Ethernet Packet Generator

TEST SUITE USER GUIDE

Version 1.0

APG4 APG8 APG200 APG208

Software Revisions

This document applies to the following software versions:

APG Unit Firmware	**Version 2.1**
APG Processing Core	**Version 6.010E**
APG TCL API	**Version 1.1.3**
APG TCL TS API	**Version 1.0.2**
APG TS RFC2544	**Version 1.0.2**

Revision History

Date	Version	Changes
8 February 2018	1.0	First release

Document Conventions

INFORMATION:
Additional information to clarify functionality or usability

WARNING:
Clarification of unexpected or restricted functionality

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Preface

About This Document

This manual describes the structure and commands of the Axtrinet Test Suite, and contains the following sections:

Section	Description
1. INTRODUCTION	Introduction to the Axtrinet Test Suite Interface.
2. INSTALLATION	Installation, running the interface and getting started.
3. MENU BAR	Menu Bar options
4. CONNECTION PANE	Connecting to and disconnecting from an Axtrinet APG.
5. CONFIGURATION TABS	Test Configuration options, port selection and running tests.
6. REPORTS	Location of Report directories

Related Documentation

[1] APG-UG Axtrinet User Guide (including APG Control Interface)

[2] APG-TCL-UG Axtrinet TCL User Guide

[3] APG-TCL-TS-UG Axtrinet TCL Test Suite User Guide

[4] APG-SW-TC Axtrinet APG Software License Terms And Conditions

Visit **www.axtrinet.com/documentation** for the latest documentation.

References

[5] RFC 1242 Benchmarking Terminology for Network Interconnect Devices. July 1991
https://www.ietf.org/rfc/rfc1242.txt

[6] RFC 2544 Benchmarking Methodology for Network Interconnect Devices, March 1999
https://www.ietf.org/rfc/rfc2544.txt

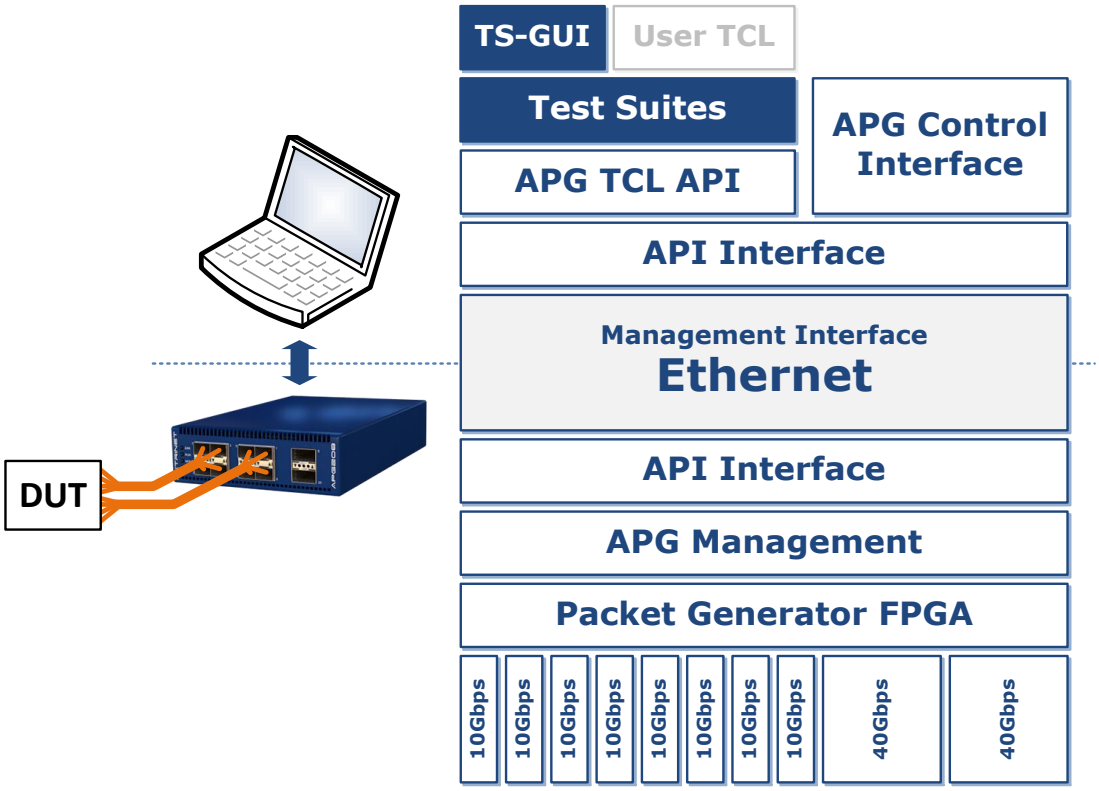
Glossary

APG	Axtrinet Packet Generator
API	Application Programming Interface
DA	Destination Address
DUT	Device Under Test
FCS	Frame Checksum
GUI	Graphical User Interface
LAN	Local Area Network
MAC	Media Access Controller
MPLS	Multiprotocol Label Switching
pps	Packets per Second
SA	Source Address
SFP	Small Form-Factor Pluggable (1Gbps)
SFP+	Small Form-Factor Pluggable (10Gbps)
TCL	Tool Command Language
VLAN	Virtual LAN

Contents

1. INTRODUCTION

The APG Test Suite provides configuration and control of the RFC2544 Test Suite within the APG TCL environment.



1.1 TESTS SUITES

The APG Test Suite supports:

- RFC2544 Benchmarking Methodology for Network Interconnect Devices, March 1999

1.2 TEST ENVIRONMENT

The Test Suite Test Environment consists of a single Axtrinet Packet Generator, managed from a single APG TCL environment.

The APG Test Suites use the APG TCL API that only runs over the Ethernet Management Interface.

1.3 SOFTWARE LICENCES AND SUPPORT

See the Axtrinet APG Software License Terms & Conditions [4]

Email based software support is included in the purchase price for the first 12 months after delivery. Extended Software Support is available for purchase; please contact Axtrinet or your reseller for more information.

1.4 CONTACT DETAILS

Technical assistance is available from Axtrinet at the following address:

Address: Xentech Solutions
Suite 6 Stanta Business Centre
3 Soothouse Spring
St Albans
AL3 6PF
UK

Phone: +44 (0)1727 867795

Email:
Technical Support: **support@axtrinet.com**
Sales: **sales@axtrinet.com**

Web Site: **www.axtrinet.com**

2. INSTALLATION

The APG Test Suite are installed as part of the standard TCL installation process as described in the APG User Guide [1] Section 2.

2.1 PREREQUISITES

2.1.1 Windows Environment

- A TCL distribution (such as Activestate® ActiveTcl) must be installed before using the APG TCL TS API. The distribution must include TK.
- The PDF Report Generation uses **pdflatex**, included in appropriate latex package. **TeX Live for Windows** and **MiKTex** are recommended, but any working **pdflatex** should be acceptable.

2.1.2 Linux Environment

- The TCL package for your 8.6.x distribution must be installed before using the APG TCL TS API. The distribution must include TK.
- The PDF Report Generation uses **pdflatex**, included in appropriate latex package for your distribution. **TeX Live** is recommended, but any working **pdflatex** should be acceptable.

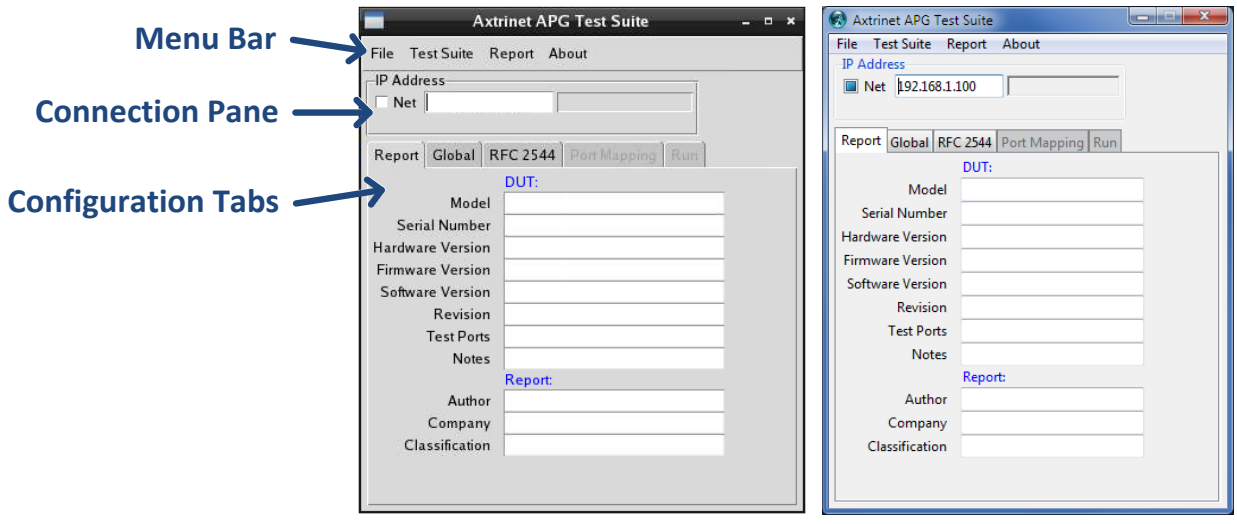
  Likely suitable packages are: on Arch, texlive-bin; on Fedora/Centos, texlive-latex; and on on Debian/Ubuntu, texlive.

2.2 RUNNING THE TEST SUITE

Start the APG Control Interface:

- On Linux, click the **home / APGTestSuite** icon or execute **user/bin/apgtestsuite**
- On the Windows Start menu, locate the Axtrinet directory and click on the **APG Test Suite** icon.

The APG Test Suite management window will be displayed:



APG Test Suite on Linux *APG Test Suite on Windows*

The following screenshots show the Test Suite on Linux.

2.3 GETTING STARTED

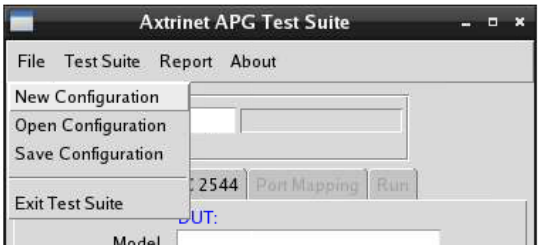
The minimum set of actions required to run the RFC2544 Tests is:

1. Enter the IP Address of the Axtrinet APG unit and click on the connect checkbox.
2. Select the 'Port Mapping' tab and select 2 test ports.
3. Select the 'Run' tab and select the required tests.
4. Click the 'Start' button to run the tests

The selected tests will run and generate a log file and PDF report of the tests (see Section 6)

3. MENU BAR

3.1 FILE MENU



The FILE Menu provides:

- **NEW CONFIGURATION**
  Clears all configuration fields to their default values.
- **OPEN CONFIGURATION**
  Opens a file select window to select and load an existing configuration file.
- **SAVE CONFIGURATION**
  Opens a file select window to save the current test configuration and test port configuration to a file.
- **EXIT TEST SUITE**
  Close the Test Suite application.

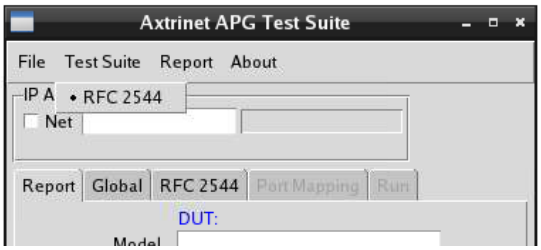
SAVE CONFIGURATION saves the current configuration as a TCL script that can be loaded later.

If connected to an Axtrinet unit, the default filename is the unit serial number (eg APG000010) followed by "-TS.apg", ie APG000010-TS.apg. The Test Suite and selected port configurations are saved.

If not connected to a unit, only the Test Suite configuration is saved. The default filename is TESTSUITE.apg.

The behaviour of the **OPEN CONFIGURATION** also depends on the connection status. The Port Configuration settings are ignored if not connected to a unit.

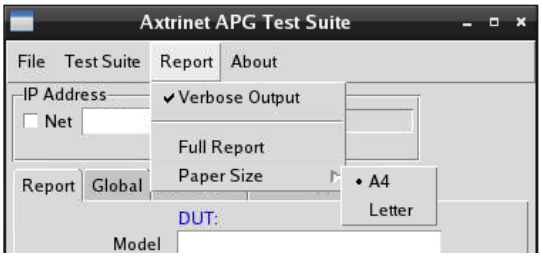
3.2 TEST SUITE MENU



The TEST SUITE Menu provides the Test Suite selection options.

Currently only RFC2544 is available.

3.3 REPORT MENU



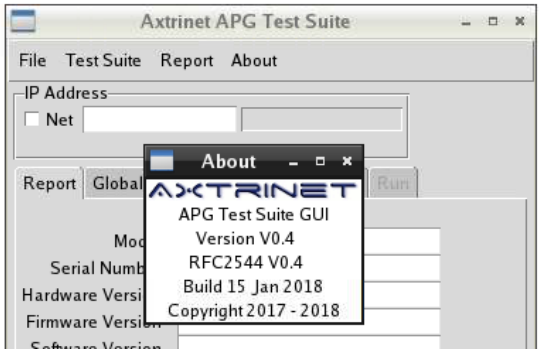
The REPORT Menu provides the report generation options:

- **VERBOSE OUTPUT**
  If checked, displays the test progress when run from the command line.

For the PDF output:

- **FULL REPORT**
  If checked, generates the test description and methodology in the report.
- **PAPER SIZE** - A4 or Letter size

3.4 ABOUT

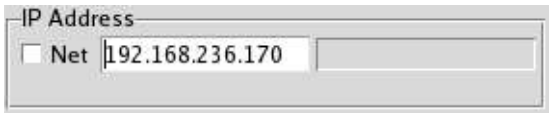


The ABOUT option displays:

- Test Suite GUI Version
- RFC2544 Test Version

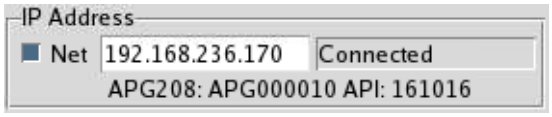
4. CONNECTION PANE

The CONNECTION PANE provides the connection to the Axtrinet unit.

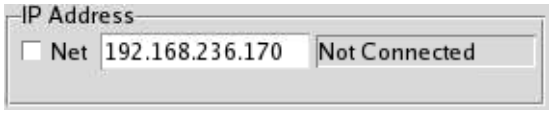


The Unit IP address is entered in the Connection Panel.

Click the **Net** checkbox to connect to the unit.



The connection status, unit type, serial number and API version are displayed.



To disconnect, click the **Net** checkbox.

The 'Not Connected' message is displayed.

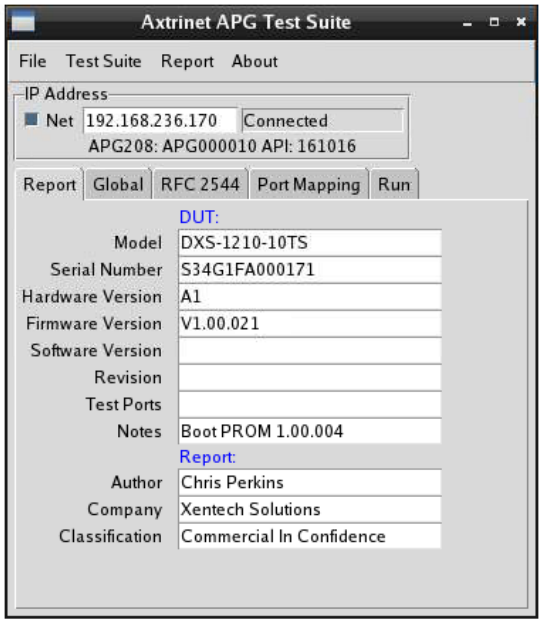
5. CONFIGURATION TABS

The Configuration Tabs allow configuration of:

- Report settings
- Global and test specific variables
- Axtrinet APG test port settings
- Test enable/disable

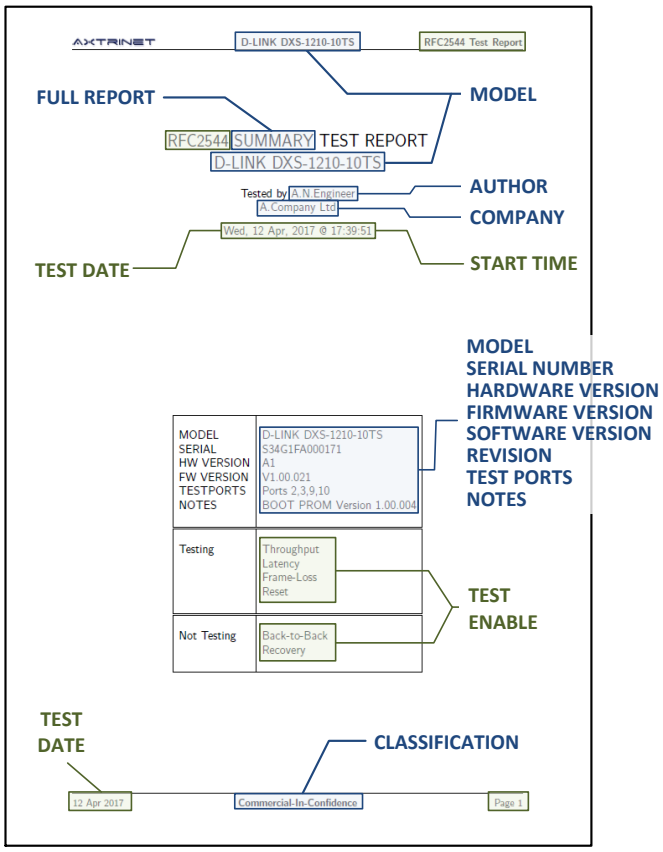
5.1 REPORT TAB

The REPORT Tab provides the data entry fields for the report title page:



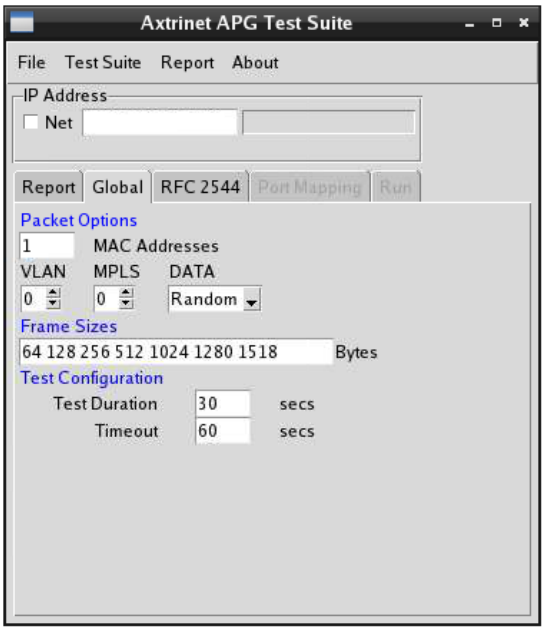
Note: Report variables are for information only and are not required to run the tests. Blank fields are not included in the report.

Where:



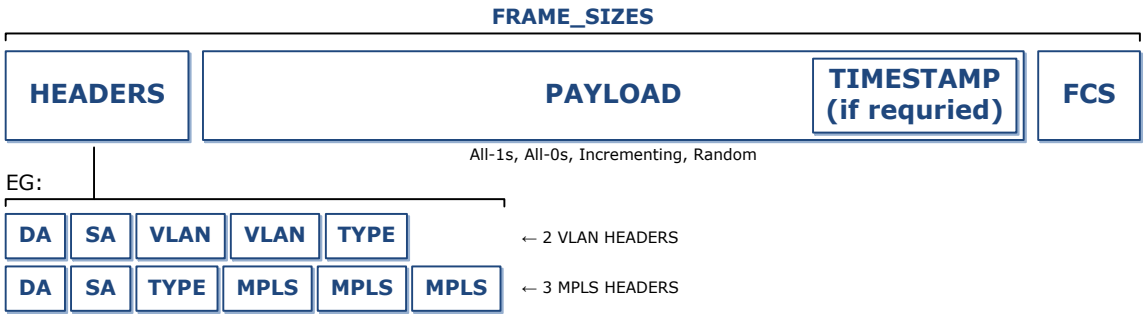
5.2 GLOBAL TAB

The GLOBAL Tab allows configuration of the global packet and test variables:



- **PACKET OPTIONS**
  The MAC DA/SA and Ethertype headers are always configured for the test packet.
  Up to 1024 MAC Address, up to 3 VLAN and MPLS headers can be added if required.
  Payload data can be configured to All-0s, All-1s, Incrementing or Random.
- **FRAME SIZES**
  Space delimited list of frame sizes (packet lengths) to be used for the tests.
  If no frame sizes are defined, the default set is used (64,128,256,512,1024,1280,1514)
- **TEST CONFIGURATION**
  Sets Number of MAC addresses, Test Duration and Test Timeout.

The test packet can be configured with up to 65535 MAC Addresses, 0-3 VLAN headers, 0-5 MPLS headers



5.2.1 VLAN Headers

Up to 3 VLAN headers can be configured on the test packet, with the following values:

- The value of the TPID field depends on the number of stacked VLANs. It is set to 0x8100 for single or inner VLANs, and 0x9200 if on the outer VLAN.
- The PRI field is always 0
- The CFI field is always 0.
- The VID field increments from 1 for each level

If a VLAN header is enabled, VLAN-aware Ethernet Switches may discard packets if the switch VLAN configuration does not match the header configuration.

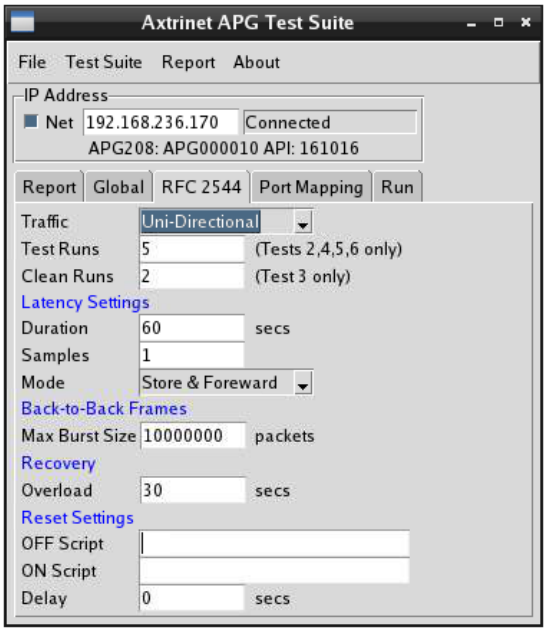
5.2.2 MPLS Headers

Up to 5 MPLS headers can be configured on the test packet, with the following values:

- The Label field increments from 1 for each level
- The Traffic Class field is always 0
- The Bottom-of-Stack field is set to 1 if the last header, otherwise it is set to 0.
- The Time-To-Live field is always 64.

5.3 RFC2544 TAB

The RFC2544 Tab allows configuration of the variables specific to the RFC2544 tests:



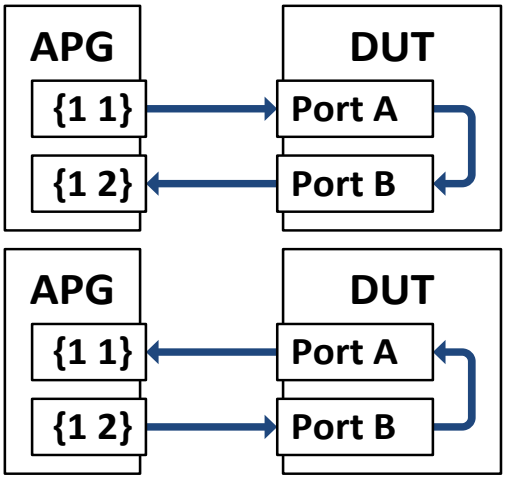
- **TRAFFIC**
  Fixed Uni-directional
- **TEST RUNS**
  Number of test runs (Latency, Back-to-Back, Recovery and Reset tests only). Default 50.
- **CLEAN RUNS**
  Frame Loss tests only. Default 2

The test-specific variables are:

- **Latency**
  Duration, Samples and Measurement Mode
- **Back-to-Back Frames**
  Maximum Burst Size at the start of each test.
- **Recovery**
  Overload period
- **Reset**
  Paths to OFF and ON scripts, and reset delay.

5.3.1 Traffic

The RFC2544 tests are point-to-point tests, run with unidirectional traffic.



a) Uni-directional Tests

5.3.2 Throughput Test

The Throughput Test measures the maximum input data rate between the test ports at each specified frame size where no packet loss occurs.

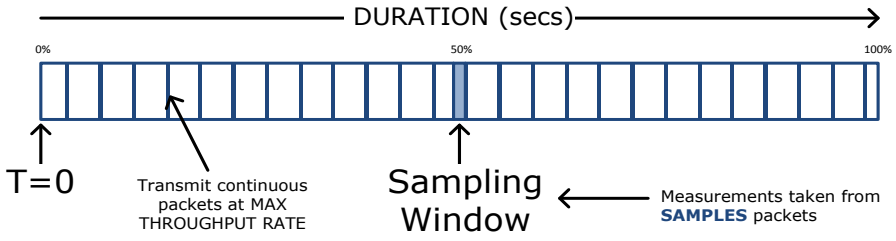
The test reports the throughput rate for each **FRAME SIZE**.

5.3.3 Latency Test

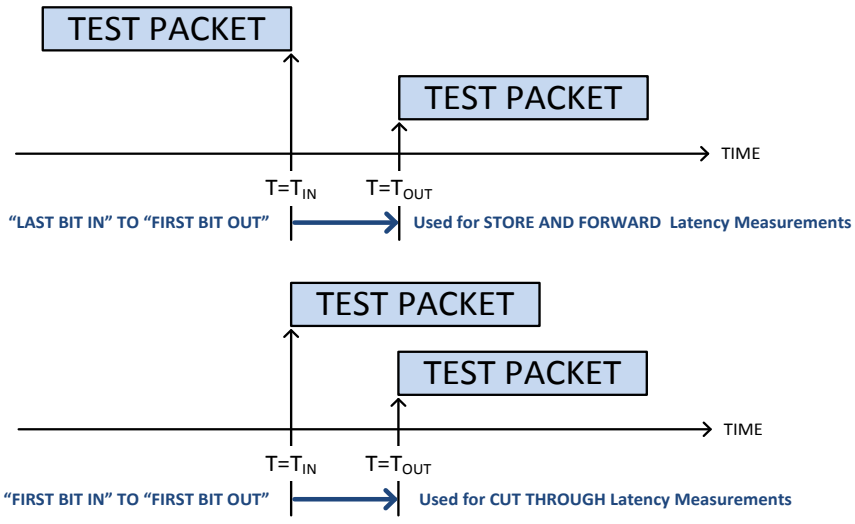
The Latency Test measures the delay through the test ports at each specified **FRAME SIZE**.

The Latency Test requires the Throughput Test to be run first to determine the throughput rate of the test port. The Throughput Test will be run automatically if not selected.

DURATION specifies the length of each latency test in seconds. The measurement window occurs after half of the **DURATION** has elapsed, when **SAMPLES** timing samples are taken from the received packet stream.



MODE sets the measurement type for "Store and Forward" or "Cut Through" devices, and changes the way the latency is measured:



The latency tests capture packets and post-process the extracted timestamp information at the end of each test.

The Axtrinet APG timestamps the transmitted packet as it leaved the Packet Generator Engine, **and** the received packet as it enters the Receiver. The latency through the transmitter MAC / SERDES and receiver SERDES / MAC are known, and are subtracted from the calculated transmit-to-receive latency.

Optical transceivers and Direct Attach (DA) cables transmit the serial data stream from the SERDES directly, and do not add to the internal latency.

Inserting 10GBase-T transceivers into the SFP+ ports adds an additional delay as the packet passes through the device.

The latency tests automatically subtract the known latencies from the overall latency measurement.

The test is run **TEST RUN** times.

The test reports the averaged latency for each **FRAME SIZE**.

5.3.4 Frame Loss Test

The Frame Loss Test measures the frame loss across the range of input data rates and **FRAME SIZE**s. Each test passes if the number of consecutive **CLEAN RUNS** result in no packet loss.

The test reports the frame loss for each **FRAME SIZE** and frame rate.

5.3.5 Back-to-Back Frame Test

The Back-to-Back Frame Test characterises the ability of the DUT to process a burst of wirespeed packets at varying **FRAME SIZE**s. On the first run, **MAX BURST SIZE** packets are transmitted into the DUT. The burst size is adjusted until no packet are lost.

The test is run **TEST RUN** times.

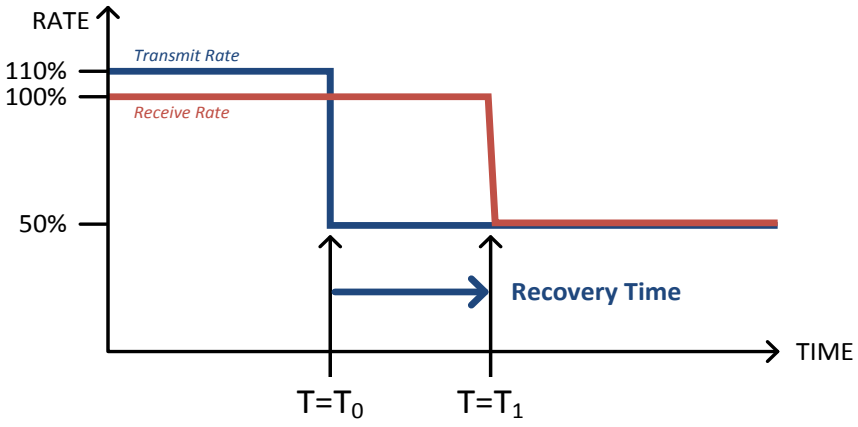
The test reports the averaged burst size for each **FRAME SIZE**.

5.3.6 Recovery Test

The Recovery Test requires the Throughput Test to be run first to determine the throughput rate of the test port. The Throughput Test will be run automatically if not selected.

The test is run if the throughput rate is not wirespeed, or the overload rate is calculated at less than wirespeed.

The test requires the port to be saturated with traffic at a rate of 110% of the recorded throughput for an **OVERLOAD** duration of at least 60 seconds, then reduced to 50% of the recorded throughput. The recovery time is the measured between the transmit rate dropping to 50% and the receive rate dropping to 50%.



The test is run **TEST RUN** times.

The test reports the averaged recovery time for each **FRAME SIZE**.

5.3.7 Reset Test

The Reset Test requires the Throughput Test to be run first to determine the throughput rate of the test port. The Throughput Test will be run automatically if not selected. Only the first specified **FRAME SIZE** is used for this test.

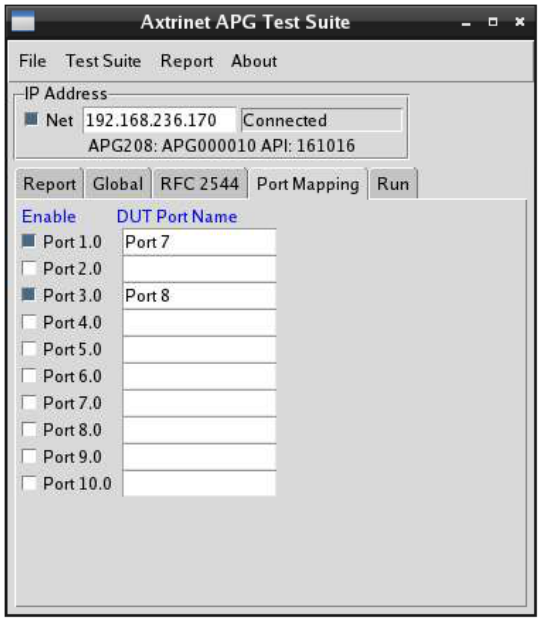
The Reset Test measures the time the DUT takes to recover from a power cycle:

1. Transmit timestamped frames at the known **FRAME SIZE** and throughput rate.
2. Cut the power to the DUT (manually or **OFF SCRIPT**)
3. Monitor the timestamp of the last received packet from the DUT.
4. Wait for reset **DELAY**
5. Apply power to the DUT (manually or **ON SCRIPT**)
6. Start transmitting traffic to the DUT
7. Monitor the time it takes for the ports to link up
8. Monitor the timestamp of the first received packet from the DUT.

The test is run **TEST RUN** times.

The test reports the averaged link-up and first packet times.

5.4 PORT MAPPING TAB



The PORT MAPPING tab selects the Axtrinet ports for test. At least 2 ports must be selected (enabled) before being able to start the tests.

The **DUT Port Name** field is a label that can be used to identify the DUT port, but can be left blank.

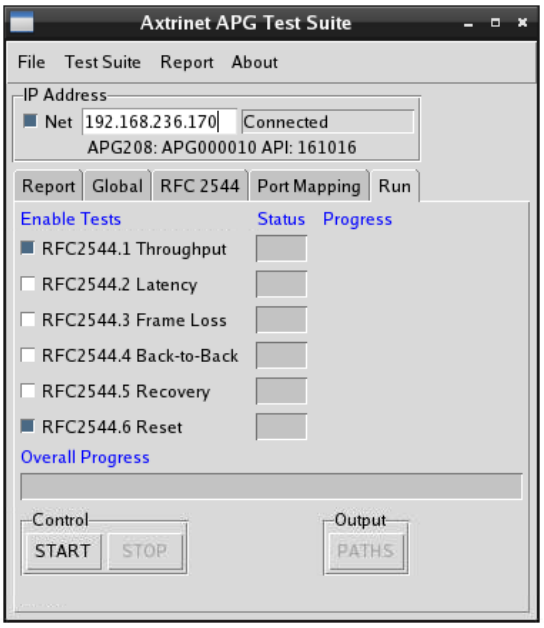
If set, the **DUT Port Name** is only used in the test report.

The combination of enabled ports and **TRAFFIC** (on RFC2544 tab) determines the number of test port combinations.

It is not recommended to specify more than 4 test ports in APGPORTS as the number of tests (and time) will increase exponentially.

5.5 RUN TAB

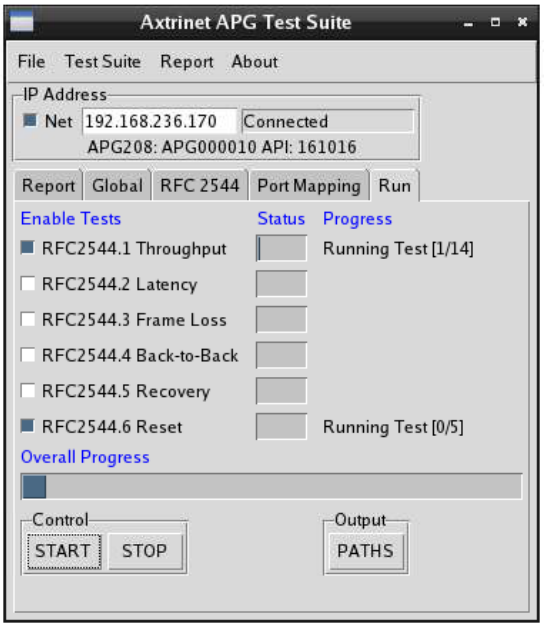
The RUN Tab allows selection of the RFC2544 tests to be run:



Tests are enabled by setting the checkbox next to each test.

The Throughput Tests are enabled automatically if the Latency, Recovery or Reset tests are enabled.

The START button is only visible if at least 2 ports are enabled on the Port Mapping tab, and at least 1 test is enabled.



Test progess is shown on the progress text and status bars for each enabled test, and the overall progress bar.

The test can be stopped at any time by clicking the STOP button. The button is highlighted RED when the stop is pending. The test will stop at the end of the current test. The log file is saved, but the PDF file is not generated.

The report paths can be viewed by clicking on the PATHS button.

Completed tests are marked COMPLETED.

6. REPORTS

6.1 TEST SUITE RESULTS DIRECTORY

6.1.1 Windows Environment

The APG Test Suite creates the RFC 2544 results directory in:

C:\Users\[USER]\Documents\APG-Test-Suite-Results\RFC2544

where it creates the results directory for the DUT.

6.1.2 Linux Environment

The APG Test Suite creates the RFC 2544 results directory in:

/usr/[USER]/apg/APG-Test-Suite-Results/RFC2544

where it creates the results directory for the DUT.

6.2 DUT RESULTS DIRECTORY

If either of the DUT [MODEL] and [SERIAL] fields are set, the results directory is:

/**[MODEL]-[SERIAL]**

otherwise the results directory is:

/DUT

6.3 OUTPUT FILES

Each test run creates an ASCII log file and a PDF Report in the DUT Directory.

If either of the DUT [MODEL] and [SERIAL] fields are set, the output files are:

[MODEL]-[SERIAL]-[TIMESTAMP].log

[MODEL]-[SERIAL]-[TIMESTAMP].pdf

otherwise the output files are:

DUT-[TIMESTAMP].log

DUT-[TIMESTAMP].pdf

Where [TIMESTAMP] is local [DATE] and [TIME] that the test started.

Example PDF and LOG file can be downloaded from **www.axtrinet.com/documentation**

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