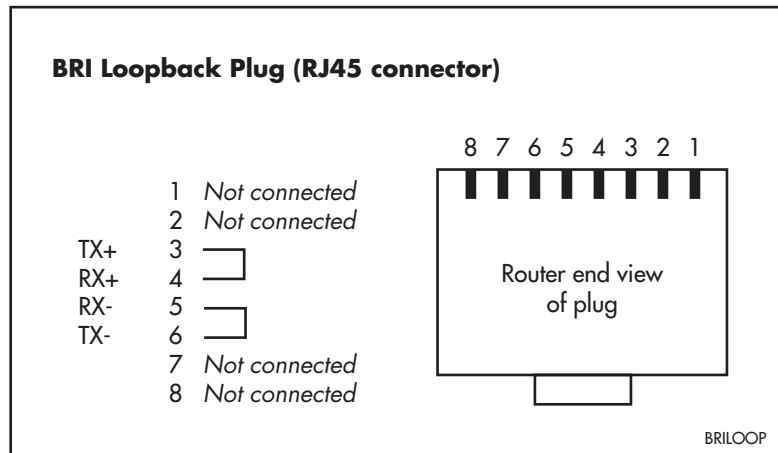


Figure 29: Basic Rate ISDN loopback plug wiring diagram



## Hot Swapping the AT-AR040 NSM with PICs Installed



**Caution** You cannot hot swap PICs. Before installing or removing a PIC from a PIC bay in a switch or router, you must disconnect all power sources to the switch or router. To install or remove a PIC from an AR040 NSM, you must first either physically remove the NSM from the switch or router using the hot swap method, or disconnect all power sources to the switch or router.

Hot swapping is the installation or removal of a component such as an NSM without powering down or restarting the switch or router. You can hot swap the AT-AR040 NSM on a switch or router running Software Version 2.3.1 or later. To find out which version your switch or router is running, use the command:

```
show install
```

You can hot swap the AT-AR040 NSM with PICs installed in its PIC bays. There is no need to remove the PICs before hot swapping the NSM.

When an AR040 NSM with PIC cards is hot swapped out, and an identical combination of AR040 and PICs is hot swapped into the same bay, the software configurations for the PIC interfaces are preserved across the hot swap. In this case, software modules configured to the PIC interfaces transfer to the newly swapped in interfaces.

When an AR040 NSM with PICs is hot swapped out and a different combination of AR040 and PICs is hot swapped into the same bay, new interface instances are created for any new PIC types or PIC types that are in different bays, and the old interface instances are discarded. For any PIC in the combination that is replaced by a PIC of the same type, interface instances are preserved.

The recessed Hot Swap button must be used when hot swapping NSMs. See the *Network Service Module Installation and Safety Guide* for the correct procedure for hot swapping the AR040 NSM.

### Behaviour of Hot Swapped Interfaces

When an NSM is hot swapped out, its interface instances become dormant. They stay dormant until either another interface of the same type is hot swapped into the bay, in which case they are reactivated, or an interface of a different type is hot-swapped into the bay, in which case they are discarded.

Dormant interfaces are included in the **show interface** command output ([Figure 30 on page 39](#) and [Figure 31 on page 39](#)) and in the SNMP interfaces MIB, marked as swapped out. In other router or switch commands, however, the router or switch behaves as though dormant interfaces do not exist.

Instances of higher-level modules such as LAPD, Q931, ISDN call control, PPP, and IP do not become dormant when an interface becomes dormant. Instead they behave as if the interface has stopped communicating, for example, as if the cable has been unplugged.

The configuration script is not scanned for commands relating to hot-inserted interfaces until the switch or router is restarted. These interfaces must be configured manually.

The switch or router does not update the MAC address of any hot-swapped Ethernet interface until the switch or router is restarted.

All other commands that show or set interface properties behave as if swapped out interfaces do not exist. Commands that operate on multiple interfaces skip swapped out interfaces. Commands specified explicitly to a dormant interface display an error message.

Figure 30: Example output from the **show interface** command

```

Interfaces                                     sysUpTime:           00:00:46

DynamicLinkTraps.....Disabled
TrapLimit.....20

Number of unencrypted PPP/FR links.....0

ifIndex Interface      ifAdminStatus ifOperStatus          ifLastChange
-----
1      eth0              Up             Up                    00:00:03
2      eth1              Up             Down                  00:00:00
3      bri0              Up             Swapped out          00:00:43
4      eth2              Up             Swapped out          00:00:42
-----

Interface name summary

Interface Full name
-----
asyn0      asyn0
asyn1      asyn1
eth0       eth0
eth1       eth1
-----

```

Figure 31: Example output from the **show interface** command for a specific interface

```

Interface..... bri0
ifIndex..... 3
ifMTU..... 1712
ifSpeed..... 144000
ifAdminStatus..... Up
ifOperStatus..... Swapped out
ifLinkUpDownTrapEnable... Disabled
TrapLimit..... 20

Interface Counters

ifInOctets ..... 52190          ifOutOctets ..... 52190
ifInUcastPkts ..... 3070        ifOutUcastPkts ..... 3071
ifInNUcastPkts ..... 0          ifOutNUcastPkts ..... 0
ifInDiscards ..... 0           ifOutDiscards ..... 0
ifInErrors ..... 0             ifOutErrors ..... 0

```



## PIC Testing and Verification

Use the following methods to check that a PIC is installed and operating correctly:

- [Verifying that the PIC has been recognised](#)
- [Using a terminal to verify operation](#)
- [Using the Test Facility to verify operation](#)
- [Using an existing network to verify operation](#)

### Verifying that the PIC has been recognised

To verify that the switch or router has recognised the PIC, turn on the switch or router, and enter the command:

```
show system
```

Figure 32 shows a typical output.

Figure 32: Example output from the **show system** command for a switch or router with PICs installed

Board	ID Bay	Board Name	Host Id	Rev	Serial number
Base	182	AT-AR745	0	M2-0	50038295
PIC	299	1 AT-AR021(S)-03 PIC BRI(S)	0	P2-0	78615636
NSM 4PIC	87	AT-AR040-00 NSM 4PIC	0	M4-0	42098017

```

Memory - DRAM :131072 kB FLASH : 16384 kB

SysDescription
CentreCOM AT-AR745 version 2.9.1-11 27-Sep-2007
SysContact

SysLocation

SysName

SysDistName

SysUpTime
396 ( 00:00:03 )
Boot Image      : 745_107.fbr size 894264 13-Dec-2006
DEVELOPMENT Build
Software Version: 2.9.1-11 27-Sep-2007
Release Version : 2.9.1-11 27-Sep-2007
Patch Installed : NONE
Territory       : europe
Country         : none
Help File       : 700-291a.hlp

Main PSU        : On           Main Fan          : On
RPS Monitor     : Off

Configuration
Boot configuration file: boot.cfg
Current configuration: boot.cfg

Security Mode   : Disabled

```

The first part of the display shows details of cards installed in the switch or router. There should be one entry for the switch or router base card and one entry for each PIC installed. Both the serial number and the part name should also be displayed.

If there is no entry for a PIC, then the boot process has not correctly detected the presence of the PIC. The most likely causes are:

- The connector on the PIC is not plugged into the PIC slot on the base card correctly.  
Repeat the installation process, inserting the PIC carefully into the lowest numbered free bay, then tightening the screws firmly. Use the **show system** command again to check that the PIC has been recognised.
- The software version running on the switch or router does not support the PIC. The AT-AR021 V3 hardware revision requires Software Version 2.9.1-13 or later. Use the **show system** command to check the software version.

For more information about the **show system** command, see the *Operation* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router.

If the display is still not correct, contact your authorised Allied Telesis distributor or reseller.

## Using a terminal to verify operation

PICs with asynchronous ports can be tested using a terminal set to:

- 9600 bps
- 8 data bits
- 1 stop bit
- No parity
- Hardware flow control

Verify that the terminal functions correctly by connecting it to the management port (Console Port or RS-232 Terminal Port) on your switch or router and pressing [Return] several times until the prompt is displayed.

Then connect the terminal to one of the PIC's ports, and press [Return] several times. If the prompt is displayed, the port is functioning correctly. If the prompt is not displayed, the most likely cause is that the PIC's ports are set to different operational parameters. This can be verified by reconnecting the terminal to the management port and then using the command:

```
show port=all
```

Compare the PIC's port settings with the settings for the management port. Any differences should be corrected by modifying the settings of the ports on the PIC using the **set asyn** command from the *Interfaces* chapter of the *AlliedWare® Operating System Software Reference* for your switch or router. Reconnect the terminal to one of the PIC's ports and press [Return] several times. If the prompt is still not displayed, contact your authorised Allied Telesis distributor or reseller.

### **Using the Test Facility to verify operation**

The built-in Test Facility software provides the best method to properly verify the correct operation of all PICs except the AT-AR026 PIC. For more information about using the Test Facility, see [“Test Facility” on page 43](#).

### **Using an existing network to verify operation**

To test a PIC using an existing network, the PIC interfaces must be configured correctly to route packets. For more information about configuring interfaces, see the relevant chapter in the *AlliedWare® Operating System Software Reference* for your switch or router.

## Test Facility

The Test Facility is built into the AlliedWare operating system, and is the best method to verify the correct operation of all PICs except the AT-AR026. Testing can be performed while the switch or router is operational, but any interfaces being tested are dedicated to the Test Facility. For more information about the Test Facility, see the *Test Facility* chapter of the *AlliedWare® Operating System Software Reference*.

The AT-AR026 PIC does not support the AlliedWare operating system's diagnostic or Test Facility features. AT-AR026 PICs include a switch chip that switches independently of the switch, router, or NSM that the PIC is installed in. The **show interface** command will show each correctly installed AT-AR026 as a single interface. The 10/100 "front side" Ethernet ports will not be shown.

PICs support a wide range of interface types, including Ethernet, asynchronous, synchronous, Basic Rate ISDN and Primary Rate ISDN. Each interface type can be tested independently using the Test Facility software.

For the Test Facility to operate, you must install a loopback plug or cable on some interfaces. See [Table 16 on page 43](#) for a list of interface types and their loopback requirements. "[Loopback Plugs for Testing Interfaces](#)" on page 35 describes how to construct a loopback plug or cable.

Table 16: Loopback plugs, cables and devices required for testing PIC interfaces

Switch Interface	Loopback plug, cable or test device required
Asynchronous	RJ-45 asynchronous loopback plug. Use one plug to individually test each port one by one, or all ports can be tested simultaneously if sufficient loopback plugs are available.
Ethernet LAN (AT-AR022 ETH PIC only)	Ethernet loopback plug. The Test Facility software will detect (by looking for traffic) if the transceiver is connected to a working LAN. If it detects traffic, the transceiver test will abort.
Basic Rate ISDN	BRI loopback plug for testing AT-AR021(S) V2 hardware revision in NT mode. The AT-AR021(S) V3 hardware revision and the AT-AR021(U) PIC do not support the NT mode, so a loopback plug can not be used. Internal loopback tests can be run without a loopback plug. For more complete testing, connect the BRI interface to an external test device or NT mode device, then execute conformance loopback tests and generate packets using the <b>enable bri ctest</b> and <b>disable bri ctest</b> commands from the <i>Integrated Services Digital Network (ISDN)</i> chapter of the <i>AlliedWare® Operating System Software Reference</i> for your switch or router.
Primary Rate ISDN	PRI loopback plug.
Synchronous	An external test device is required. Use a loopback to the local DCE.

To run the Test Facility for a specific interface, use the command:

```
enable test interface={all|base|expansion|ethn|synn|portn|
brin|prin|engine|mac|mac0|mac1|mac2}
```

where *n* is the interface number.

To run the Test Facility for all interfaces on a PIC, use the command:

```
enable test interface=exp
```

If the tests are run with a loopback plug or external test device, the tests will run for 4 minutes. If the tests are run without a loopback plug, they will stop after about 30 seconds and display a warning message.

Test status and results can be displayed at any time, using the command:

```
show test
```

which produces a display like that shown in [Figure 33](#).

Figure 33: Example output from the **show test** command

Board	ID Bay	Board Name	Host Id	Rev	Serial number
Base	86	AT-RP24 Rapier 24		0 M3-3	50434040
NSM 4PIC	87	AT-AR040-00 NSM 4PIC		0 M4-0	42097500
PIC	75 0	AT-AR020-00 PIC E1/T1 PRI		0 M1-0	42197228
PIC	75 1	AT-AR023-00 PIC Sync		0 M2-1	54883467
PIC	75 2	AT-AR022-00 PIC Eth		0 M1-0	43225677
PIC	75 3	AT-AR021(S)-00 PIC BRI(S)		0 M3-0	50123345

Interface	State	Result	Type	Duration (minutes)	Details Data( %OK )	Control
port1	complete	good	ALL	4	good(100.0)	-
port2	complete	good	ALL	4	good(100.0)	-
port3	complete	good	ALL	4	good(100.0)	-
port4	complete	good	ALL	4	good(100.0)	-
port5	complete	good	ALL	4	good(100.0)	-
port6	complete	good	ALL	4	good(100.0)	-
port7	no test	-	-	-	-	-
.						
.						
.						
port23	complete	good	ALL	4	good(100.0)	-
port24	complete	good	ALL	4	good(100.0)	-
asyn0	complete	good	-	4	good(100.0)	good
eth0	testing	wait 12552 minutes	trans	0	-	-
			TP	5	BAD ( 56.2)	-
			ENDEC	5	good(100.0)	-
			MAC	5	good(100.0)	-
syn0	testing	wait continuous	RS-232dte	355	good(100.0)	good
			dce	355	good(100.0)	good
			X.21 dte	354	good(100.0)	good
			dce	0	-	-
			V.35 dte	354	good(100.0)	good
			dce	0	-	-
bri0	complete	good	-	1000	good( 99.9)	good
PRI0	no test	-	-	-	-	-

The status of the tests for each interface is shown in the right-most column of the output. For more information on the meanings of the other figures, see the *Test Facility* chapter of the *AlliedWare<sup>®</sup> Operating System Software Reference* for your switch or router.

If you are unsure about running the Test Facility, or have difficulty evaluating the results, contact your authorised Allied Telesis distributor or reseller.

## Troubleshooting

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This section provides information on how to detect and resolve problems with PICs.

Performing the following tasks will eliminate the most common faults.

1. Check that the PIC is correctly installed. See the *Port Interface Card Installation and Safety Guide* for a step by step guide to installing PICs.
2. Make sure the power cord is securely connected to the switch or router.
3. Check that the power supply voltage to the switch or router is stable.
4. Check that the correct data cables are being used and that their connections are secure.
5. Make sure that other network devices are working properly.
6. Use the **show install** command to check that the latest software release is loaded. The *AlliedWare® Operating System Software Reference* for your switch or router has more information about obtaining and installing the latest software release. In particular, the AT-AR021 V3 hardware revision requires a switch or router running Software Version 2.9.1-13 or later.
7. If the switch is malfunctioning, reboot it by pressing the recessed Reset button or entering the command **restart reboot**. Alternatively, power off and on the switch by disconnecting and reconnecting the main power supply and, if connected, the RPS power.

Other sources of troubleshooting information are:

- “Test Facility” on page 43
- The Installation and Safety Guide or Quick Install Guide for your switch or router, which can be downloaded from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).
- The Hardware Reference for your switch or router, which can be downloaded from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).
- [www.alliedtelesis.com](http://www.alliedtelesis.com)

## Obtaining Documentation and Resources

- Document set** The complete document set for Port Interface Cards includes the following:
- this Hardware Reference, which contains detailed information on the hardware features of Port Interface Cards
  - the *Port Interface Card Installation and Safety Guide*, which describes how to install a Port Interface Card
  - the *Network Service Module Installation and Safety Guide*, which describes how to install a Network Service Module
  - the *Network Service Module Hardware Reference*, which contains detailed information on the hardware features of Network Service Modules
  - the Installation and Safety Guide, or Quick Install Guide and Safety and Statutory Information for your switch or router, which describes how to install the switch or router and includes important safety and statutory information
  - the Hardware Reference for your switch or router, which contains detailed information on the hardware features of your switch or router
  - the *AlliedWare® Operating System Software Reference* for your switch or router, which contains detailed information on configuring WAN and routing protocols to use PICs

You can download these documents and updates from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).

You need Adobe® Acrobat® Reader® to view, search, or print these documents. You can download it from [www.adobe.com](http://www.adobe.com).

- Other resources** How-To Notes describe a range of standard Allied Telesis solutions, and include technical tips and guides to configuring specific hardware and software features. You can download the latest How-To Notes from [www.alliedtelesis.com/resources/literature/howto.aspx](http://www.alliedtelesis.com/resources/literature/howto.aspx).

MIBs supported by Allied Telesis products can be downloaded from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).

Microsoft® Visio® stencils for Allied Telesis products can be downloaded from [www.alliedtelesis.com/resources/images/visio.aspx](http://www.alliedtelesis.com/resources/images/visio.aspx).

AT-TFTP Server for Windows is a TFTP (*Trivial File Transfer Protocol*) server for transferring software versions, configuration scripts and other files between a PC and your switch or router. You download AT-TFTP Server from [www.alliedtelesis.com/support/software](http://www.alliedtelesis.com/support/software).

- CD-ROM** Some products ship with a Documentation and Tools CD-ROM, which includes:
- the complete document set
  - Adobe® Acrobat® Reader®
  - AT-TFTP Server
  - Supported MIBs
  - How-To Notes, white papers, Microsoft® Visio® stencils and other resources
  - Tryouts of networking software



**Contacting us** With locations covering all of the established markets in North America, Latin America, Europe, Asia, and the Pacific, Allied Telesis provides localized sales and technical support worldwide. To find the representative nearest you, visit us on the Web at [www.alliedtelesis.com](http://www.alliedtelesis.com).