

Chapter 64

Test Facility

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Introduction

This chapter describes the main features of the Test Facility on the router, and how to set up and use the Test Facility. The Test Facility provides a simple, efficient method of validating the operation of the router hardware, including ports. The Test Facility does not test the router processing core but it must be operational for the Test Facility to operate. The router processing core is tested during every power up.

Some interface and port types described in this chapter may not be supported on your router. These vary depending on the model and whether an expansion option is installed. For more information, see the Hardware Reference.

Disabling configurations before running tests

Before using the Test Facility, we recommend that you disable interface configurations by using the command:

```
set config=none
```

Then restart or reboot the router by using either of the commands:

```
restart reboot
restart router
```

Operating mode

The Test Facility runs in the normal router operating environment. This means that the router processing core and an access port must be operational before you begin testing. Tests operate by using standard router device drivers, so this software must also be fully operational. Control tests with the Command Line Interface (CLI), either from a local terminal port or remotely with Telnet. An SNMP management system can determine whether an interface is being tested, but cannot be used to initiate a test. The objects in the enterprise MIB used to set an interface to test mode may be written and read, but do not result in any action.

Test hardware required

Tests on interfaces require external connections to be made to loopbacks or specialised test hardware.

Displaying test status and results

When a test is initiated from a local asynchronous connection, test messages are printed for tests that are completed or halted. These messages may occur at any time during the test. If the test command has been entered from another source, such as a remote Telnet connection, these messages are not printed. In this case, use the [show test command on page 64-14](#) to display the test status and results.

Impact of testing

Tests have the potential to degrade network operations if they are enabled on active resources, such as ports connected to a LAN or another router. To limit this potential problem, tests stop when they detect an active resource. The resource is returned to its pre-test configuration after a test stops.

With the exception of asynchronous ports, tests should not be used to test the interface through which access was obtained to the router. The reason for this is that the connection to the router is broken when the Test Facility attaches to the interface. The same applies to PAC cards—a PAC card should not be placed into test mode if the test commands themselves pass through the PAC card. No mechanism is provided to prevent this from occurring. It is the responsibility of the user to check the operation of a resource before starting the test.

Test methodology

Interface tests use data loopbacks and (where applicable) control line loopbacks. Frames containing a known data sequence are repeatedly transmitted via the hardware being tested. The contents of frames received via the hardware are compared against this sequence. If a packet is received with the wrong sequence it is counted as a bad frame.

The loopback error free rate is calculated as the number of good frames received divided by the number of frames sent, where a good frame is one where the received and transmitted data and lengths match. For interfaces that do not transport frames (for example, asynchronous ports), the term “frame” means the test string.

All interfaces can be tested simultaneously, including the interface used to enter the test command, by using the command:

```
enable test interface=all
```

Special cable for testing the access port

The Test Facility automatically detects when a test is enabled on the same asynchronous port attached to the terminal from which the test command was entered, and tests only the port’s control signals. Testing of the data path is by visual inspection—if the command interpretation and the response displayed on the terminal are correct then the data path is judged to be functional. A special cable must be used in this case to provide a normal data path while looping the control signals ([Figure 64-1 on page 64-3](#), [Figure 64-2 on page 64-3](#)). Alternatively, use Telnet to access the CLI and initiate the test.

Figure 64-1: Cable pinouts for connecting a terminal to an asynchronous port under test on an AR725 or AR745

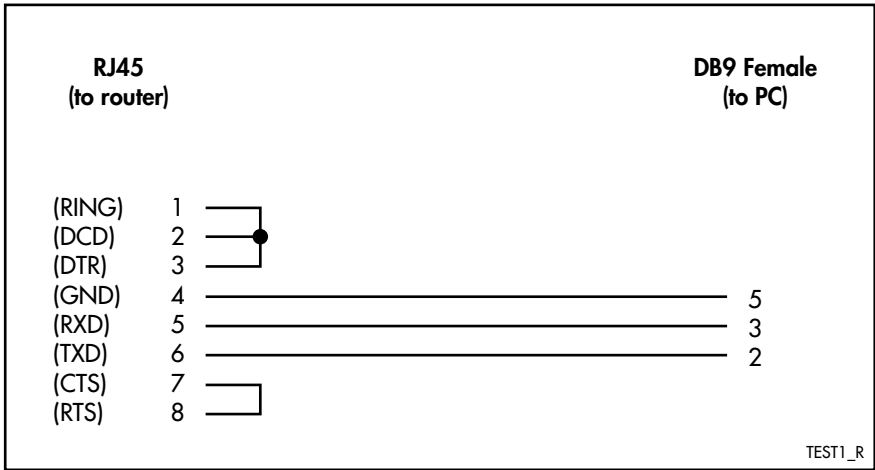
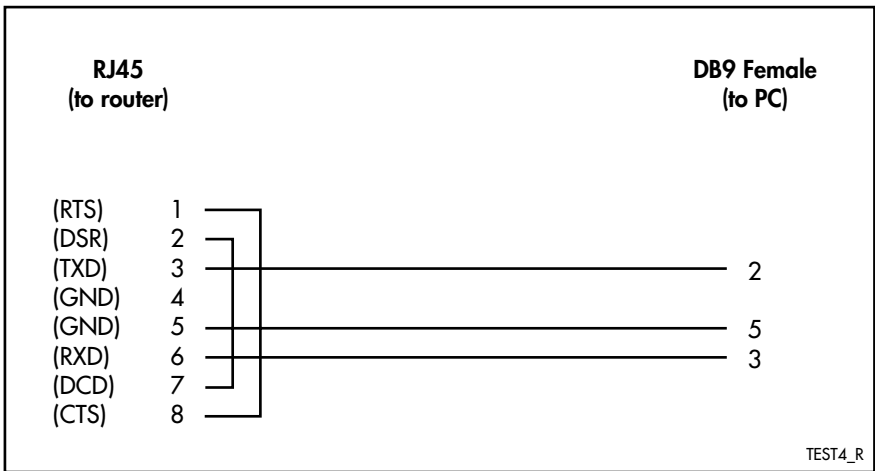


Figure 64-2: Cable pinouts for connecting a terminal to an asynchronous port under test on an AR750S, AR750S-DP, and AR770S



Ethernet Port Tests

Ethernet port tests can be used to verify the operation of all switched and unswitched Ethernet ports except Ethernet ports on the AR026 Port Interface Card (PIC). Examples of switched Ethernet ports are 10BASE-T, 100BASE-TX, 1000BASE-T, 100BASE-FX, 1000BASE-SX, 1000BASE-LX, and 10GBASE-R ports. An example of an unswitched Ethernet port is eth0.

Tests on unswitched Ethernet ports use two internal loopbacks (ENDEC and MAC) and one or two external loopbacks. Tests on switched Ethernet ports use external loopbacks. The tests cycle through each loopback in turn.

When tests are enabled on an Ethernet port the configurations of all the attached modules are stored and their configuration is replaced by the Test Facility.

To quickly detect if the test is being run on an active LAN, the transceiver or twisted pair loopback test is run first. If data is detected on the LAN, it is assumed to be active and the test is immediately aborted.

For 10/100Mbps Ethernet ports, the TP external loopback can be provided using a transceiver loopback plug (Figure 64-3 on page 64-4, Figure 64-4 on page 64-5). Alternatively, connect pairs of ports by using standard crossover cables, and enable tests with the command:

```
enable test interface=all
```

Figure 64-3: 10/100 Ethernet twisted pair (TP) loopback plug pinouts (RJ45)

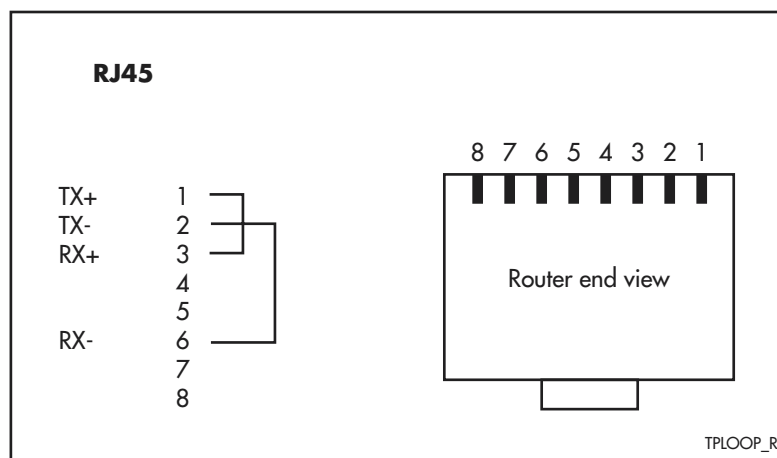
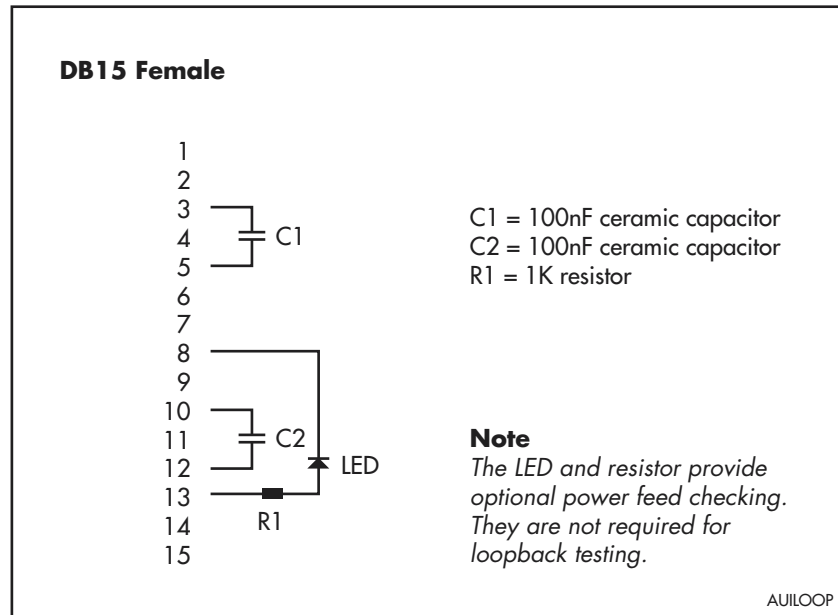


Figure 64-4: Ethernet AUI loopback plug pinouts (DB15 female)



Possible test outcomes are described in the following table.

Event	Action	Error	Result
2 non-sent frames received in any second	Halt test	Active LAN	Bad
10 consecutive bad or missing frames during transceiver loop	Complete test	No Transceiver warning	See below
< 99.9% error free frames	Complete test	-	Bad
>= 99.9% error free frames	Complete test	-	Good

Asynchronous Port Tests

The asynchronous port test requires a loopback plug in the port being tested in order to loop data and control signals back to the router (Figure 64-5, Figure 64-6 on page 64-6).

Figure 64-5: Asynchronous loopback plug pinouts (RJ45) for an AR725 or AR745

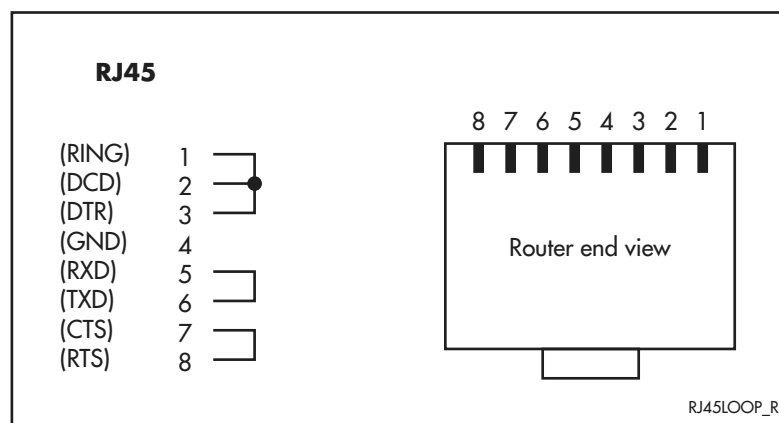
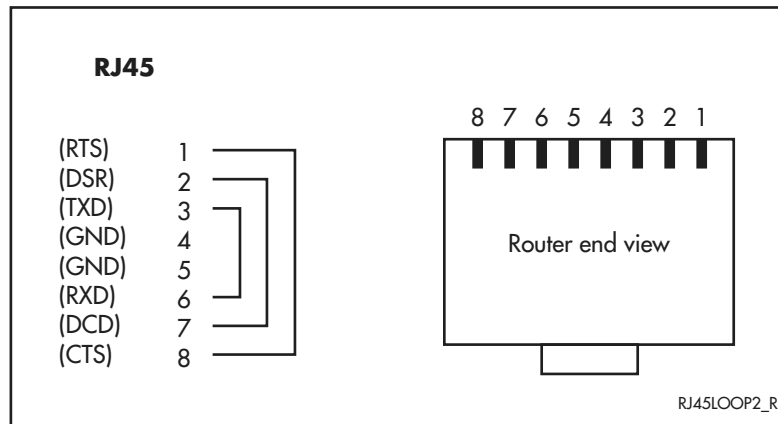


Figure 64-6: Asynchronous loopback plug pinouts (RJ45) for an AR750S, AR750S-DP, and AR770S



Tests cannot be run on an asynchronous port that is already configured for use by other modules, for example, as a permanent assignment, a service, a printer port or a Telnet session.

To test the port control signals, the output signals are continuously toggled, and the corresponding (looped back) input state is examined. To pass the control signal test, the state of an input must match the state of the corresponding output.

The following table describes the error thresholds that determine the test outcome. For the error rate calculations, a test data sequence is considered to be the equivalent of a frame.

Event	Action	Error	Result
10 consecutive bad or missing sequences	Halt test	No loopback	Bad
< 99.9% error free sequences	Complete test	-	Bad
>= 99.9% error free sequences	Complete test	-	Good

Synchronous Interface Tests

The synchronous interface test verifies the operation of all the data, clock and control signals of the router's universal synchronous interface. Because a universal synchronous interface provides a number of electrical interface types, and can generate or receive data clocks, an external test device is required. This device is the SynTester. It provides all the switching, clocking, and interface control features required to completely test a universal synchronous interface. It is available from your authorised distributor or reseller.

The SynTester ensures that the failure of a signal does not cause a false "good" result, though in some of these cases the fault source (data or control) may be wrongly identified. The SynTester MkII tests interfaces that use AMPLIMITE 50-way connectors, and supports six modes of operation—RS-232 DTE, RS-232 DCE, X.21 DTE, X.21 DCE, V.35 DTE and V.35 DCE.

To fully test a synchronous interface, the interface hardware cycles through all modes that are supported. Test frames are transmitted during each mode, and frames that are received are checked for errors. The following table shows possible results.

Event	Action	Error	Result
3 consecutive bad or missing frames in every mode	Halt test	No SynTester	Bad
< 99.9% error free frames	Complete test	-	Bad
>= 99.9% error free frames	Complete test	-	Good

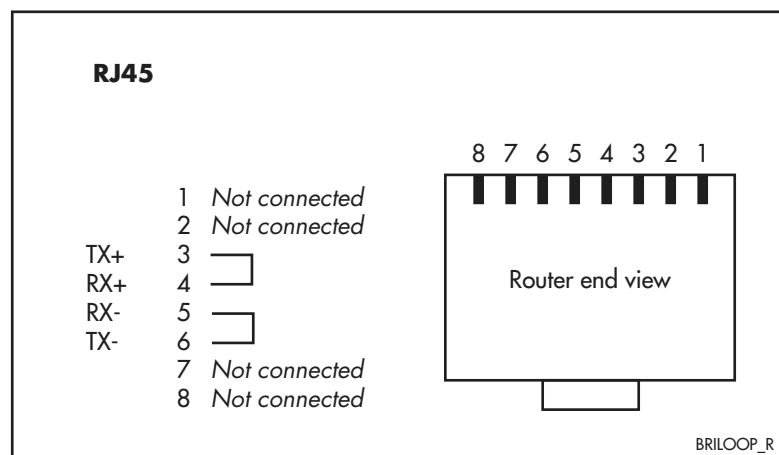
Control signals are tested in addition to data signals. To test the control signal, each signal is continuously toggled and the corresponding input signals are examined. To pass the control signal test, the state of the input must always match the state of the corresponding output. The router detects the cable type via mode select pins in the cable connector. The Test Facility tests the operation of this part of the interface by comparing the cable type that these pins report with the cable type selected by the SynTester. If they differ, the control test also fails.

It is normal for a small number of errors to occur during synchronous tests. These are from the test method and should be ignored.

Basic Rate ISDN Interface Tests

If the Basic Rate ISDN (BRI) interface has an MC145474 or MC145574 transceiver, a loopback plug is required before the BRI interface can be tested (Figure 64-7). The test can be performed without a loopback plug for all other types of transceiver.

Figure 64-7: Basic Rate ISDN loopback plug pinouts (RJ45)



To determine which type your router uses, enter the command:

```
show bri test
```

Figure 64-8 shows an example of the output screen from the **show bri test** command, with the transceiver type listed in the first line.

Figure 64-8: 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

```

The following table describes the error thresholds that determine the test outcome.

Event	Action	Error	Result
10 consecutive bad or missing sequences	Halt test	No loopback	Bad
< 99.9% error free sequences	Complete test	-	Bad
>= 99.9% error free sequences	Complete test	-	Good

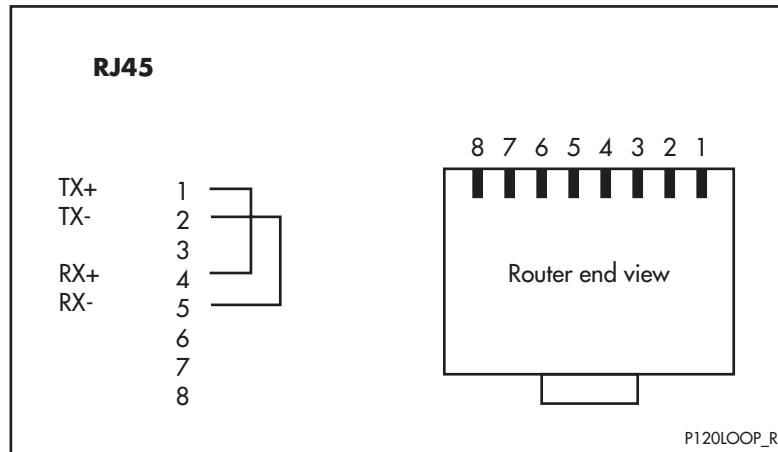
Tests cannot run on a BRI interface that has a call established. This should not be a problem if a loopback plug is being used because removing the ISDN connection to insert the loopback plug disconnects the call.

It is normal for up to three errors to occur at the start of the test so you can safely ignore them.

Primary Rate ISDN Interface Tests

The Primary Rate ISDN interface test requires a loopback plug in the interface being tested (Figure 64-9).

Figure 64-9: Primary Rate ISDN loopback plug pinouts (RJ45)



Three error thresholds determine the test outcome (Table 64-1).

Table 64-1: Possible test outcomes for a Primary Rate ISDN interface

Event	Action	Error	Result
10 consecutive bad or missing sequences	Halt test	No loopback	Bad
< 99.9% error free sequences	Complete test	-	Bad
>= 99.9% error free sequences	Complete test	-	Good

PAC Card Tests

The PCI Accelerator Card (PAC) is not strictly an interface, but PAC card tests are included with the interface tests to allow the tests to be managed in the same manner.

There are two different types of tests to check the correct functioning of the installed PAC card—encryption tests and compression tests. The tests that may be run depend on the specific PAC card installed in the router. For example, encryption tests can only be run on a card capable of performing encryption. Individual tests can be activated manually. However, the Test Facility can also detect the type of PAC card installed and run all of the tests appropriate for that type of PAC card.

When the test is enabled, the Test Facility configures the necessary encryption and/or compression channels. Test frames are processed through these channels and the resulting data compared with the original data.

Three error thresholds determine the test outcome ([Table 64-2](#)).

Table 64-2: Possible test outcomes for a PAC card

Event	Action	Error	Result
10 consecutive bad or missing sequences	Halt test	Hardware fault in PAC card.	Bad
< 99.9% error free sequences	Complete test	-	Bad
>= 99.9% error free sequences	Complete test	-	Good

In Test Facility commands, the PAC cards are referred to by the names PAC0 and PAC1.

Command Reference

This section describes the commands available on the router for testing the router's hardware.

Some interface and port types described in this chapter may not be supported on your router because these vary depending on the model and whether an expansion option is installed. For more information, see the Hardware Reference.

The shortest valid command is denoted by capital letters in the Syntax section. See [“Conventions” on page lxiv of About this Software Reference](#) in the front of this manual for details of the conventions used to describe command syntax. See [Appendix A, Messages](#) for a complete list of messages and their meanings.

To alert the user of a test failure, a bell character is printed each time a negative test result is printed. In the following outputs, a bell character is printed for each * character displayed in the outputs (the * character is included in the actual output).

disable test interface

Syntax `DISable TEST INTerface=interface`

where *interface* is the interface being tested

Description This command halts interface tests that are active. The interface must be specified.

Examples To disable testing on asyn0, use the command:

```
dis test int=asyn0
```

Related Commands [enable test interface](#)
[reset test interface](#)
[show test](#)

enable test interface

Syntax ENAbLe TEST INTerface=*interface* [Time=*time*|CONT] [MORE]

where:

- *interface* is the interface to be tested.
- *time* is the required test duration in minutes.

Description Before using the Test Facility, disable configurations (**set configuration=none**) and restart or reboot the router. This command enables interface tests described in the following table.

This interface option...	Tests this...
ALL	All router interfaces
ASYNn	Asynchronous port n
BASE	All interfaces on the base board
EXPansion	All interfaces on expansion options/modules
ETHn	Ethernet port n
SYNn	Synchronous interface n
PORTn	Switch port n
BRIn	Basic Rate ISDN interface n
PRIn	Primary Rate ISDN interface n
PAC	All possible tests on the installed PAC card
PAC0	PAC card encryption
PAC1	PAC card compression

The **time** parameter specifies the duration of the tests in minutes. If **time** is not specified, tests run for four minutes. If **cont** is specified, tests run continuously.

The **more** parameter provides continuous updates of the status of the current test and control states of asynchronous and synchronous interfaces (Figure 64-10 on page 64-13 and Figure 64-11 on page 64-13). Control signal faults are logged to the router's logging facility. To display this information, use the **show log command on page 59-37 of Chapter 59, Logging Facility**.

The **more** parameter should be used only on a single interface at a time. The **more** parameter is not valid when **interface** specifies a group of them; however, no mechanism is provided to prevent **more** being individually enabled on multiple interfaces. This command is provided for hardware servicing only.

Due to the nature of the output, it may be difficult to enter commands, including the **disable test interface command on page 64-11**, while the **more** option is in effect. Therefore, tests should be enabled for short periods.

Figure 64-10: Example output from the **enable test interface more** command for an asynchronous port

```
asyn1 control signals; cycle 2

output          input
-----
rts    OFF      cts    OFF
dtr    ON        cd     ON
                ring    -
-----
```

Figure 64-11: Example output from the **enable test interface more** command for a synchronous interface

```
syn0 control signals; cycle 4
Test cycle 2      X.21
Interface mode 3  X.21

output          input
-----
rts OFF         cts OFF
rl  ON          cd  ON
ll  OFF         ti  OFF
-----
```

Examples To enable testing on asynchronous port 0, use the command:

```
ena test int=asyn0
```

To enable testing on switch port 3, use the command:

```
ena test int=port3
```

To enable testing on synchronous interface 0, use the command:

```
ena test int=syn0
```

Related Commands [disable test interface](#)
[reset test interface](#)
[show test](#)

reset test interface

Syntax RESET TEST INTerface

Description This command clears all the results from interface tests; that is, it sets the state column to “no test” and clears previous results.

Examples To clear all previous test results ready to start a new test, use the command:

```
reset test int
```

Related Commands [disable test interface](#)
[enable test interface](#)
[show test](#)

show test

Syntax `SHOW TEST [INTERface[={ALL|BASe|EXPansion|PAC}]] [COUnter]`

Description This command displays the unit test status and results. Results are stored until one of the following takes place:

- a test is rerun
- the **reset test interface** command is entered
- the router is powered off or reset

Parameter	Description
INTERface	Type of interface. Default: all
ALL	All router interfaces.
BASe	All interfaces on the base board.
EXPansion	All interfaces on expansion options/modules.
PAC	All resources on a PAC card.
COUnter	Total number of frames transmitted and received, and the number of good and bad frames received. Default: no default

Figure 64-12: Example output from the **show test** command

Board	ID Bay	Board Name	Host Id	Rev	Serial number
Base	241	AT-AR750S	0	P1-0	123123123

Interface	State	Result	Type	Duration (minutes)	Details Data(%OK)	Control
eth0	testing	wait 12552 minutes	trans	0	- - -	-
			TP	5	BAD (56.2)	-
			ENDEC	5	good(100.0)	-
			MAC	5	good(100.0)	-
eth1	complete	good	trans	0	- - -	-
			TP	2	good(100.0)	-
			ENDEC	0	- - -	-
			MAC	2	good(100.0)	-
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)	-
asyn0	complete	good	-	4	good(100.0)	good
enco0	no test	-	-	-	- - -	-

Table 64-3: Parameters in output of the **show test** command

Parameter	Meaning
Board	Possible board types: Base Expansion PAC NSM PIC
ID	Identification number for the board model.
Bay	Bay number where the expansion card or module is installed.
Board Name	Short name for the board.
Host ID	Used when the stacking feature is enabled to uniquely identify each stack member in a stack.
Rev	Version number of the board.
Serial Number	Unique serial number for the board.
Interface	Name of the interface to which the test results apply.
State	Status of the test module for this interface: No test Testing Complete Halted
Result	Test results. If the test has been completed, the result can be good or bad. If testing is in progress, the result is either wait continuous or wait <mins> minutes. If testing has been halted, the result is either Active LAN, BAD, no SynTstr, or BAD or no loop.
Type	Test sub-mode, which varies depending on the router model and interface type being tested. Not all tests have multiple sub-modes. Ethernet sub-modes are trans, TP, ENDEC, and MAC.
Duration (minutes)	Duration of the test.
Details	Three columns of detailed results. Due to the criteria used to halt tests, they may show "good" if the event that halted the test occurred after the test had been running correctly.
Data	Whether results for data signals are good or bad.
%OK	Number of data frames successfully received as a percentage of the total number of data frames transmitted.
Control	Whether results for control signals are good or bad. A dot is printed when the State is "testing". For asyn0 tests, it indicates the interface mode being tested. For Ethernet tests, it indicates the loopback mode being tested.

Figure 64-13: Example output from the **show test counter** command

Board	ID Bay	Board Name	Host Id	Rev	Serial number		
Base	241	AT-AR750S	0	P1-0	123123123		
Interface	State	Type	Duration (minutes)	Tx	Frame Counters RxTotal	RxGood	RxBad
eth0	testing	trans	0	000000000	000000000	000000000	000000000
		TP	5	000003503	000003469	000001903	000001566
		ENDEC	5	002465873	002465872	002465872	000000000
		MAC	5	002607090	002607090	002607090	000000000
eth1	testing	trans	0	000000000	000000000	000000000	000000000
		TP	5	000003503	000003469	000001903	000001566
		ENDEC	5	002465873	002465872	002465872	000000000
		MAC	5	002607090	002607090	002607090	000000000
port1	complete	ALL	4	000025224	000025223	000025223	000000000
port2	complete	ALL	4	000025224	000025223	000025223	000000000
port3	complete	ALL	4	000025224	000025223	000025223	000000000
port4	complete	ALL	4	000025223	000025223	000025223	000000000
port5	complete	ALL	4	000025224	000025223	000025223	000000000
asyn0	complete	-	4	000002399	000002399	000002399	000000000
enco0	no test	-	-	-	-	-	-

Table 64-4: Parameters in output of the **show test counter** command

Parameter	Meaning
Board	Possible board types: Base Expansion PAC NSM PIC
ID	Identification number for the board model.
Bay	Bay number where the expansion card or module is installed.
Board Name	Short name for the board.
Host ID	Used when the stacking feature is enabled to uniquely identify each stack member in a stack.
Rev	Version number of the board.
Serial Number	Unique serial number for the board.
Interface	Name of the interface to which the test counters apply.
State	Status of the test module for this interface: No test Testing Complete Halted

Table 64-4: Parameters in output of the **show test counter** command (Continued)

Parameter	Meaning
Type	The test sub-mode, which varies depending on the router model and interface type being tested. Not all tests have multiple sub-modes. Ethernet sub-modes are trans, TP, ENDEC, and MAC.
Duration (minutes)	Duration of the test.
Frame Counters	Four columns of details.
Tx	Total number of frames transmitted on the interface.
RxTotal	Total number of frames received on the interface.
RxGood	Number of good frames received on the interface.
RxBad	Number of bad frames received on the interface.

Examples To display results from testing the PAC, use the command:

```
sh test int=pac cou
```

To display results from testing all interfaces on the router, use the command:

```
sh test int=all
```

Related Commands [disable test interface](#)
[enable test interface](#)
[reset test interface](#)

