Network Service Module
Hardware Reference

AT-AR040
AT-AR041
AT-AR042
AT-AR048

Allied Telesis™

Network Service Module
Hardware Reference

AT-AR040
AT-AR041
AT-AR042
AT-AR048

Download the complete document set from
www.alliedtelesis.com/support/software

Allied Telesis™

Network Service Module Hardware Reference
Document Number C613-03022-00 REV K.

Contents

Devices Covered By This Document

This Hardware Reference includes information on the following Network Service Modules (NSMs):

■   AT-AR040, four Port Interface Card (PIC) expansion bays

■   AT-AR041, eight ISDN Basic Rate S/T interfaces

■   AT-AR042, four ISDN Basic Rate S/T interfaces

■   AT-AR048, one unchannelised DS3 interface

You can download the complete document set for NSMs, and for your switch or router, from www.alliedtelesis.com/support/software. For more information about the document set and other resources, see "Obtaining Documentation and Resources" on page 23.

Compatible Switches and Routers

The following table shows which NSMs are appropriate for different models of switch and router.

Table 1: Compatible switches and routers for Network Service Modules (NSMs)

Model(s)	AR040	AR041	AR042	AR048
Rapier 8/8 (MT & SC) switch	✓	✓	✓	
Rapier 16F-FX (MT-RJ & SC) switch	✓	✓	✓	
Rapier 16F*i*-FX (MT-RJ & SC) switch	✓	✓	✓	
Rapier 24 switch	✓	✓	✓	
Rapier 24*i* switch	✓	✓	✓	✓
Rapier 48w switch	✓			✓
AR816F-FX (MT-RJ & SC) modular switching router	✓	✓	✓	
AR824 modular switching router	✓	✓	✓	
AR740 router	✓	✓	✓	
AR745 router	✓	✓	✓	

AT-AR048 Support

Maximum DS3 packet forwarding rates are achieved only when the AT-AR048 is installed in a Rapier 48w switch, or a Rapier 24*i* switch whose serial number ends with the letter N or higher. If maximum DS3 performance is not required, you can install the AT-AR048 in any Rapier 24*i* whose serial number ends in J or later. You can find the serial number on the underside of the switch (Figure 1 on page 5).

Figure 1: Serial number label on the underside of a Rapier 24i

Model : AT-RP241-10

‖‖‖ ‖‖‖‖ ‖‖‖‖‖‖ ‖‖‖‖‖ ‖‖‖‖‖

Part Number: 990-11934-10

‖‖‖‖‖‖‖‖‖ ‖‖‖‖‖‖‖‖‖ ‖‖‖‖‖‖‖ ‖‖‖

Product Serial Number: S03K225N — N or higher for maximum DS3 performance

‖‖‖ ‖‖‖‖‖ ‖‖‖‖‖‖‖‖‖ ‖‖‖‖‖ — J, K, L, or M for less demanding DS3 applications

Quantity With Unit of Measure: ‖‖‖‖‖‖‖‖‖‖‖‖‖‖ ‖‖‖‖‖‖

‖‖‖‖ ‖‖‖‖‖‖‖ 1 EA 7 67035 14875 5

Made in Singapore
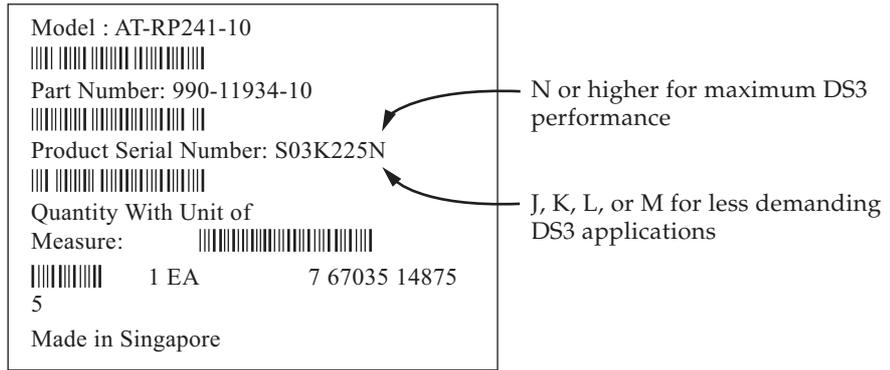
Hardware Overview

This section provides an overview of the hardware features of NSMs. NSMs are expansion options for switch and router models with an NSM bay. NSMs slot into a base-unit switch or router and either directly provide additional WAN interfaces, or provide expansion slots for Port Interface Cards (PICs).

Hardware descriptions for your switch or router, Uplink Modules, and PICs can be found in their respective Hardware References. These documents can be downloaded from www.alliedtelesis.com/support/software.

Safety and conformance information can be found in the Installation and Safety Guide or Safety and Statutory Information booklet for your switch or router, which can be downloaded from www.alliedtelesis.com/support/software.

Common Features

The following hardware features are common to all NSM models.

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: 5 to 95% non-condensing

Regulatory Standards

AT-AR040

- Listing: UL, cUL, TUV
- Safety: UL 60950-1, CAN/CSA-C22.2 No. 60950-1-03, EN60950-1, AS/NZS60950.1
- EMC: Radiated: EN55022 class A, FCC class A, VCCI class A, AS/NZS CISPR22 class A
- Immunity: EN55024

AT-AR041 and AT-AR042

- Listing: TUV
- Safety: EN60950-1, AS/NZS60950.1
- EMC: Radiated: EN55022 class A, AS/NZS CISPR22 class A
- Immunity: EN55024
- Network interface: TBR3, ACA TS031, iDA ISDN 1

AT-AR048

- Listing UL, cUL
- Safety: UL60950-1, CAN/CSA-C22.2 No. 60950-1-03
- EMC: Radiated: FCC Part 15 class A, IC-03 class A
- Network interface: ANSI T1.102, ANSI T1.404, ANSI T1.107, ANSI T1.231

AT-AR040 NSM

The AT-AR040 provides four Port Interface Card (PIC) expansion bays for installing PICs. The front panel of the AT-AR040 NSM is shown in Figure 2. The AT-AR040 NSM does not have LEDs.

Figure 2: AT-AR040 NSM with three PICs installed
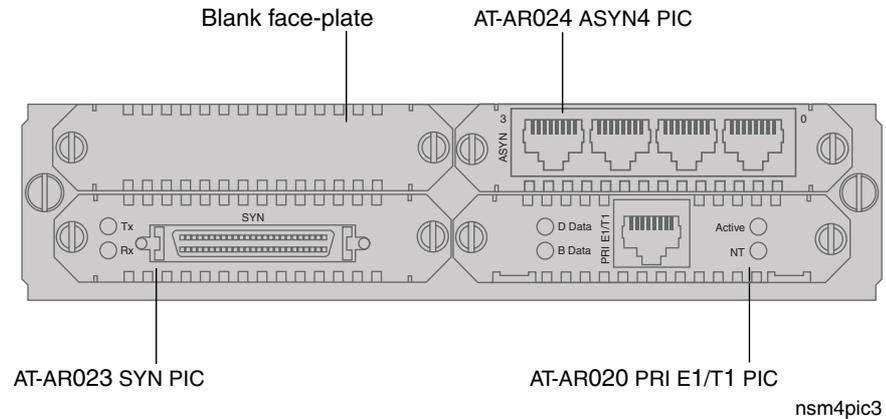
Supported Port Interface Cards (PICs)

The following PICs can be installed in an AT-AR040 NSM:

■ 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-AR023 SYN, a single 2 Mbps synchronous interface supporting RS-232, X.21, and V.35 in DTE and DCE modes

■ AT-AR024 ASYN4, four asynchronous ports

■ AT-AR027 VoIP-FXS, two Foreign Exchange Voice over IP ports

For more information about installing PICs, see the *Port Interface Card Installation and Safety Guide*, which is included with every PIC or can be downloaded from www.alliedtelesis.com/support/software.

For more information about the hardware features of PICs, constructing data cables, and verifying installation, see the *Port Interface Card Hardware Reference*, which can be downloaded from www.alliedtelesis.com/support/software.

Guidelines and limits for installing PICs

Observe the following guidelines and limits when installing PICs:

■ Use the PIC bays on the switch or router first, before installing PICs into an AT-AR040 NSM.

■ Fill any PIC bays in the base router starting at bay 0.

■ Fill the PIC bays in the AT-AR040 NSM starting at bay 0.

■ You can install a maximum of two AT-AR020 PRI E1/T1 PICs into an AT-AR040 NSM, and maximum of four total in a switch or router.

■ If two AT-AR020 PICs are installed in an AT-AR040 NSM, PIC one must be installed in the lower row (bay 0 or 1) and the other PIC must be installed in the upper row (bay 2 or 3).

■ If an AT-AR020 PIC is installed in an AT-AR040 NSM, and operating in E1 mode, you can not install an AT-AR021(S) or AT-AR021(U) PIC in the same row of the NSM.

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

■ Avoid installing an AT-AR022 or AT-AR026 PIC in an AT-AR040 NSM. Performance of these interfaces may be reduced and packet loss may occur.

Interface numbering

For each interface type (e.g. BRI, PRI, SYN, ETH, PORT), interfaces are numbered starting at 0, in the following sequence:

1. interfaces on the base switch or router

2. interfaces on PICs installed in PIC bays on the base switch or router, starting with PIC bay 0

3. interfaces on PICs installed in PIC bays on the AT-AR040 NSM, starting with NSM PIC bay 0, and ending with NSM PIC bay 3.

AT-AR041 and AT-AR042 NSMs

The AT-AR041 NSM provides eight ISDN Basic Rate S/T interfaces. The front panel of the AT-AR041 is shown in Figure 3.

Figure 3: AT-AR041 NSM
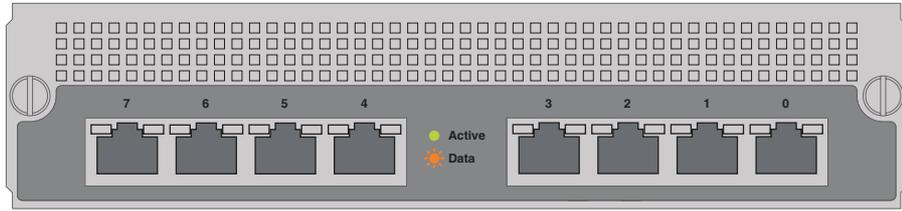
The AT-AR042 NSM provides four ISDN Basic Rate S/T interfaces. The front panel of the AT-AR042 is shown in Figure 4.

Figure 4: AT-AR042 NSM
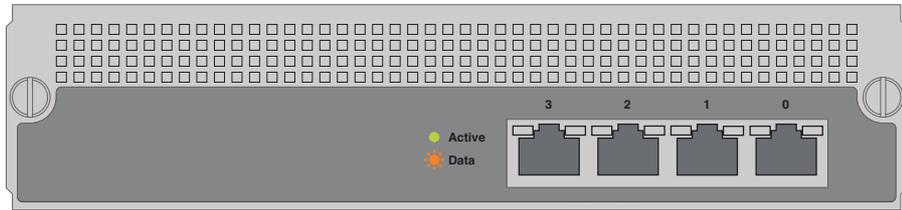
The BRI ports use RJ-45 connectors and provide TE interfaces. There are two status LEDs per port. The functions of the LEDs are listed in Table 2.

Table 2: AT-AR041 and AT-AR042 LEDs

LED	State	Function
Active	Green	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 the ISDN interface is correctly connected to a working NT device.
	Off	There is no connection to the ISDN, or the ISDN has deactivated the connection.
Data	Amber	For on-demand ISDN, lit when there is a call up over the respective B channel.
		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.
	Flashing Amber	For on-demand ISDN, flashing when data is being exchanged.
	Off	For on-demand ISDN, Off when there is no active connection or when continuous data exchange is occurring.
		For permanent ISDN circuits, Off when no data exchange is occurring.

The AT-AR041 and AT-AR042 support point-to-point links. Point to multi-point links are not supported.

Basic Rate ISDN Interfaces

Each Basic Rate S/T interface supports two 64 kbit/s B channels and one 16 kbit/s D channel, and operates in TE mode only. The switch or router should be configured as a TE for normal operation.

User-configurable jumpers provide 100 Ω line termination. By default, the jumpers are factory set to terminate Rx and Tx, bridging terminals 2 and 3 (Figure 5 on page 10). To remove the line termination, move the jumpers so that they bridge terminals 1 and 2.

Figure 5: Location of jumpers on BRI NSMs

Jumper set to Not Terminated

Jumper set to Terminated
(Factory default)

There are two jumpers per port. The AT-AR041 NSM,
therefore, has sixteen jumpers, while the AT-AR042 NSM has
eight jumpers. Each pair of jumpers set the Termination for the
port that they are closest to.
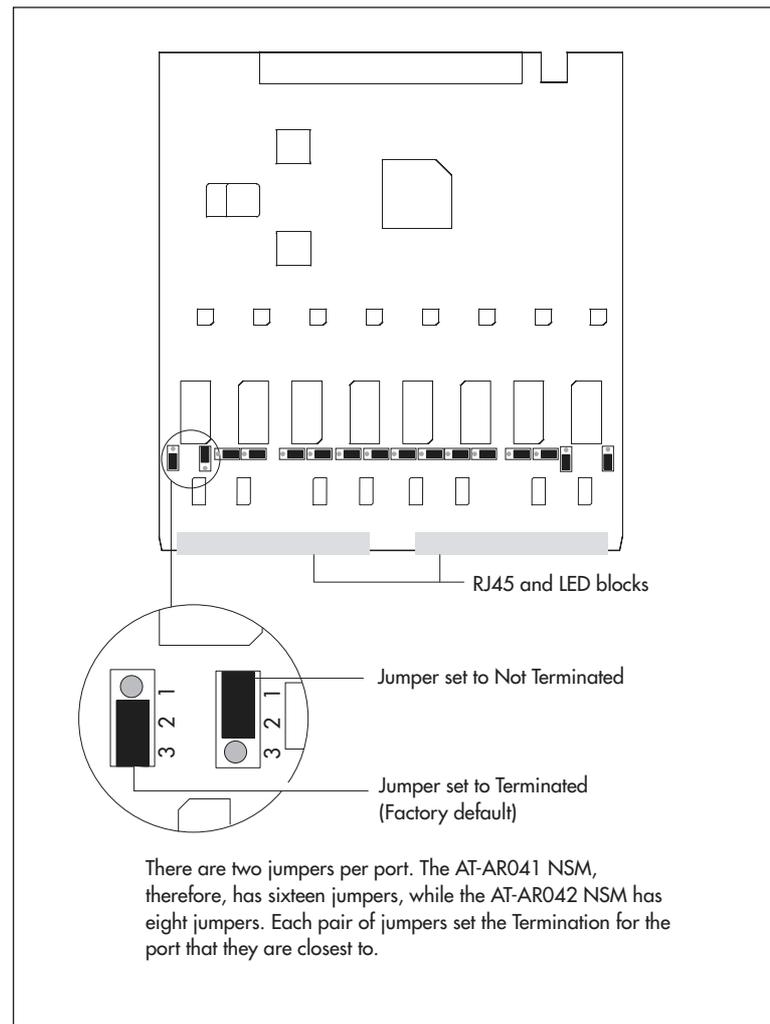
You should install the termination jumpers (terminate Rx and Tx) if:

■ 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 change any jumpers on the NSM 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 ISDN ports of the NSM. Dangerous voltages may be present on some parts of the NSM board, even if the switch or router is powered off.

The BRI interfaces use RJ-45 connectors. Table 3 shows the pinout of the BRI interfaces.

Table 3: Pinout of the Basic Rate ISDN S/T interfaces

Pin	S/T Interface Functions
1	-
2	-
3	TX+
4	RX+
5	RX-
6	TX-
7	-
8	-

ISDN S/T Interface Cables

Figure 6 on page 11 shows how to wire a cable to connect a Basic Rate Interface (BRI) to the ISDN network terminating equipment (NT).

Figure 6: Pin wiring diagram for an ISDN Basic Rate straight-through Interface cable

RJ45
(to switch or router)

RJ45
(to NT)

Not connected	1		1	Not connected	
Not connected	2		2	Not connected	
→	TX+	3	3	RX+	→
→	TX-	6	6	RX-	→
←	RX-	5	5	TX-	←
←	RX+	4	4	TX+	←
Not connected	7		7	Not connected	
Not connected	8		8	Not connected	

Notes:
(1) → Output from switch or router; ← Input to switch or router.
(2) Use twisted pair cable, with pairs 3 and 6, and 4 and 5.
(3) Each wire is connected to the same pins at each end.
(4) Cable version 1.0.

BRI1NT

Testing an AT-AR041 or AT-AR042 NSM

The Test Facility is built into the AlliedWare operating system, and is the best method to verify the correct operation of the BRI interfaces on the AT-AR041 and AT-AR042 NSMs. 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*.

When testing BRI interfaces using the Test Facility, a loopback plug must be inserted into each interface being tested. The 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. Figure 7 on page 12 shows how to construct loopback plug to test the BRI interfaces.

Figure 7: BRI S/T loopback plug

To test a specific AT-AR041 or AT-AR042 interface, insert a BRI S/T loopback plug into the interface and enter the command:

```
enable test interface=brin
```

where *n* is the interface number.

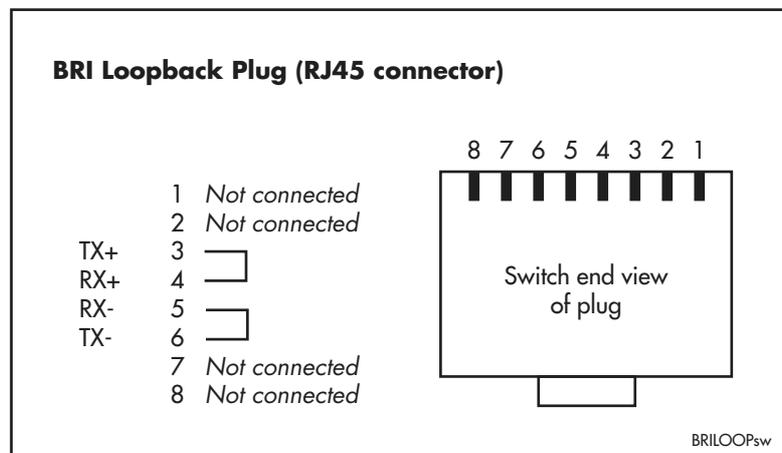To test all AT-AR041 or AT-AR042 interfaces at once, insert BRI S/T loopback plugs into all NSM BRI interfaces and enter the command:

```
enable test interface=expansion
```

Tests run for 4 minutes. Test status and results can be viewed at any time, using the command:

```
show test
```

which produces a display like that shown in Figure 8 on page 13.

The status of the tests for each interface will be 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® 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.

Figure 8: Example output from the **show test** command

```
Board       ID Bay  Board Name                    Host Id Rev   Serial number
-------------------------------------------------------------------------------
Base        78      AR740                                 M1-15  46625812
PIC         38   0  AT-AR023-00 PIC Sync                  M1-1   5918255
NSM         95      AT-AR041-00 NSM 8BRI                  P1-3   46624968

                                     Duration      Details
Interface  State    Result          Type  (minutes) Data( %OK )  Control
-------------------------------------------------------------------------------
  eth0     complete good            trans     0     -      -      -
                                    TP        1     good(100.0)  -
                                    ENDEC     1     good(100.0)  -
                                    MAC       1     good(100.0)  -
  eth1     complete good            trans     0     -      -      -
                                    TP        2     good(100.0)  -
                                    ENDEC     0     -      -      -
                                    MAC       2     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     -      -      -
  asyn0    complete check this screen -       4     -      -      -
  asyn1    complete good            -         4     good(100.0)  good
  BRI0     complete good            -         4     good(100.0)  -
  BRI1     complete good            -         4     good(100.0)  -
  BRI2     complete good            -         4     good(100.0)  -
  BRI3     complete good            -         4     good(100.0)  -
  BRI4     complete good            -         4     good(100.0)  -
  BRI5     complete good            -         4     good(100.0)  -
  BRI6     complete good            -         4     good(100.0)  -
  BRI7     complete good            -         4     good(100.0)  -
-------------------------------------------------------------------------------
```

For more complete testing, connect the BRI interface to an external ISDN test device or NT mode device and use the **enable bri ctest** command and the **disable bri ctest** command from the *Integrated Services Digital Network (ISDN)* chapter the *AlliedWare® Operating System Software Reference*. This test will execute conformance loopback tests and generate packets. If a test fails, please contact your authorised Allied Telesis distributor or reseller.

AT-AR048 NSM

The AR048 NSM provides a single unchannelised DS3 interface with two BNC connectors for transmit and receive. The front panel of the AT-AR048 NSM is shown in Figure 9 and the functions of the LEDs are described in Table 4.
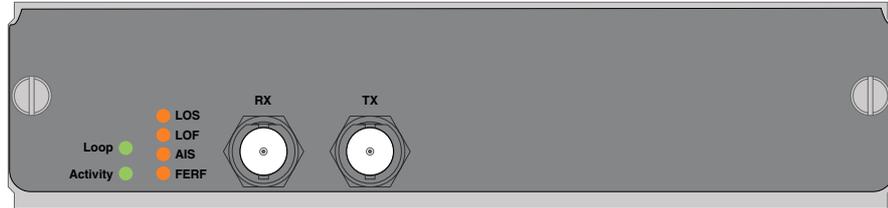
Figure 9: AT-AR048 NSM

Table 4: AT-AR048 LEDs

LED	State	Function
Active	Green	Lit when the Line Interface Unit (LIU) is receiving a signal.
Loop	Green	Lit when any loopback is active.
LOS	Amber	Lit when the received signal is lost. This usually indicates a network disruption, such as a cable being disconnected or a device failure.
LOF	Amber	Lit when the DS3 framer cannot extract valid frames from the received signal.
AIS	Amber	Lit when an Alarm Indication Signal is detected.
FERF	Amber	Lit when a Far End Receive Failure signal is detected. This indicates the far end is receiving an AIS, LOS, or LOF signal.

DS3 Interface

The AT-AR048 NSM provides a single standards-based unchannelised DS3 interface. The interface has the following features:

■ 44.736 Mbit/s interface rate, 44.210 Mbit/s payload data rate

■ Separate transmit (Tx) and receive (Rx) BNC connectors

■ 75 Ω impedance

■ B3ZS line encoding

■ Automatic compensation for lines up to 135 m (450 feet)

■ Loop or internal timing

■ C-bit framing

■ Support for PPP and Frame Relay encapsulation

The interface meets the following specifications:

■ ANSI T1.103, Digital Hierarchy - Synchronous DS3 Format

■ ANSI T1.107, Digital Hierarchy - Formats

■ ANSI T1.231, Digital Hierarchy - Layer 1 In-Service Digital

■ RFC 2496 (DS3 MIB)

DS3 Interface Cables

Use $75\,\Omega$ RG59 coaxial cables with BNC connectors. Two cables are required, one for transmit and one for receive. Neither cable should exceed 135 m (455 feet) in length.

Testing an AT-AR048 NSM

The Test Facility is built into the AlliedWare operating system, and is the best method to verify the correct operation of the DS3 interface on the AT-AR048 NSM. 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*.

To test an AT-AR048 DS3 interface, connect a $75\,\Omega$ RG59 cable between the transmit and receive BNC connectors, and enter the command:

```
enable test interface=ds3n
```

where *n* is the interface number.

Alternatively, enter the command:

```
enable test interface=expansion
```

Tests run for 4 minutes. Test status and results can be viewed at any time, using the command:

```
show test
```

which produces a display like that shown in Figure 10.

Figure 10: Example output from the **show test interface** command for a DS3 interface

```
Board       ID Bay  Board Name                        Host Id Rev    Serial number
-----------------------------------------------------------------------------
Base        114     AT-RP24i Rapier 24i                      M2-0   41376726
NSM DS3     187     AT-AR048 NSM DS3                         M1-1   49986061

                                          Duration       Details
Interface  State    Result          Type  (minutes)  Data( %OK ) Control
-----------------------------------------------------------------------------
  DS30     complete good             -         4      good(100.0)  -
-----------------------------------------------------------------------------
```

A more detailed output (with frame counts) can be displayed with the command:

```
show test interface counter
```

which produces a display like that shown in .

For more information on the meanings of the output, see the see the *Test Facility* chapter of the *AlliedWare® Operating System Software Reference*. If you are unsure about running the Test Facility, have difficulty evaluating the results, or if a test fails, contact your authorised Allied Telesis distributor or reseller.

Figure 11: Example output from the **show test interface counter** command for a DS3 interface

```
Board       ID  Bay Board Name                        Rev    Serial number
-------------------------------------------------------------------------------
Base        114     AT-RP24i Rapier 24i               M2-0   41376726
NSM DS3     187     AT-AR048 NSM DS3                  M1-1   49986061

                          Duration                Frame Counters
Interface  State    Type  (minutes)     Tx     RxTotal     RxGood      RxBad
-------------------------------------------------------------------------------
  DS30     complete  -          4   001045030  001045030  001045030  000000000
-------------------------------------------------------------------------------
```

LEDs and What They Mean

The following LEDs report operations and faults on NSMs and related hardware:

LEDs on the...	Are described in ...
Switch and router base unit	Table 5
AT-AR041 NSM	Table 2 on page 9
AT-AR042 NSM	Table 2 on page 9
AT-AR048 NSM	Table 4 on page 14
AT-AR020 PRI E1/T1 PIC	Table 6 on page 18
AT-AR021(S) BRI-S/T PIC	Table 7 on page 18
AT-AR022 ETH PIC	Table 8 on page 18
AT-AR023 SYN PIC	Table 9 on page 19
AT-AR026 4ETH PIC	Table 10 on page 19
AT-AR027 VoIP-FXS PIC	Table 11 on page 19

The AT-AR040 NSM has no independent LEDs. See Table 5 for information about related LEDs found on the base switch or router.

Switch and Router LEDs for NSMs

The following LEDs on switches and routers with NSM bays report operations and faults on installed NSMs.

Table 5: Switch and Router LEDs for NSMs

LED	State	Function
In use	Green	An NSM is installed, is receiving power, and is operational. The NSM and its PICs are not ready for hot swap.
	Off	No NSM is installed, or the NSM is not installed correctly (the switch or router has not recognised the NSM).
Swap	Green	The NSM and its PICs are ready to be hot swapped.
	Off	The Hot Swap button must be pressed before the NSM or its PICs can be hot swapped, or the software release does not support hot swapping. Hot swapping is supported by software version 2.3.1 or later.

PIC LEDs

The following LEDs report operations and faults on PICs, and may be helpful when diagnosing possible AT-AR040 NSM operational faults. The LEDs are located on the faceplate of the respective PIC. The AT-AR024 ASYN4 PIC does not have LEDs.

Table 6: AT-AR020 PRI E1/T1 PIC LEDs

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 set) frames are being received on the respective interface (PRI 0 or PRI 1) from another source.
NT	[ISDN mode only] Lit when the PRI1 is operating in NT mode. This LED should not be lit during normal operation.

Table 7: AT-AR021(S) BRI-S/T PIC LEDs

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.

Table 8: AT-AR021(U) BRI-U PIC LEDs

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 *Activated* state (i.e., it is in a 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.

Table 9: AT-AR023 SYN PIC LEDs

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

Table 10: AT-AR026 4ETH PIC LEDs

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.

Table 11: AT-AR027 VoIP-FXS PIC LEDs

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 **reset voip** command.

Hot Swapping

Hot swapping is the installation or removal of a component such as an NSM without powering down or restarting the switch or router.

NSMs can be hot swapped in and out of switches and routers that are running Software Version 2.3.1 or later. To find out which software version your switch or router is running, use the command:

```
show system
```

See the *Network Service Module Installation and Safety Guide* for instructions on how to hot swap your NSM.

Hot Swapping the AT-AR040 NSM with PICs

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 AT-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.

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 AT-AR040 NSM with PIC cards is hot swapped out, and an identical combination of AT-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 AT-AR040 NSM with PICs is hot swapped out and a different combination of AT-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.

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 12 on page 21 and Figure 13 on page 21) and in the SNMP interfaces MIB, marked as swapped out. In other switch or router commands, however, the switch or router 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 12: 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 13: 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
```

Troubleshooting

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

Performing the following tasks will eliminate the most common faults.

1. Check that the NSM is correctly installed. See the *Network Service Module Installation and Safety Guide* for a step by step guide to installing NSMs.

2. Make sure the power cord is securely connected to the switch or router and the power outlet.

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.

7. If the switch or router is malfunctioning, reboot it by pressing the recessed Reset button or entering the command **restart reboot**. Alternatively, power off and on the switch or router by disconnecting and reconnecting the main power supply and, if connected, the RPS power.

Other sources of troubleshooting information are:

■   The Installation and Safety Guide or Quick Install Guide for your switch or router, which can be downloaded from www.alliedtelesis.com/support/software.

■   The Hardware Reference for your switch or router, which can be downloaded from www.alliedtelesis.com/support/software.

■   www.alliedtelesis.com

Obtaining Documentation and Resources

Document set The complete document set for Network Service Modules includes:

- this Hardware Reference, which contains detailed information on the hardware features of Network Service Modules

- the *Network Service Module Installation and Safety Guide*, which describes how to install a Network Service Module

- the *Port Interface Card Installation and Safety Guide*, which describes how to install a Port Interface Card

- the *Port Interface Card Hardware Reference*, which contains detailed information on the hardware features of Port Interface Cards

- 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.

You need Adobe® Acrobat® Reader® to view, search, or print these documents. You can download it from 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.

MIBs supported by Allied Telesis products can be downloaded from www.alliedtelesis.com/support/software.

Microsoft® Visio® stencils for Allied Telesis products can be downloaded from 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.

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.