Overview

Developed by Telcordia Technologies and licensed by Spirent Communications to run on the AX/4000 ATM Test System, the ATM Conformance and Interoperability Test Suites provide a comprehensive series of pre-defined test cases for checking the conformance and interoperability characteristics of ATM network equipment. Each test case tests a logical unit of functionality and reports a pass, fail, or inconclusive result.

A Windows 98/NT-based graphical user interface for the test suites is provided by the Test Suite Manager software. The Test Suite Manager allows users to set test parameters and selectively run test cases either individually or in a batch operation. Test results appear in an on-screen window and can be saved to ASCII files for printing and off-line analysis.

Software Description

The Test Suite Manager provides a multi-segmented window to display the following information:

- Selection window—test cases available
- Status window—test case description, test statistics
- Results window—test results, details
- Message window—ladder diagram

From the Test Suite Manager screen, the user can select any number of available test cases to run in batch mode. In addition to selecting the test cases, the user can tailor the test suite to the IUT by answering the PICS/PIXIT pro formas in the Parameter menu. Buttons are provided for running and stopping the tests.

Test Standards

Each test suite provides a series of test cases for specific ATM Forum specifications. In addition to ATM Forum standards, the test suites provide enhanced test coverage based on Telcordia conformance and interoperability specifications.
Telcordia Certification and Registration Service

Because the test cases in these test suites are identical to those used by Telcordia for its own certification and registration service, passing these test cases helps assure passing Telcordia certification tests. Certifying your application or equipment with Telcordia entitles you to use the Telcordia Mark as proof of third-party verification of your product’s technical performance against a defined set of criteria.

Note: Telcordia (www.telcordia.com) is a leading provider of communications software, engineering, and consulting services based on world-class research.

TTCN Notation

The test suites are written as separate tree and tabular combined notation (TTCN) applications. TTCN (ISO IS-9646) is a high-level, computer-like language that is optimized for protocol test applications. In addition to pass/fail results, the Test Suite Manager software will also display TTCN pseudo-code associated with each test case.

Test Setup

Each test suite includes its own set of PICS/PIXIT pro formas for the user to answer before running the tests. The setup screen lists all of the information required and provides either True/False radio buttons or a simple fill-in field for information entry.

Setup files can be saved to disk and loaded for future tests. The test suites also include default setup files for users to experiment with.

Test Detail

The test suite setup allows the user to select the amount of detail that will appear in the test report. Reporting large amounts of detail takes more time and provides a much higher volume of data than lower amounts of detail. For this reason, testing with minimal detail can be used to quickly identify which test cases pass or fail. Afterwards, a second test using only test cases that fail can be set up to report a high level of detail.

The following list indicates the details that can be included or excluded from the report by using True/False radio buttons on the setup screen.
- Display TTCN behavior
- Display raw PDU data
- Display TTCN structured data
- Display parameter values in summary
- Display protocol decode, match/failed match

Test Selection

Each test suite is a separate file that can be opened from the Test Suite Manager System menu. Once a test suite is opened, its test cases will appear in a list in a selection window on the left side of the screen. The list structure includes groups and subgroups indicated by folder icons. Users can use their mouse to select the individual test cases they want to run. Selecting a group or subgroup folder will include all of the test cases inside that folder.
The right mouse button displays a pop-up menu that provides the following additional test case selection and deselection options:

- All test cases in the entire test suite
- Test cases that passed the most recent test*
- Test cases that failed the most recent test*
- Test cases that were inconclusive in the most recent test*
- Test cases that did not run during the most recent test*
- Test cases that require operator intervention
- Test cases that do not require operator intervention

*All tests run for this test session.

**Equipment Configuration**

After parameters are set up, clicking on the Port Selection option of the system menu brings up an interface setup screen. This screen allows the user to map point-of-control and operation to an AX/4000 port. It is also possible to configure the interface from this screen. The interface screen allows the user to configure operational interface commands and monitor the interface for physical errors.

**Running the Tests**

After the parameters are set up, clicking on the Run button will start the selected tests in the order shown in the Test Suite Manager screen. If no user input is required during the tests, the tests can run unattended. Testing will stop automatically when finished.

Some test cases will require operator intervention. For these cases, the test will pause and wait for the operator to enter the required information. If nothing is entered, the system will time out and move to the next test case.

**Test Results**

The right side of the Test Suite Manager screen displays the test results in real time. It also displays other information including the parameters used for the test, test script pseudo code, the start and end time for each test case, and cell information. The Test Suite Manager also includes automatic decoding to identify the contents of incoming and outgoing ATM data.

Because some test results can be lengthy, a search function allows users to locate specific strings quickly within the test results. Results for individual test cases can be located by clicking on the test case name in the selection window.
Sample Test Output

Sample format of output file with maximum amount of test detail selected.
Test Suites

The following is a list of test suites for the AX/4000 Broadband Test System.

Note: All of the test suites require the Test Suite Manager for operation.

Test Suite Manager Software

Part Number 402001

This software provides a Windows 95/NT-based user interface for running the test suites and formatting test results. The Test Suite Manager is required to run any of the test suites listed below.

ATM Layer Test Suites

Part Number 402010 — Conformance tests for end system
Part Number 402011 — Conformance tests for intermediate system
Part Number 402012 — Interoperability tests for intermediate system

Telcordia’s test suites for the ATM layer provide testing capabilities for both end systems and intermediate systems. The test suites are based on the following documented criteria:

- ATM Forum Test Subworking Group, ATM Layer Testing

Functional Elements—Tests for system conformance with basic connectivity requirements including:

- Multiplexing
- Demultiplexing
- Encoding
- Decoding
- Cell rate decoupling
- VP switching
- VC switching
- Invalid cell discarding

OAM Elements—Tests for system conformance with OAM requirements such as:

- Generation of and response to VP-AIS
- VP-FERF
- VP-LOOPBACK
- VC-AIS
- VC-FERF
- VC-LOOPBACK

Conformance tests for end system—This test suite tests the operation of an end system device, like a NIC card, against the ATM layer requirements specified in UNI 3.1.

Conformance tests for intermediate system—This test suite tests the operation of an intermediate system device, like a switch, against the ATM layer requirements specified in UNI 3.1.

Interoperability tests for intermediate system—This test suite tests the operation between intermediate system devices. It requires two switches and evaluates the interaction or interoperability between these switches as they relate to the ATM layer requirements specified in UNI 3.1.

Q.2110 (SSCOP) Conformance Test Suites

Part Number 402020—Q.2110 (SSCOP) Conformance Test Suites Version 1.0

This test suite provides fully automated capability to test the conformance of ATM equipment such as ATM switches and ATM interface cards that use ITU-T Q.2110 Service Specific Connection Oriented Protocol (SSCOP). The test cases include testing for SSCOP based on higher protocol layer recovery procedures. The test suite can be executed on both UNI and NNI links supporting SSCOP and covers basic procedures to verify IUT implementation in the following areas:

- Receipt of valid messages at different states
- Credit and flow control procedures
- Sequencing of multiple connections
- Status reporting
- State transition check
- Timer operation and protocol parameters
- Message sequence error
- Invalid message formats including invalid coding
ATM UNI 3.1 Signalling Conformance Test Suites—
Point-to-Point, Network Side
Part Number 402030—Complete package (Parts 1, 2, and 3)
This test suite provides fully automated conformance
testing of network side equipment, such as ATM switch-
es, that implement ATM Forum UNI 3.1 signalling require-
ments for point-to-point connections.
The test suite is based on ATM Forum UNI 3.1 signalling
requirements.
Part 1—Covers basic signalling procedures to verify the IUT’s
capability to support valid call/connection control proce-
dures, which include
- All valid combinations of bearer class, traffic parame-
ters, and QoS in setup message as specified in
  Appendix F of ATM Forum UNI 3.1 Specification
- All valid combinations of supported optional
  information elements
- Call/connection clearing procedures including restart
  procedures
- Correct implementation of network side timers
Part 2—Covers procedures to verify IUT’s capability to handle
error conditions which include
- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including
  length error, content errors, and missing information
  element errors
- Status inquiry procedures
Part 3—Covers optional procedures to verify IUT’s capability to
handle error conditions for non-mandatory information
elements including
- Unrecognized information element error
- Information element content error
- Information element length error
- Unexpected recognized information element

ATM UNI 3.1 Signalling Conformance Test Suites—
Point-to-Point, User Side
Part Number 402040—Complete package (Parts 1, 2, and 3)
This test suite provides fully automated conformance
testing of user side equipment, such as ATM NIC cards,
that implement ATM Forum UNI 3.1 signalling require-
ments for point-to-point connections. The test suite is
based on ATM Forum UNI 3.1 signalling requirements.
It also permits choosing from all valid combinations of
setup messages as defined in the ATM Forum
Specification and allows custom setup messages for test-
ing purposes.
Part 1—Covers basic signalling procedures to verify the IUT’s
capability to support valid call/connection control procedures
which include
- All valid combinations of bearer class, traffic parame-
ters, and QoS in setup message as specified in
  Appendix F of ATM Forum UNI 3.1 Specification
- All valid combinations of supported optional informa-
tion elements
- Call/connection clearing procedures including restart
  procedures
- Correct implementation of user side timers
Part 2—Covers procedures to verify IUT’s capability to handle
error conditions which include
- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including
  length error, content error, and missing information
  element errors
- Status inquiry procedures
Part 3—Covers optional procedures to verify IUT’s capability to
handle error conditions for non-mandatory information
elements including
- Unrecognized information element error
- Information element content error
- Information element length error
- Unexpected recognized information element
ATM UNI 3.1 Signalling Conformance Test Suites—Point-to-Multipoint, Network Side

Part Number 402050—Complete package (Parts 1 and 2)

This test suite provides fully automated conformance testing of network side equipment, such as ATM switches, that implement ATM Forum UNI 3.1 signalling requirements for point-to-multipoint connections. The test suite is based on ATM Forum UNI 3.1 signalling requirements.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures for point-to-multipoint connections which include:

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Appendix F of ATM Forum UNI 3.1 Specification
- All valid combinations of supported optional information elements
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers

Part 2—Covers procedures to verify IUT’s capability to handle error conditions which include:

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors including length error, content error and unrecognized information error element
- Status inquiry procedures

ATM UNI 3.1 Signalling Conformance Test Suites—Point-to-Multipoint, User Side

Part Number 402060—Complete package (Parts 1 and 2)

This test suite provides fully automated conformance testing of user side equipment, such as ATM NIC cards, that implement ATM Forum UNI 3.1 Signalling requirements for point-to-multipoint connections. The test suite is based on ATM Forum UNI 3.1 signalling requirements. It also permits choosing from all valid combinations of setup messages as defined in the ATM Forum Specification and allows custom setup messages for testing purposes.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures for point-to-multipoint connections which include:

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Appendix F of ATM Forum UNI 3.1 Specification
- All valid combinations of supported optional information elements
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers

Part 2—Covers procedures to verify IUT’s capability to handle error conditions which include:

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors including length error, content error and unrecognized information error element
- Status inquiry procedures
**ATM UNI 4.0 Signalling Conformance Test Suites—Point-to-Point, Network Side**

Part Number 402075—Complete package (Parts 1, 2, 3, and 4)

This test suite provides fully automated conformance testing of network side equipment, such as ATM switches, that implement ATM Forum UNI 4.0 signalling requirements for point-to-point connections. The test suite is based on ATM Forum UNI 4.0 signalling requirements and supports UNI 4.0 specific signalling procedures such as traffic negotiation, signalling of individual QoS parameters, and ABR signalling procedures.

**Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures which include**

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Call/connection clearing procedures including restart procedures
- Correct implementation of network side timers

**Part 2—Covers ATM Forum UNI 4.0 specific procedures which include**

- Traffic negotiation
- Signalling of individual QoS parameters
- ABR procedures
- ATM Anycast
- VPCI/VCI selection procedures

**Part 3—Covers procedures to verify IUT’s capability to handle error conditions which include**

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Status inquiry procedures

**Part 4—Covers optional procedures to verify IUT’s capability to handle error conditions for non-mandatory information elements including**

- Unrecognized information element error
- Information element content error
- Information element length error
- Unexpected recognized information element

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**ATM UNI 4.0 Signalling Conformance Test Suites—Point-to-Point, User Side**

Part Number 402085—Complete package (Parts 1, 2, 3, and 4)

This test suite provides fully automated conformance testing of user-side equipment, such as ATM NIC cards, that implement ATM Forum UNI 4.0 signalling requirements for point-to-point connections. The test suite is based on ATM Forum UNI 4.0 signalling requirements and supports UNI 4.0 specific signalling procedures such as traffic negotiation, signalling of individual QoS parameters, and ABR signalling procedures.

**Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures which include**

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Call/connection clearing procedures including restart procedures
- Correct implementation of timers

**Part 2—Covers ATM Forum UNI 4.0 specific procedures which include**

- Traffic negotiation
- Signalling of individual QoS parameters
- ABR procedures
- ATM anycast
- VPCI/VCI selection procedures

**Part 3—Covers procedures to verify IUT’s capability to handle error conditions which include**

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error and missing information element errors
- Status inquiry procedures

**Part 4—Covers optional procedures to verify IUT’s capability to handle error conditions for non-mandatory information elements including**

- Unrecognized information element error
- Information element content error
- Information element length error
- Unexpected recognized information element
ATM UNI 4.0 Signalling Conformance Test Suites—Point-to-Multipoint, Network Side

Part Number 402090—Complete package (Parts 1 and 2)

This test suite provides fully automated conformance testing of network side equipment, such as ATM switches, that implement ATM Forum UNI 4.0 signalling requirements for point-to-multipoint connections. The test suite is based on ATM Forum UNI 4.0 signalling requirements.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid point-to-multipoint call/connection control procedures which include

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers
- Leaf Initiated Join procedures for Network LIJ connection and Root LIJ connection

Part 2—Covers procedures to verify IUT’s capability to handle error conditions which include

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors which includes unrecognized information error element
- Status inquiry procedures

ATM UNI 4.0 Signalling Conformance Test Suites—Point-to-Multipoint, User Side

Part Number 402100—Complete package (Parts 1 and 2)

This test suite provides fully automated conformance testing of user side equipment, such as ATM NIC cards that implement ATM Forum UNI 4.0 signalling requirements for point-to-multipoint connections. The test suite is based on ATM Forum UNI 4.0 signalling requirements.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid point-to-multipoint call/connection control procedures which include

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers
- Leaf Initiated Join procedures for Network LIJ connection and Root LIJ connection

Part 2—Covers procedures to verify IUT’s capability to handle error conditions which include

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors which includes unrecognized information error element
- Status inquiry procedures
ATM UNI 3.1/UNI 4.0 Signalling Interworking Test Suite

Part Number 402110

This test suite provides fully automated interworking testing of ATM equipment, such as ATM switches, that support ATM Forum UNI 3.1 and UNI 4.0 specifications. It includes test procedures to verify correct mappings of messages and parameters when a call crosses a UNI 3.1 link and a UNI 4.0 link. It also covers call completion and call clearing procedures.

This test suite covers basic procedures to verify IUT’s implementation in the following areas:

- Verify correct mapping of calls originating on UNI 4.0 link covering all possible valid combinations as defined in ATM Forum UNI 4.0 Specification, Annex 9
- Verify correct mapping of all mandatory information elements and optional information elements on the UNI 3.1 link when calls originate on the UNI 4.0 link. Additionally, correct procedures for handling UNI 4.0 procedures such as ABR and other non-supported UNI 4.0 specific procedures (on UNI 3.1 link) are verified.
- Verify correct mapping of calls originating on UNI 3.1 link covering all possible valid combinations as defined in ATM Forum UNI 3.1 Specification, Appendix F
- Verify correct mapping of all mandatory information elements and optional information elements on the UNI 4.0 link when calls originate on the UNI 3.1 link
- Call completion procedures in both directions across the UNI 3.1 and UNI 4.0 link

PNNI Signalling Conformance Test Suites—Point-to-Point

Part Number 402120—Complete package (Parts 1, 2, 3 and 4)

Part Number 402121—Part 1. Fundamental functionality W/PNNI procedures

These test suites provide fully automated conformance testing of network equipment, such as ATM switches, that implement ATM Forum PNNI 1.0 signalling requirements for point-to-point connections. They are based on ATM Forum PNNI 1.0 signalling requirements.

These test suites include signalling procedures for designated transit lists, crankback, and soft PVCs.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures which include:

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Call/connection clearing procedures including crankback procedures and restart procedures
- Soft permanent virtual connection procedures
- Correct implementation of timers

Part 2—Covers ATM Forum 4.0 specific procedures which include:

- Traffic negotiation
- Signalling of individual QoS parameters
- ABR procedures
- ATM anycast
- VPCI/VCI selection procedures

Part 3—Covers procedures to verify IUT’s capability to handle error conditions which include:

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Status inquiry procedures

Part 4—Covers optional procedures to verify IUT’s capability to handle error conditions for non-mandatory information elements which include:

- Non-mandatory information element errors including unrecognized information element error, content error, length error and unexpected recognized information element error.
PNNI Signalling Conformance Test Suites—Point-to-Multipoint

Part Number 402130—Complete package (Parts 1 and 2)

These test suites provide fully automated conformance testing of network equipment, such as ATM switches, that implement ATM Forum PNNI 1.0 signalling requirements for point-to-multipoint connections. They are based on ATM Forum PNNI 1.0 signalling requirements. This test suite includes signalling procedures for designated transit lists, crankback, and soft PVCs.

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support valid point-to-multipoint call/connection control procedures which include

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers

Part 2—Covers procedures to verify IUT’s capability to handle error conditions which include

- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors which include unrecognized information element errors
- Status inquiry procedures

PNNI/UNI 4.0 Signalling Interworking Test Suites—Point-to-Point

Part Number 402140—Complete package (Parts 1 and 2)

Part Number 402141—Part 1—UNI/PNNI interworking for point-to-point

Part Number 402143—Part 2—Interoperability across PNNI for point-to-point

This test suite verifies interworking of ATM equipment that supports call control procedures based on ATM Forum UNI 4.0 and PNNI specifications for point-to-point calls.

Part 1 includes test procedures to verify correct mapping of call procedures across a UNI 4.0 link and a PNNI link. Additionally, this test suite covers call control procedures for normal and abnormal conditions. Part 2 of this test suite verifies interoperability of multiple (3) ATM switches that support call control procedures based on ATM Forum PNNI 1.0 specifications for point-to-point calls.

Part 1—UNI/PNNI Interworking for Point-to-Point Connections. Covers basic signalling procedures to verify the IUT’s capability to support valid call/connection control procedures on UNI and PNNI links which include

- All valid combinations of Bearer Class, Traffic Parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Parsing of PNNI/UNI specific information elements across a UNI/PNNI link
- Call/connection clearing procedures including crankback procedures and restart procedures
- Soft permanent virtual connection procedures
- Correct implementation of timers
- Traffic negotiation
- Signalling of individual QoS parameters
- ABR procedures
- ATM Anycast
- VPCI/VCI selection procedures
- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Status inquiry procedures
- Non-mandatory information element errors including unrecognized information element error, content error, length error, and unexpected recognized information element error
Part 2—Interoperability across PNNI for point-to-point calls. Covers basic signalling procedures to verify the network’s (3 switches) capability to support valid call/connection control procedures across PNNI links which include:

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements supported
- Complex DTL processing procedures and path selection procedures across 3 PNNI nodes
- Crankback procedures and alternate route procedures
- Call/connection clearing procedures including restart procedures
- Soft permanent virtual connection procedures
- Correct implementation of timers across 3 PNNI nodes
- Verify PNNI procedures for traffic negotiations across multiple signalling implementations, signalling of individual QoS parameters, ABR procedures, and ATM anycast
- Handling of error conditions including message sequence errors, unrecognized message errors, and message length errors
- Status inquiry procedures
- Non-mandatory information element errors including unrecognized information error element, content error, length error, and unexpected recognized information element error

Part 1—Covers basic signalling procedures to verify the IUT’s capability to support point-to-multipoint call/connection control procedures which include:

- All valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements
- Valid call/connection control procedures for adding a leaf to a point-to-multipoint connection
- Party clearing procedures
- Restart procedures
- Correct implementation of timers
- Proper processing of non-supported procedures across a UNI PNNI link
- Protocol errors
- Short message errors
- Call reference errors
- Message sequence errors
- Unrecognized message errors
- Message length errors
- Mandatory information element errors including length error, content error, and missing information element errors
- Non-mandatory information element errors which include unrecognized information error element
- Status inquiry procedures

Part 2—Covers basic signalling procedures to verify the network’s (3 switches) capability to support valid call/connection control procedures for point-to-multipoint across PNNI links which include:

- Point-to-multipoint messages covering all valid combinations of bearer class, traffic parameters, and QoS in setup message as specified in Annex 9 of ATM Forum UNI 4.0 Specification
- All valid combinations of optional information elements
- Complex DTL processing procedures and path selection procedures across 3 PNNI nodes
- Crankback procedures and alternate route procedures
- Call/connection clearing procedures including restart procedures
- Soft permanent virtual connection procedures
- Correct implementation of timers across 3 PNNI nodes
- Verify PNNI procedures for traffic negotiations across multiple signalling implementations, signalling of individual QoS parameters, ABR procedures, and ATM anycast
- Handling of error conditions including message sequence, unrecognized message, and message length
- Status inquiry procedures
- Non-mandatory information element errors
including unrecognized information element error, content error, length error, and unexpected recognized information element error.

PNNI Routing Conformance Test Suites
Part Number 402150—Part 1—ATM Forum PNNI 1.0 Routing
Part Number 402152—Part 2—ATM Forum PNNI 1.0 Routing Extension

This test suite provides fully automated capability to test conformance of network equipment, such as ATM switches, that implements ATM Forum PNNI 1.0 routing requirements.

Part 1 covers PNNI 1.0 routing operation for a single peer group, including Hello protocol operation, flooding, and database synchronization. Part 2 covers PNNI 1.0 routing operation for multiple peer groups, including peer group leader election and border node operation.

Part 1—Covers test procedures for verifying Hello protocol operation, flooding, and database synchronization. The single peer group tests cover the following areas:

- General operational procedures including validation of packet format
- Verification of Hello protocol state machine
- Verify database synchronization and exchange mechanism using PTSE and PTSP
- Verify topology distribution and description
- Packet format and contents (e.g., sequence number)
- Lifetime expiry procedures
- Flooding
- Verify advertisement and summarization for reachable addresses
- Verify path selection procedures

Part 2—Covers test procedures for verifying Hello protocol operation and border node operation. The multiple peer group tests cover the following areas:

- Verify Hello protocol state machine for border nodes
- Verify originating Hello messages on outside links
- Verify the peer group leader election state machine
- Verify proper operation when sending a Nodal Information PTSE
- Verify operation in preferred PGL election

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