

DataScout™ 1G

Multi-Service Network Analyzer



Read and understand all of the instructions and safety information in this manual before operating or servicing this tool.

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1. Introduction

1.1 Description

The Greenlee DataScout™ 1G Multi-Service Network Analyzer is a lightweight, battery-operated test set optimized for monitoring, testing, and troubleshooting of Gigabit Ethernet, Wi-Fi, VoIP, IPTV, IEEE C37.94 and PDH (T1/E1, T3/E3, CODIR, DATACOM) services. Depending on the actual configuration ordered, some of these interfaces may not be available in the tester.

The DataScout™ 1G test set is menu-driven and operated from a touch panel Graphical User Interface. Test results are safely accumulated and stored in the nonvolatile memory.

This test set is powered by either an external 12 VDC adapter or the rechargeable lithium-ion polymer battery.

1.2 Safety

Safety is essential in the use and maintenance of Greenlee tools and equipment. This manual and any markings on the tool provide information for avoiding hazards and unsafe practices related to the use of this tool. Observe all of the safety information provided.

1.3 Purpose of this Manual

This manual is intended to familiarize all personnel with the safe operation and maintenance procedures for the Greenlee DataScout™ 1G Multi-Service Network Analyzer.

Keep this manual available to all personnel.

Replacement manuals are available upon request at no charge at www.greenlee.com.



Do not discard this product or throw away!

For recycling information, go to www.greenlee.com.

All specifications are nominal and may change as design improvements occur. Greenlee Textron Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

2. Important Safety Information

CAUTION

Do not allow anything to contact the battery terminals.

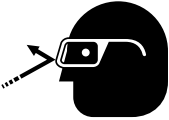
- Do not immerse the batteries in liquid. Liquid may create a short circuit and damage the battery. If batteries are immersed, contact your service center for proper handling.
- Do not place the battery into a pocket, tool pouch, or tool box with conductive objects. Conductive objects may create a short circuit and damage the battery.
- Do not place a battery on moist ground or grass. Moisture may create a short circuit and damage the battery.

Failure to observe these precautions may result in injury or property damage.

CAUTION

- Do not store the battery at more than 122 °F (50 °C) or less than -4 °F (-20 °C). Damage to the battery can result.
- Do not use another manufacturer's charger. Other manufacturers' chargers may overcharge and damage the battery.
- Do not attempt to open the battery. It contains no user-serviceable parts.

Failure to observe these precautions may result in injury or property damage.

	⚠ CAUTION
	<p>Wear eye protection when using this tool.</p> <p>Failure to observe this precaution may result in injury.</p>

CAUTION



IF DAMAGED

Lithium Ion Battery
DO NOT LOAD OR TRANSPORT
PACKAGE IF DAMAGED

For More Information Call 1-800-435-0786
Greenlee Technical Services

3. Identification

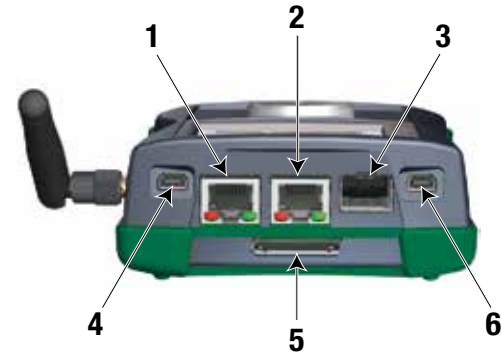
3.1 External Interfaces

3.1.1 Top Control Panel

This diagram shows a fully equipped DataScout™ 1G test set with optional Gigabit and IEEE C37.94 ports.

Standard features include the USB port and Audio micro connector.

DS1G-SW-DCOM is also an option. It includes the RS-232, RS-539, RS-449, V-35, and X.21 interfaces. DS1G-SW-CODIR provides G.703 CO-DIR. Both options perform Bit Error Test via the DATACOM connector. This connector also acts as a printer port to a RS-232 thermal printer, model DPU-40.



- 1 – 10/100 Base-T LAN port or IPTV and VoIP test in transparent (passive) mode.
- 2 – 10/100/1000 Base-T Gigabit test interface.
- 3 – SFP interface for MM or SM removable 1000Base-SX, 1000Base-LX, 1000Base-ZX, or 850 nm IEEE C37.94.
- 4 – Mini-USB connector for USB OTG host or slave access.
- 5 – DS1G-SW-DCOM option connector provides Datacom bit error testing interface for RS-232, RS-530, V.35, RS-449, X.21, or G.703 CO-DIR interface.
- 6 – Audio headset access via mini-USB type connector.

3.1.2 Test Interface Signal Panel

The Signal Panel is used for the PDH (T1, E1, T3, and E3) interface connector. There are many possible configurations available to accommodate these interfaces.

The standard configuration for DataScout™ 1G test set DS1G-PDH2 is shown below:

Both RJ45 (balanced 100/120 ohm) and BNC (75 ohm) connectors carry E1/T1 signal or, when equipped, the G.703 64 kbps CO-DIR. Also, the E3 and T3 signals are available via these BNC connectors. The switchover is under software control when the corresponding application is running. The line impedance of 75, 100 or 120 ohm on these connectors is also software selectable.



- 1 – External clock for E1 or T1 transmitter clocking on SMA connector.
- 2 – T1, E1 interface available on RJ-45.
- 3 – E1, T1, or CO-DIR receiver on BNC or Bantam connector.
- 4 – E1, T1, or CO-DIR transmitter on BNC or Bantam connector.

3.1.3 Front Control Panel

The front Control Panel accommodates a 3.5" LCD touchscreen and the five-way navigation switch assembly.

The four arrows on the navigation switch provide an alternate way to control the cursor position, and the OK button selects the item highlighted by the cursor on the LCD display.

Additionally, the OK button serves as a power ON button. Pressing the OK button for at least 2 seconds turns power ON.

Power OFF is accomplished via the Toolbar Soft Power button, which shuts down all processes and turns power OFF. Alternatively, hardware Power OFF can be accomplished by holding down the OK button for 60 seconds.

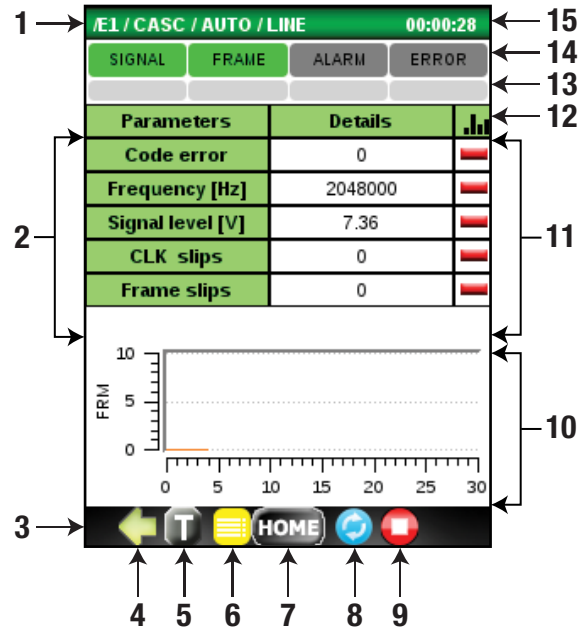


- 1 – 5-way lighted navigation keypad for alternate way to operate the GUI even in the dark. Center button is also a Power ON-OFF-hibernate switch.
- 2 – 3.5" TFT color touch screen with bright white LED backlight.
- 3 – Detachable Wi-Fi antenna for increased signal sensitivity to improve coverage and provide accurate signal strength.
- 4 – Rubber overmold provides non-slip grip, protection, and water resistance.
- 5 – 12 VDC adapter jack to power the unit and charge the li-ion polymer battery.

3.2 Graphical User Interface (GUI)

The LCD display is organized into the following sections:

- Application tree that shows the current test location in the application
- Signal Status LEDs
- Signal Status History LEDs
- Measurement Results window that may show the measurement results or a summary status of the submenu
- Submeasurement results window such as histogram or error injection menu

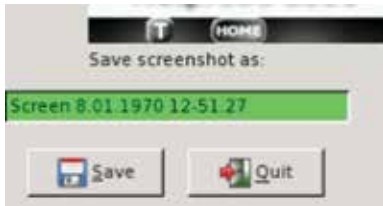


- 1 – Current application tree (e.g., E1, CASC frame, Automonitor). Background color is specific for the application (e.g., green for E1).
- 2 – Name of the measurement parameter or submenu entry button.
- 3 – Hot Buttons bar.
- 4 – Go to the previous menu.
- 5 – Toolbar entry button for housekeeping functions (touchscreen calibration, screenshot, battery status, etc.).
- 6 – Result button, goes to test results log.
- 7 – Home button, goes to top menu.
- 8 – Test Pause button.
- 9 – Test Start or Stop button.
- 10 – Submeasurement results window (histograms, error injections, etc.).
- 11 – Measurement Results window.
- 12 – Histogram selector.
- 13 – Interface Signal Status LED history.
- 14 – Interface Signal Status LED.
- 15 – Timer of test seconds, minutes, and hours.

- Hot Buttons bar with:
 - ▶ Go to arrows to previous or next menu (left and right)
 - ▶ Toolbar with housekeeping functions such as:





















- Touchscreen calibration
- Clock and Calendar setup
- Screenshot tool allows taking a screen picture and saving it in a file; this feature is useful when a temporary event displays on the screen



- Battery charge or discharge status
- LCD brightness control
- Globe – LAN, Wi-Fi, and VNC setup
- Software version info and update tool
- Soft Power OFF button
- ▶ Result button to enter the test log of saved test results
- ▶ HOME button to return to the top menu
- ▶ Pause button to pause the screen refresh
- ▶ Test Start/Stop button
- Signal and Alarm LEDs and History LEDs; History LEDs can be reset by tapping on any of the five buttons below.



3.3 Operator's Reference

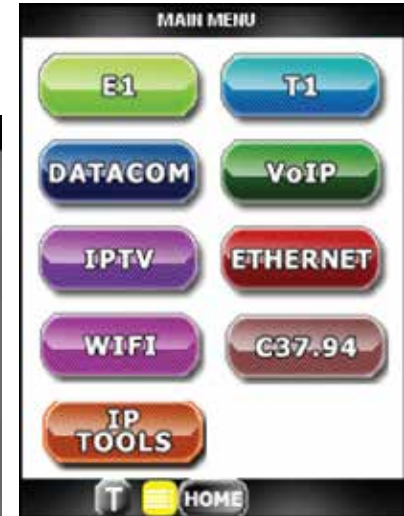
Operator's Name	Symbol	Description
START		Toggles between  and  . Activates test and storing test results in  .
STOP		Toggles between  and  . Stops test and storing results in  .
RESTART		Restarts test and clear current data without stopping transmission.
PAUSE		Pauses the current test until pressed again.
TEST RESULT		Enters test log with Results.
HOME		If test is not running (stopped), GUI returns to the main menu.
RETURN UP		Returns to the higher level menu.
GO TO NEXT MENU		Switched to lower level menu.
GO TO ALTERNATE SUBMENU		Goes to alternate submenu (used optionally).
RETURN TO ALTERNATE SUBMENU		Returns to the alternate submenu (used optionally).
TOOL BAR		 Icons for: LCD calibration, date and calendar setup, screenshot, battery status, display brightness, LAN-WLAN-VNC setup, software ver. and update tool, soft Power Off button.

3.4 Main Menu


Upon Power Up the display starts with the main menu. Each available application has a corresponding button and designated color.


- Only installed applications are accessible and their buttons active.
- Not installed applications have their buttons grayed out and inactive.

Interfaces E1, T1, and Datacom are powered up only when they are activated from the main menu. This raises the test set's overall power consumption. Upon return to the main menu these interfaces are turned off, reducing the overall power consumption.

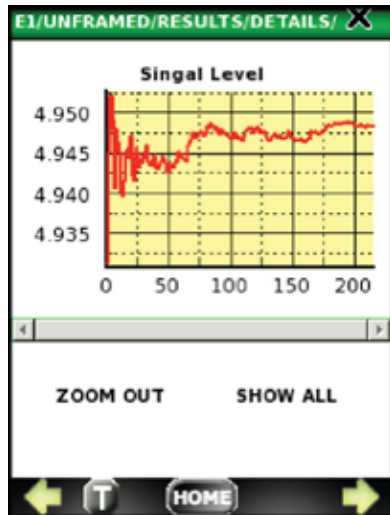


3.5 Test Results

The Test Results  menu shows a log of all tests for the application currently in use. To view details, highlight the desired test record and press **NEXT**.

To see a histogram of specific measurements, select it and click  .

To export it to the USB flash memory, press **EXPORT**.



E1/CASC/RESULTS/LOG/

Type	Metric
E1	G.821 AVS
E1	G.821 AVS Percent
E1	G.821 UAVS
E1	G.821 UAVS Percent
E1	G.821 SES
E1	G.821 SES Percent
E1	G.821 ES
E1	G.821 ES Percent
E1	LGC Errors
F1	LGC Error Data

HOME

E1/CASC/RESULTS/

Date	Time started	Time ended	Type
6.01.1970	13:21	13:22	E1
6.01.1970	13:21	13:21	E1
6.01.1970	13:21	13:21	E1
6.01.1970	12:48	in progress	E1
6.01.1970	12:48	12:48	E1

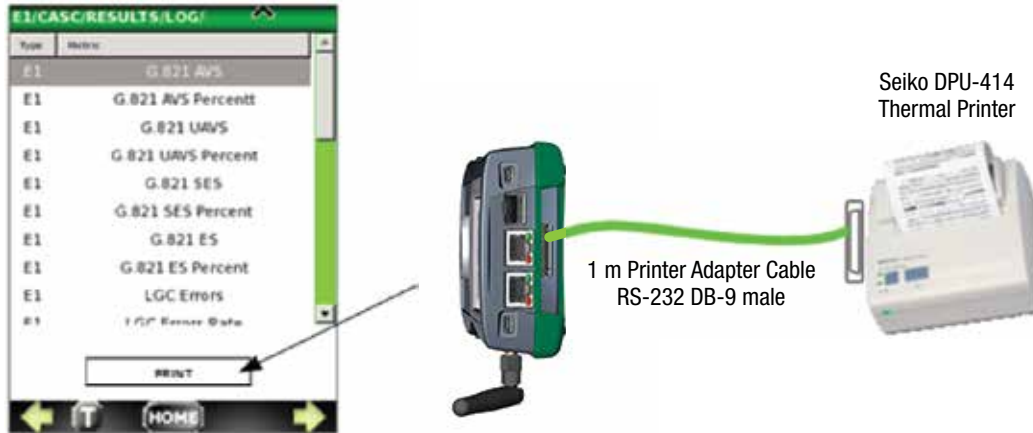
EXPORT DELETE NEXT

HOME

The printer option and the DPU-414 printer are set by default to 9600, no parity, and no setup is needed to print.

To print a detail test report to the DPU-414 serial printer, connect the printer with the provided adapter cable, turn the printer on, and press **PRINT**. The report will be printed instantly.

Datacom Printer Port Option Data Port RS-232



4. E1 Application

4.1 Top Menu

The E1 application starts with the top menu with buttons for the test functions:

- AUTO MONITOR
- BERT
- DSO
- PULSE SHAPE analysis
- PDL propagation delay test
- SETUP

The DataScout™ 1G test set offers AUTO MONITOR, BERT, PDL, and SETUP functions. Other buttons are inactive.

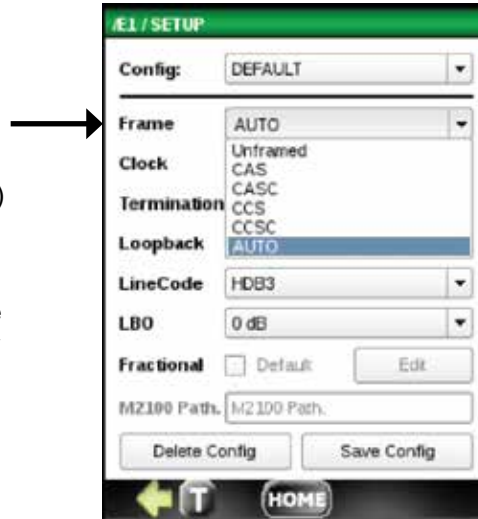


4.2 Setup

The SETUP menu allows configuration of the E1 receiver and transmitter, such as:

Frame Type

- Unframed – all bits used for data
- CAS – Channel Associated Signaling
- CASC – Channel Associated Signaling with Signaling
- CCS – Common Channel Signaling (ISDN)
- CCSC – Common Channel Signaling with CRC
- AUTO – detect E1 signal, line code, frame type, and BERT type (if any) automatically



Transmitter Clock Source

- Internal – 3 ppm sourced from analyzer
- Recovered – from Receive Data Rx
- External – from 0–5 V TTL clock source



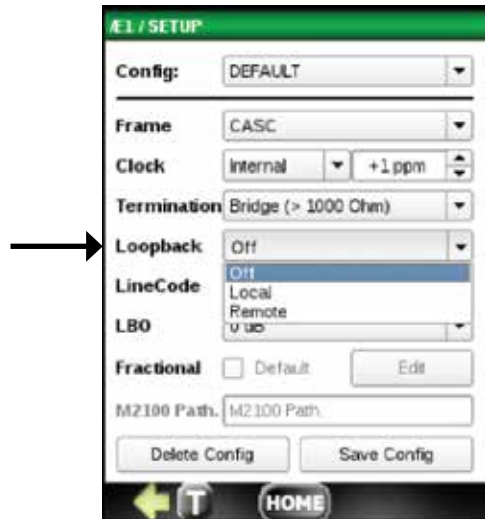
E1 Line Termination Type

- Termination – 120 ohm, 100 ohm, 75 ohm, Tx and Rx software switchable
- Bridge – Input Rx impedance > 1 k Ω , intended for monitoring E1 line on the outside plant circuit
- DSX Monitor – 120/100 or 75 ohm termination on DSX test point that is typically 20 dB lost across on a 100 ohm resistive load



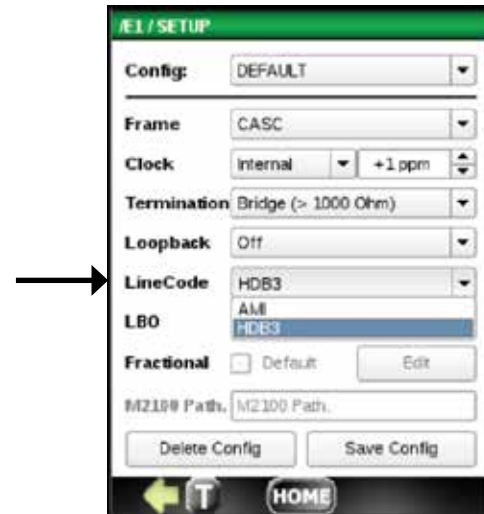
E1 Line Loopback mode

- Local loop
- Remote loop



E1 Line Code

- AMI code
- HDB3 code



Line Build Out Transmitter TX (LBO)

E1 Transmitter at 0 dB level or OFF

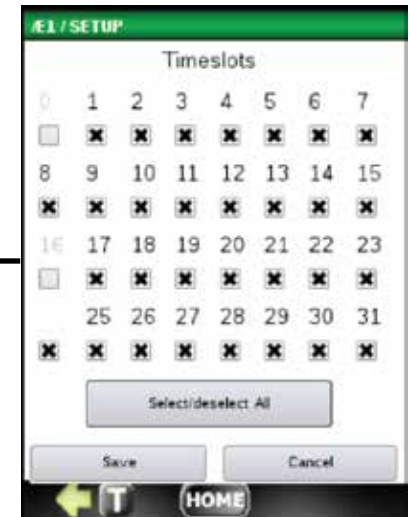
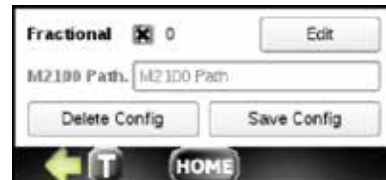


E1 Fractional Submenu Enable

If Fractional option is selected, press Edit button and then select desired Timeslots for nx64 kbps fractional E1 Testing (where n=1 ...15,17...31 for CAS and n = 1...31 for CCS framing).

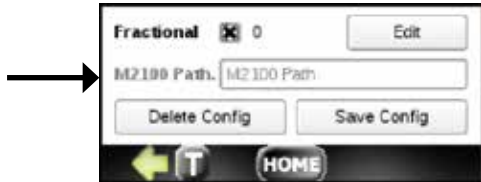
Press **Save Config** to assure that this selection is saved.

Confirms the selection is stored.



M2100 Path (ITU-T M2100 standard Path Allocation value)

This M.2100 Path Allocation value has a range from 0.5% to 63.0%, in 0.5% increments. Based on this value, the S1 and S2 Limits of the M.2110 are preset accordingly. Set this value as required.



Saving the SETUP

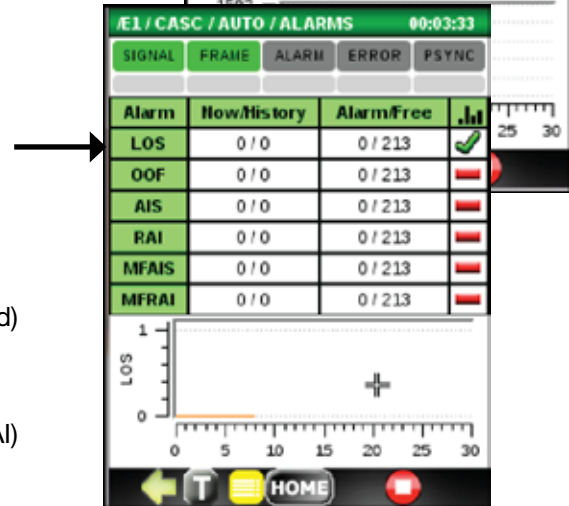
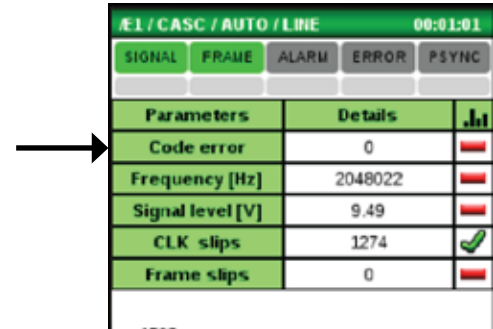
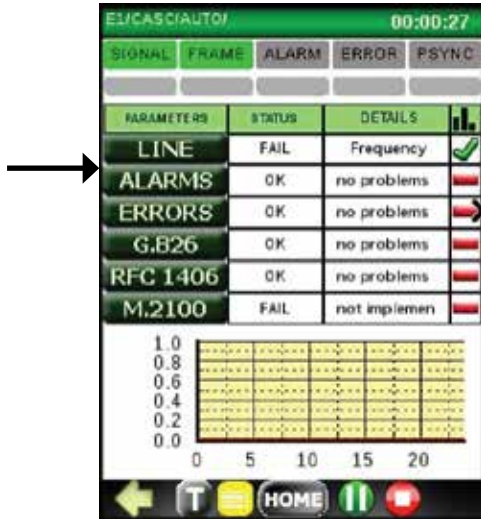
Buttons **Delete Config** and **Save Config** allow deleting and saving the configuration file currently shown in the Config window. If not saved, the currently displayed setup remains a default setup.

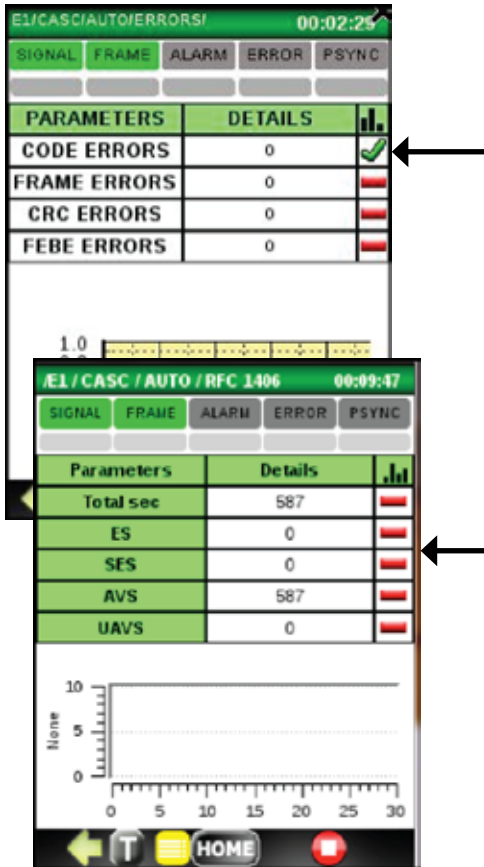
4.3 Auto Monitor

The purpose of AUTO MONITOR is to check the tested E1 signal automatically for the following:

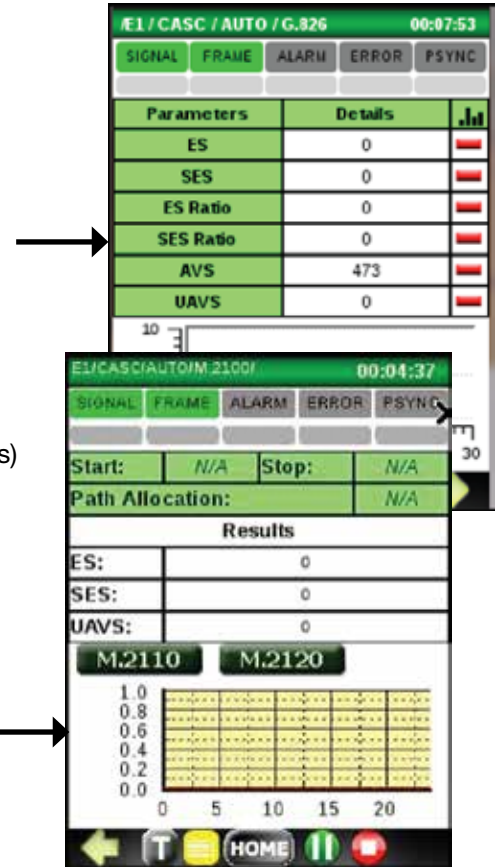
- E1 LINE measurements, such as:
 - ▶ CODE ERRORS
 - ▶ E1 Frequency
 - ▶ E1 Signal Level
 - ▶ Clock Slips
 - ▶ Frame Slips

- E1 ALARMS
 - ▶ LOS (loss of signal)
 - ▶ OOF (out of frame)
 - ▶ AIS (all 1 alarm ind)
 - ▶ RAI (remote alarm ind)
 - ▶ MFAIS (multiframe AIS)
 - ▶ MFRAI (multiform RAI)





- E1 ERRORS
 - ▶ CODE
 - ▶ FRAME
 - ▶ CRC
 - ▶ FEBE
- G.826 MEASUREMENTS
 - ▶ ES (errored seconds)
 - ES Ration in %
 - SES Ratio in %
 - ▶ SES (severely errored sec)
 - AVS (available seconds)
 - UAVS (unavailable seconds)
- RFC 1406 MEASUREMENTS
 - ▶ TOTAL SEC
 - ▶ ES
 - ▶ SES
 - ▶ AVS
 - ▶ UAVS
- M.2100 MEASUREMENTS
 - ▶ ES
 - ▶ SES
 - ▶ UAVS



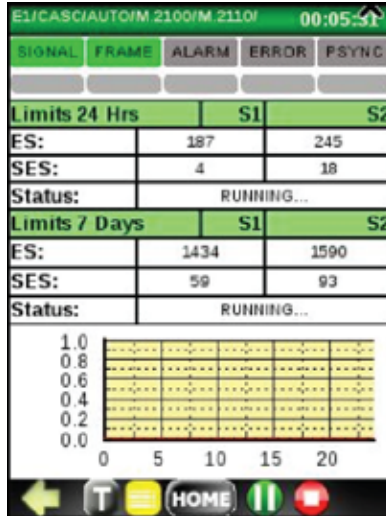
- M2110 MEASUREMENTS

Limit 24 Hours

- ▶ ES
- ▶ SES
- ▶ STATUS

Limit 7 Days

- ▶ ES
- ▶ SES
- ▶ STATUS



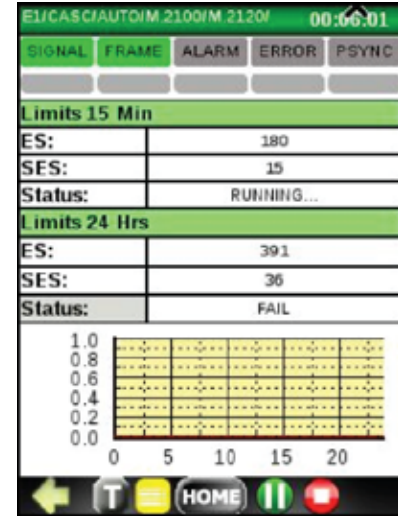
- M.2120 MEASUREMENTS

Limit 15 Minutes

- ▶ ES
- ▶ SES
- ▶ STATUS

Limit 24 Hours

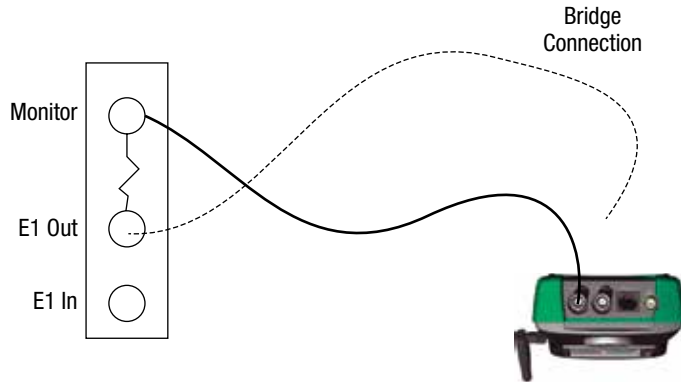
- ▶ ES
- ▶ SES
- ▶ STATUS



To perform the AUTO MONITOR test, connect the DataScout™ 1G test set E1 receiver to either DSX MON jack or, if not available, to E1OUT for BRIDGE.

If RJ-45 IN/OUT connector is used, connect the RJ-45 cable. The transmitter Tx is disabled by default.

In Service E1 Line Measurements



Steps:

1. Connect E1 In to Monitor output if available
or
2. E1 OUT using Bridge Hi Impedance Input Mode. Change SETUP Termination to E1-BRDG.








Next press the  button to begin the AUTO MONITOR test.

Check the AUTO MON main screen if all STATUS boxes are checked OK. If not, check DETAILS, if available, or consult submenu for detail breakdown of failed results.

The following are preset levels at which status changes from OK to FAILED:


- LINE:
 - ▶ Frequency: If measured frequency deviated ± 5 Hz from 2048000 Hz.
 - ▶ Signal level, Clock and Frame slip: Status OK regardless of signal level.
- All others (ALARMS, ERRORS, G.826, RFC 1406, M.2100):
Single error causes FAILED

Note: Depressing FAILED message button for any parameter will reset that error.

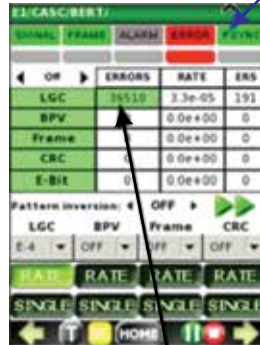
PARAMETERS	STATUS	DETAILS	
LINE	OK	no informati	
ALARMS	OK	no informati	
ERRORS	OK	no informati	
G.826	OK	no informati	
RFC 1406	OK	no informati	
M.2100	OK	no informati	

4.4 Bit Error Testing (BERT)

A typical loop around or point-to-point Bit Error Test setup is shown here.

After the bantam or RJ-45 cable connection, press  button to begin the BERT test.

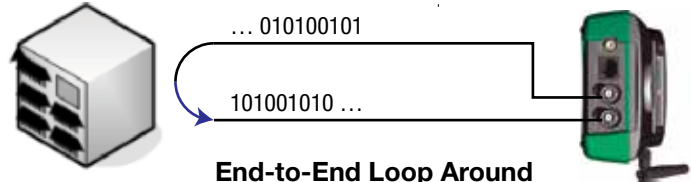
Pattern Sync LED turns green when transmitter pattern matches received pattern.



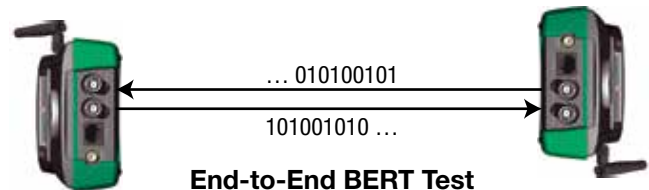
When errors are detected, LOGIC (LGC) ERROR counter advances.

E1 (or T1) Bit Error Test – BERT In Loop Around or End-to-End Connection

Network Switch



End-to-End Loop Around
BERT Test



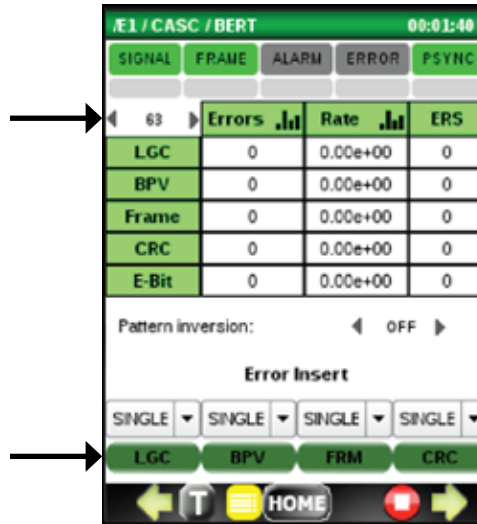
End-to-End BERT Test

A default BERT test pattern is 2-15-1.

A different pattern can be selected from the list by scrolling left or right:

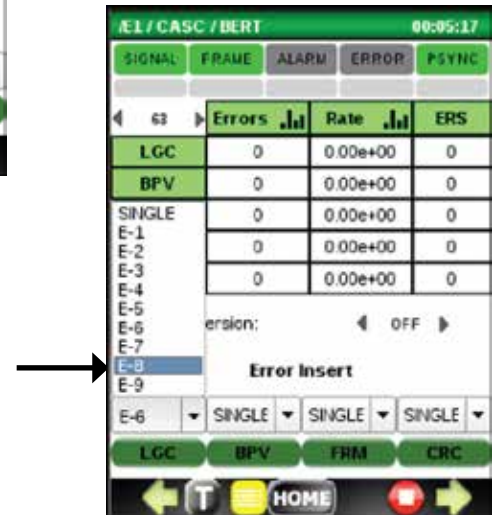
Off, 63, 511, 2047, 2-15-1, 2-21-1, 2-23-1, QRSS, All 0's, All 1, 1:3, 1:7, 1:15, 1:31

To verify the proper connection, press the LGC button to force one bit error. If the LGC error shows up, the connection is verified.




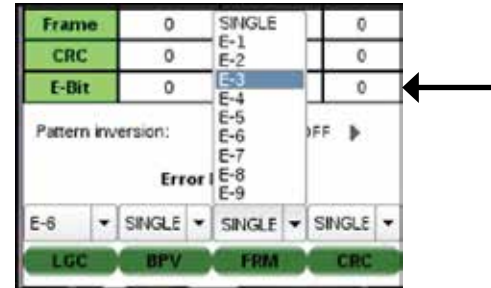
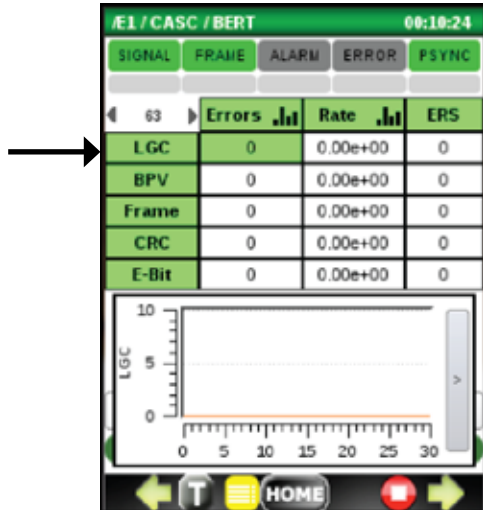
The lap counter of test seconds starts counting after START and stops after STOP, at which point it can be reset to 0 by tapping on it.

Optionally, a constant bit error rate can be injected using the RATE menu to choose the rate from the pull-down menu. Press the LGC button to begin the error RATE injection.




To view a histogram of the selected measurement, click on the corresponding field in the column ERROR. This field will then change from white to green and the histogram will appear below.

If the submenu field for histograms shows ERROR INJECTION SUBMENU, then click on  to open it.




ALARM Menu


To access this menu, press .


Use this menu to:

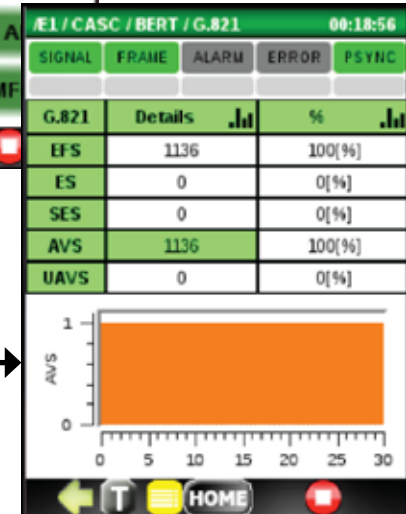
- Check which alarms caused the ALARM LED to turn red.
- Force one of the available error types into the E1 transmitter:
 - ▶ LOS (loss of signal)
 - ▶ OOF (out of frame)
 - ▶ OOMF (out of multiframe)
 - ▶ AIS (all 1'1 alarm indication)
 - ▶ REMOTE (remote alarm indication)

To exit, press .

G.821 ERROR Menu

To access this menu, press  from the ALARM menu.

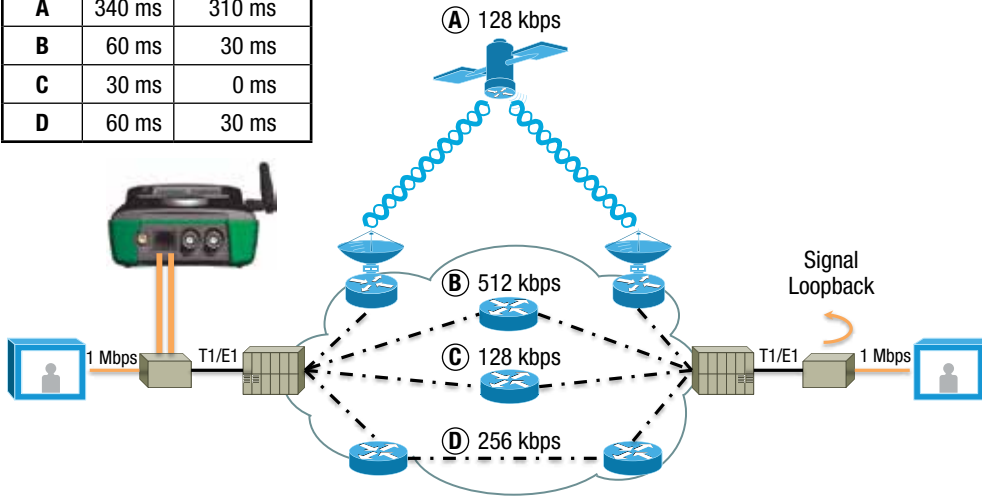
To exit, press .



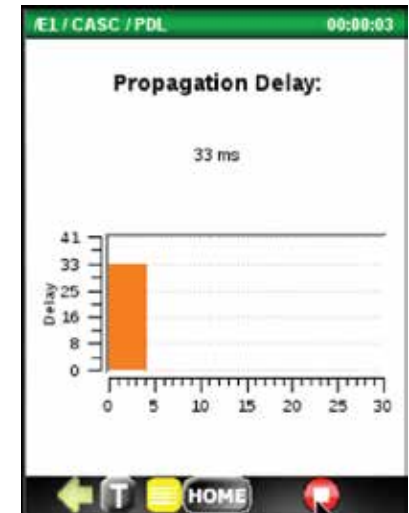
4.5 E1 Propagation Delay Measurement (PDL)

Measuring Round-Trip Delay

Path	Total Delay	Differential Delay
A	340 ms	310 ms
B	60 ms	30 ms
C	30 ms	0 ms
D	60 ms	30 ms



To access E1 Propagation Delay, press PDL on the E1 top menu and connect both E1 Tx and E1 Rx to the looped circuit under test. The resulting delay in milliseconds will show on the screen below:

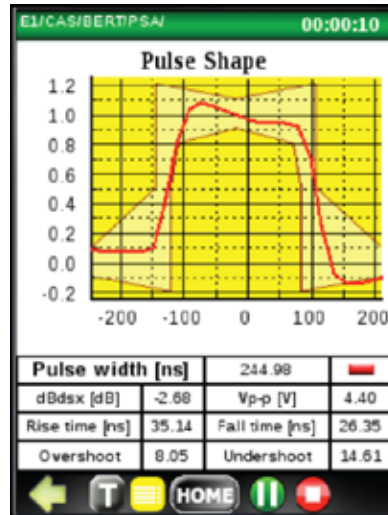


4.6 E1 Pulse Shape Analysis

To plot and analyze E1 pulse shape, connect E1 signal under test in 120 ohm (balanced) termination mode and select PSA function from the main E1 menu.

Then press **Start**. If the pulse can be normalized, it will be plotted inside the G.703 template. If the pulse fits 100% inside the template, the test PASSED (green bar). If it does not fit 100%, any part that is outside will cause the test to FAIL (red bar).

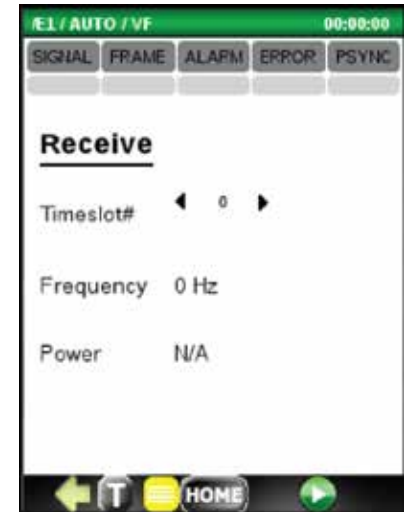
The example to the right shows a pulse that has excessive undershoot.



4.7 DS0 Testing

The DS0 testing in this software release includes:

- Listening to any of the 30 DS0 Voice Channels using the supplied earbud speaker/microphone (DS-ASSY-EARBUD).
- Measuring the frequency of the signal received. Test tones are typically 404 Hz, 1004 Hz, and 1804 Hz.
- Measuring the power (dBm) of the received test tones. If the reading is not available, N/A message shows instead.



5. T1 Application

5.1 Top Menu

The T1 application starts with the top menu with buttons for the test functions:

- AUTO MONITOR
- BERT
- DSO
- PULSE SHAPE analysis
- PDL propagation delay test
- SETUP

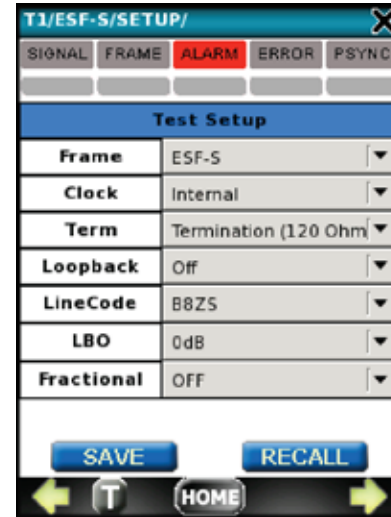
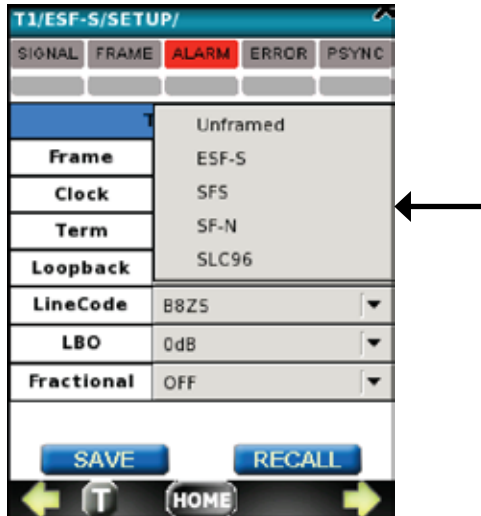
The T1 application offers AUTO MONITOR, BERT, PDL, and SETUP functions. Other buttons are inactive.



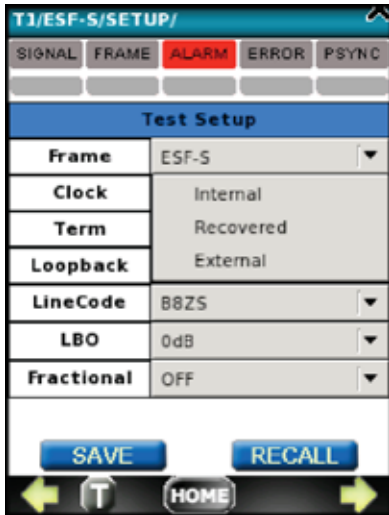
5.2 Setup

The SETUP menu allows configuration of the T1 receiver and transmitter, such as:

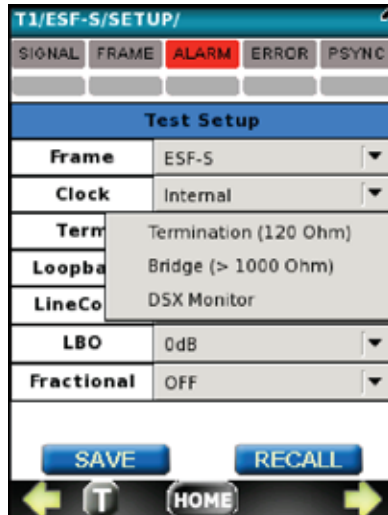
- Frame Type



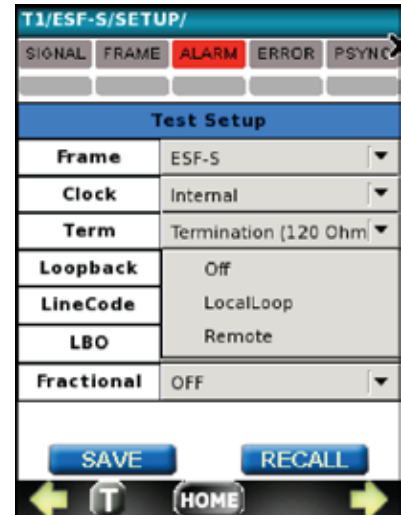
- Transmitter Clock Source



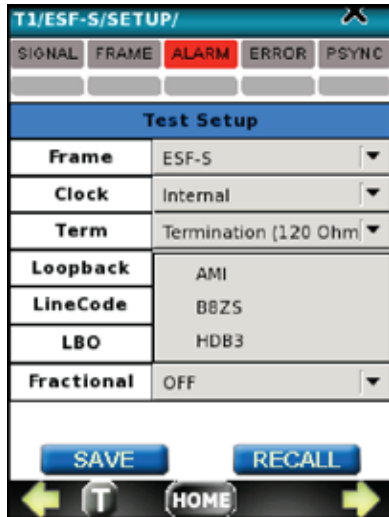
- T1 Line Termination Type



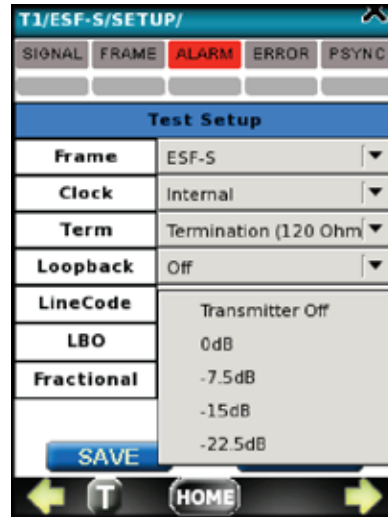
- T1 Line Loopback mode



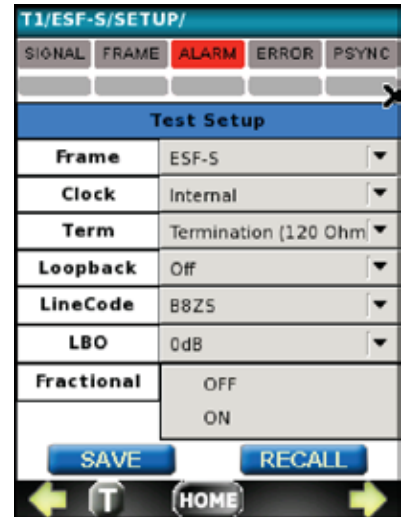
- T1 Line Code



- T1 Transmitter Signal Level



- T1 Fractional Submenu Enable

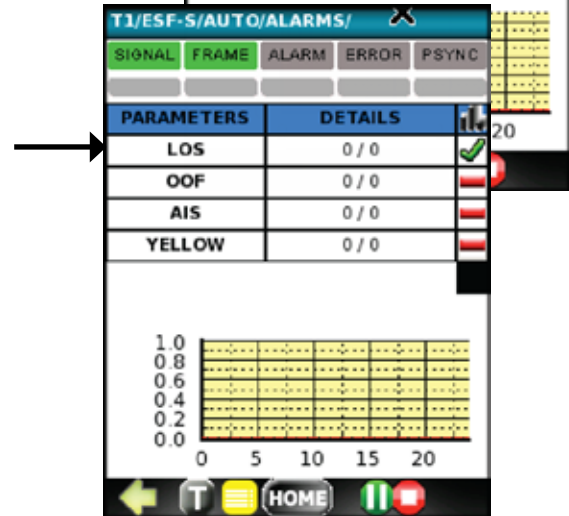
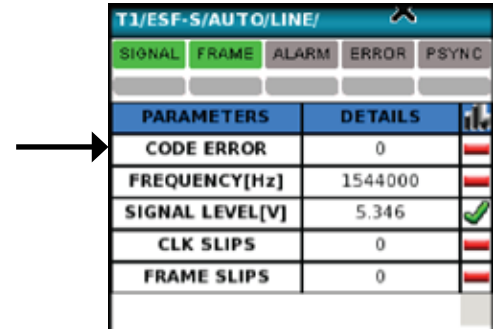
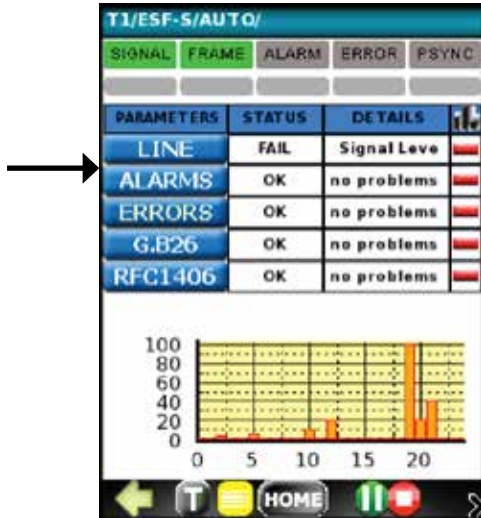


Buttons SAVE and RECALL are used to save the current setup as seen on the screen or recall any of the previously stored setups. If nothing is saved, the current display setup remains the default setup.

5.3 Auto Monitor

The purpose of AUTO MONITOR is to test the T1 line automatically for the following:

- T1 LINE measurements, such as:
 - ▶ CODE ERRORS
 - ▶ T1 Frequency
 - ▶ T1 Signal Level
 - ▶ Clock Slips
 - ▶ Frame Slips
- T1 ALARMS
 - ▶ LOS (loss of signal)
 - ▶ OOF (out of frame)
 - ▶ AIS (all 1's alarm)
 - ▶ YELLOW (remote alarm)



T1/ESF-S/AUTO/FR~~X~~IE/

SIGNAL FRAME ALARM ERROR PSYNC

PARAMETERS	DETAILS	
CODE ERRORS	0	✓
FRAME ERRORS	0	✗
CRC ERRORS	0	✗
FEBE ERRORS	0	✗

- T1 ERRORS
 - ▶ CODE
 - ▶ FRAME
 - ▶ CRC
 - ▶ FEBE
- G.826 MEASUREMENTS
 - ▶ ES (errored seconds)
 - ▶ SES (severely errored sec)
 - ▶ ES Ration in %
 - ▶ SES Ratio in %
 - ▶ AVS (available seconds)
 - ▶ UAVS (unavailable seconds)

T1/ESF-S/AUTO/G.826/

SIGNAL FRAME ALARM ERROR PSYNC

PARAMETERS	DETAILS	
ES	1	✓
SES	0	✗
ES Ratio	3.3e-01	✗
SES Ratio	0.0e+00	✗
AVS	302	✗
UAVS	0	✗

T1/ESF-S/AUTO/RFC 1406/

SIGNAL FRAME ALARM ERROR PSYNC

PARAMETERS	DETAILS	
TOTAL SEC	476	✗
ES	0	✓
SES	0	✗
AVS	476	✗
UAVS	0	✗

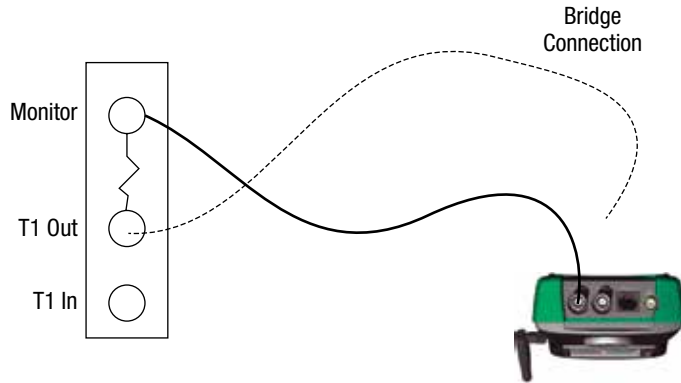
- RFC 1406 MEASUREMENTS
 - ▶ TOTAL SEC
 - ▶ ES
 - ▶ SES
 - ▶ AVS
 - ▶ UAVS

Check the AUTO MON main screen if all STATUS boxes are checked OK. If not, check details, if available, or consult submenu for detail breakdown of failed results.

PARAMETERS	STATUS	DETAILS	
LINE	FAIL	Signal Leve	✗
ALARMS	OK	no problems	✗
ERRORS	OK	no problems	✗
G.826	OK	no problems	✗
RFC1406	OK	no problems	✗

Connect the DataScout™ 1G test set T1 receiver to either DSX MON jack or, if not available, T1 OUT for BRIDGE.

In Service T1 Line Measurements




Steps:

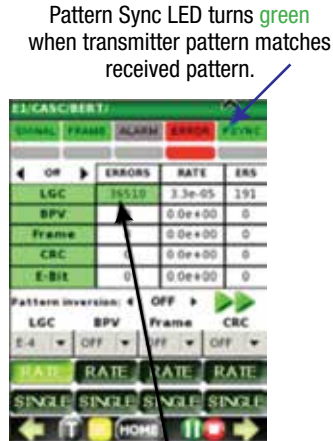
1. Connect T1 In to Monitor output if available
or
2. T1 OUT using Bridge Hi Impedance Input Mode. Change SETUP Termination to E1-BRDG.

Press  button to begin AUTO MONITOR test.

5.4 Bit Error Testing (BERT)

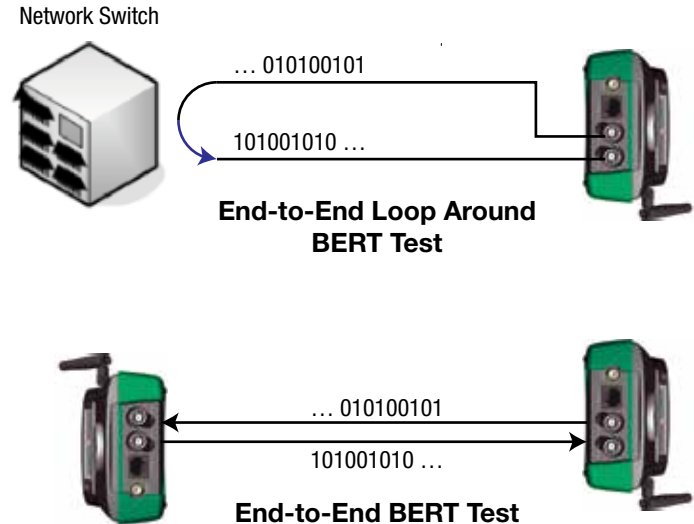
A typical loop around or point-to-point Bit Error Test setup is shown to the right.

After the bantam or RJ-45 cable connection, press  button to begin the BERT test.



When errors are detected, LOGIC (LGC) ERROR counter advances.

E1 (or T1) Bit Error Test – BERT In Loop Around or End-to-End Connection

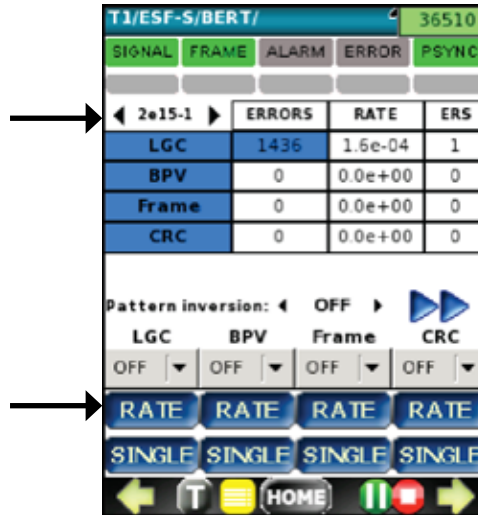


A default BERT test pattern is 2-15-1.

A different pattern can be selected from the list by scrolling left or right:

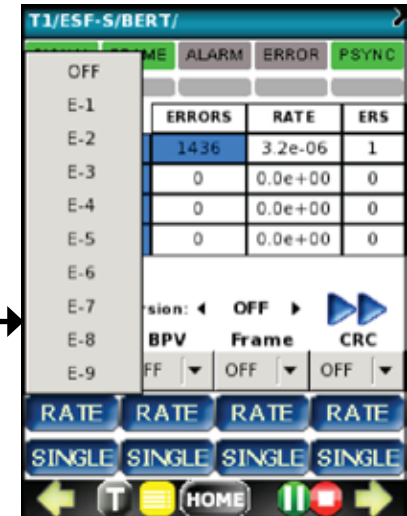
Off, 63, 511, 2047, 2-15-1, 2-21-1, 2-23-1, QRSS, All 0's, All 1, 1:3, 1:7, 1:15, 1:31

To verify the proper connection, press **SINGLE** button once under LGC section of ERROR injection menu to force one bit error. If the LGC error shows up, the connection is verified.



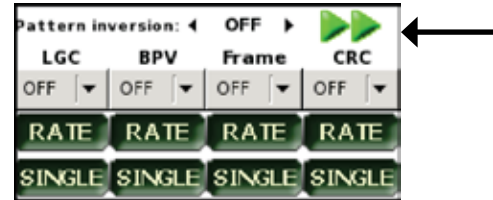
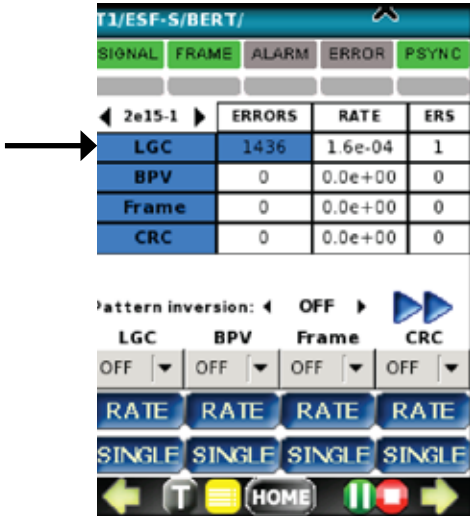
The lap counter of test seconds starts counting after START and stops after STOP, at which point it can be reset to 0 by tapping on it.

Optionally, a constant bit error rate can be injected using the RATE menu to choose the rate and pressing RATE button to begin the error injection.




To view a histogram of the selected measurement, click on the corresponding field in the column ERROR. This field will then change from white to green and the histogram will appear below.

If the submenu field for histograms shows ERROR INJECTION SUBMENU, then click on ►► to open it.




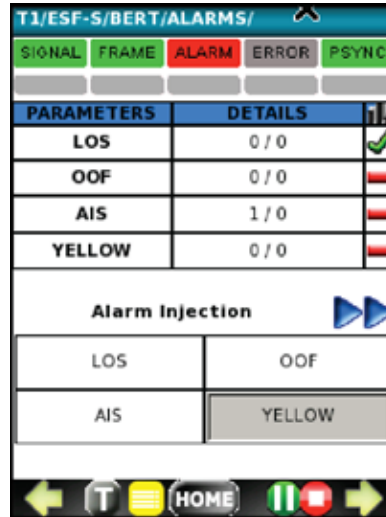
ALARM Menu



To access this menu, press  .



Use this menu to:

- Check which alarms caused the ALARM LED to turn red.
- Force one of the available error types into the T1 transmitter:
 - ▶ LOS (loss of signal)
 - ▶ OOF (out of frame)
 - ▶ OOMF (out of multiframe)
 - ▶ AIS (all 1's alarm)
 - ▶ REMOTE (remote alarm indication)

To exit, press  .





PARAMETERS	DETAILS	
LOS	0 / 0	
OOF	0 / 0	
AIS	1 / 0	
YELLOW	0 / 0	

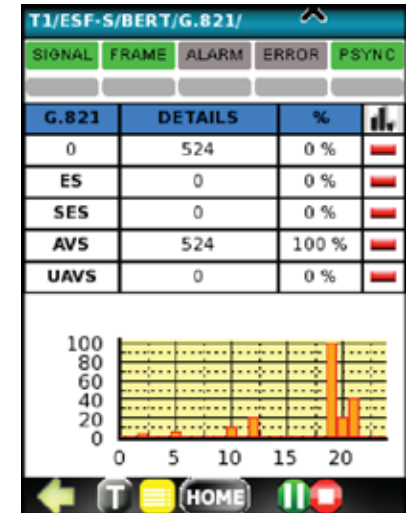
Alarm Injection  

LOS	OOF
AIS	YELLOW

ERROR Menu

To access this menu, press  from the ALARM menu.

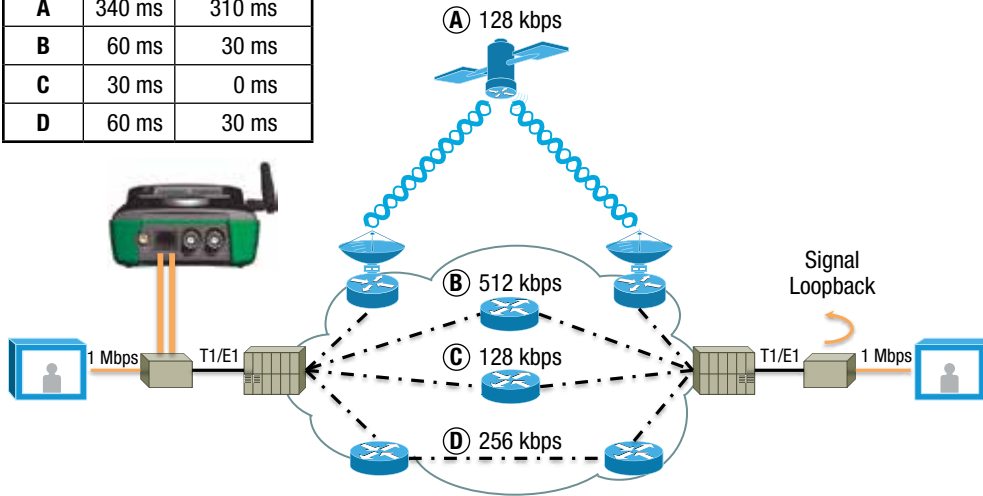
To exit, press  .



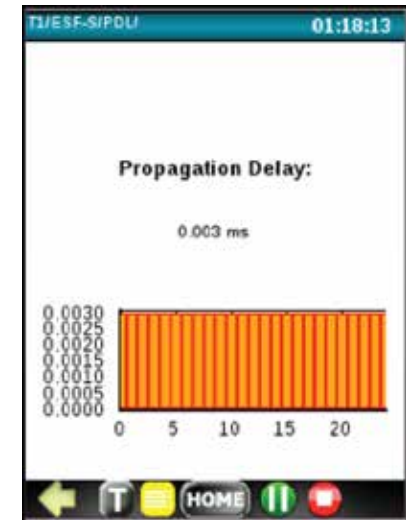
5.5 T1 Propagation Delay Measurement (PDL)

Measuring Round-Trip Delay

Path	Total Delay	Differential Delay
A	340 ms	310 ms
B	60 ms	30 ms
C	30 ms	0 ms
D	60 ms	30 ms



To access T1 Propagation Delay, press PDL on the T1 top menu and connect both T1 Tx and T1 Rx to the looped circuit under test. The resulting delay in milliseconds will show on the screen below:

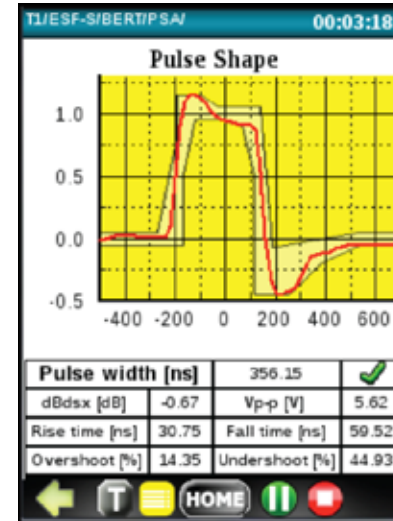


5.6 T1 Pulse Shape Analysis

To plot and analyze T1 pulse shape, connect T1 signal under test in 100 ohm (balanced) termination mode and select PSA function from the main T1 menu.

Then press **Start**. If the pulse can be normalized, it will be plotted inside the G.703 template. If the pulse fits 100% inside the template, the test PASSED (green bar). If it does not fit 100%, any part that is outside will cause the test to FAIL (red bar).

The example here shows a pulse that has excessive undershoot.



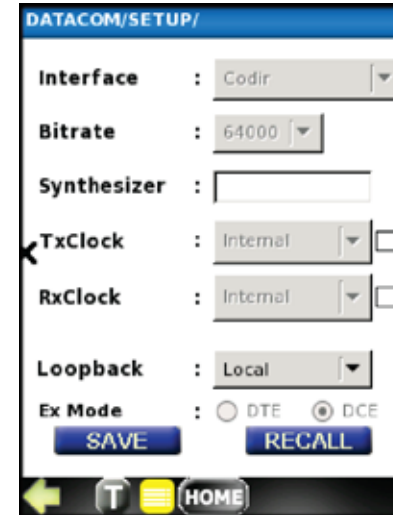
6. CO-DIR Testing

6.1 Setup

The CO-DIR interface is a G.703 64 kbps data interface to be used for Bit Error Testing and Propagation Delay Test.

The setup is predefined. The only variable is the Loopback that can be one of the following:

- Local
- Off
- Remote



The screenshot displays the 'DATACOM/SETUP/' configuration screen. The settings are as follows:


- Interface**: Codir (dropdown menu)
- Bitrate**: 64000 (dropdown menu)
- Synthesizer**: (empty text field)
- TxClock**: Internal (dropdown menu) with an unchecked checkbox to its right.
- RxClock**: Internal (dropdown menu) with an unchecked checkbox to its right.
- Loopback**: Local (dropdown menu)
- Ex Mode**: DTE (radio button) and DCE (radio button, which is selected).

At the bottom of the screen, there are two buttons: 'SAVE' and 'RECALL'. Below the buttons is a navigation bar with a back arrow, a 'T' icon, a menu icon, and a 'HOME' button.

6.2 Bit Error Test

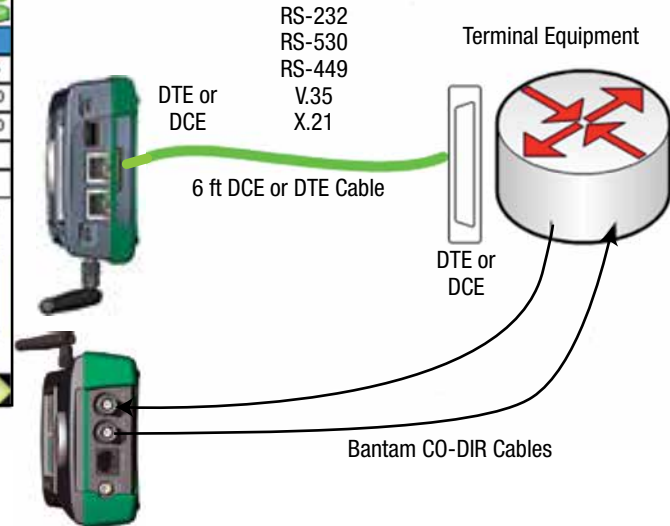
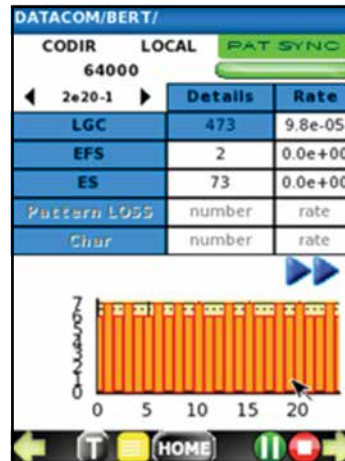
The Datacom option of the DataScout™ 1G test set T1E1CODIR is equipped only in the CO-DIR interface for BERT and Propagation Delay tests.

Access to this G.703 64 kbps interface is via Bantam connector on the Signal Panel that is shared with T1 and E1 Tx and Rx.


To start the CO-DIR BERT test, select a test pattern and press  button.

Datacom Option Data Port RS-232/530/449 or V.35, Bantam CO-DIR 64 kbps

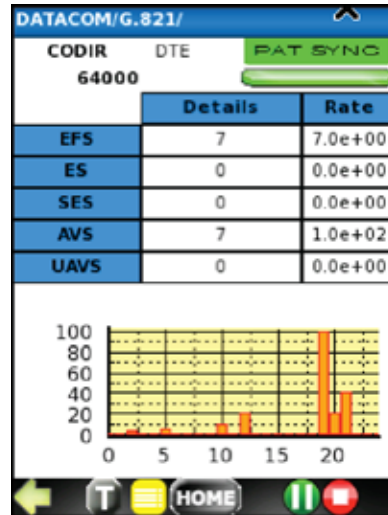
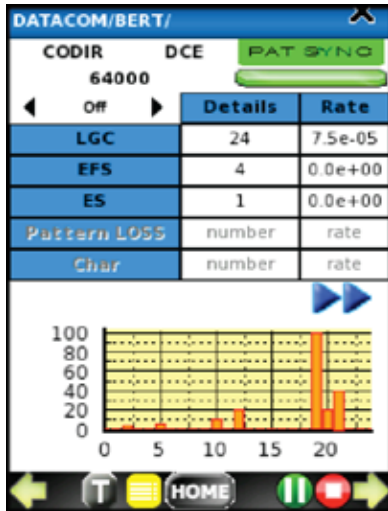
Observe status LEDs for presence of data bits, clocks, and correct handshakes.



Observe LGC (bit errors), EFS (error free seconds), and ES (errored seconds).

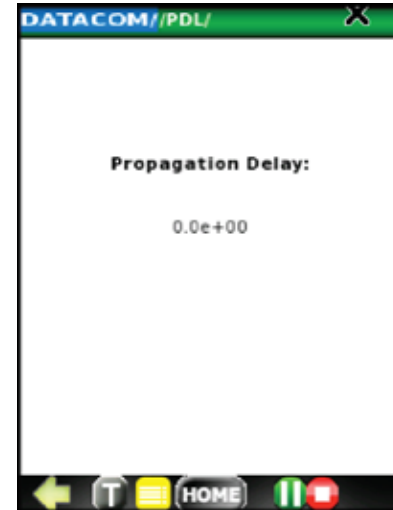
To view G.821 errors, press  .

To verify the correct connection of the CO-DIR test, inject a single bit error.

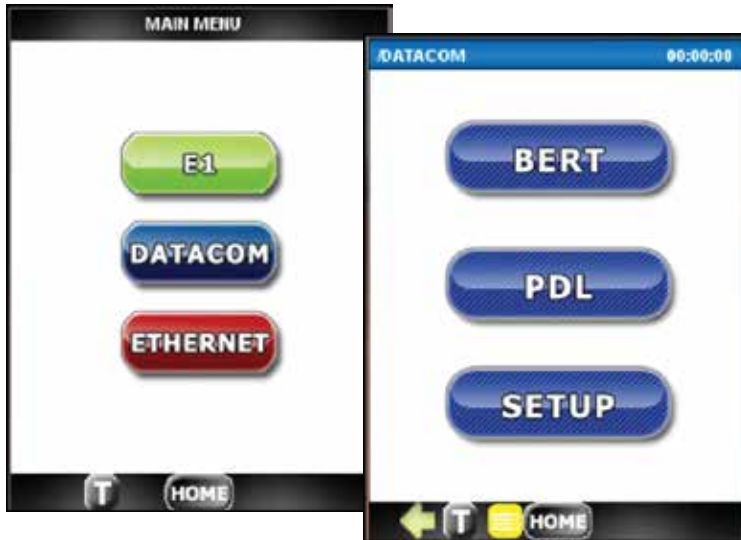


6.3 CO-DIR Propagation Delay Test

To access CO-DIR Propagation Delay, press **DATA COM** on the top menu, and then press **PDL** and connect both CO-DIR Tx and Rx to the looped circuit under test. The resulting delay in milliseconds will show on the screen to the right.



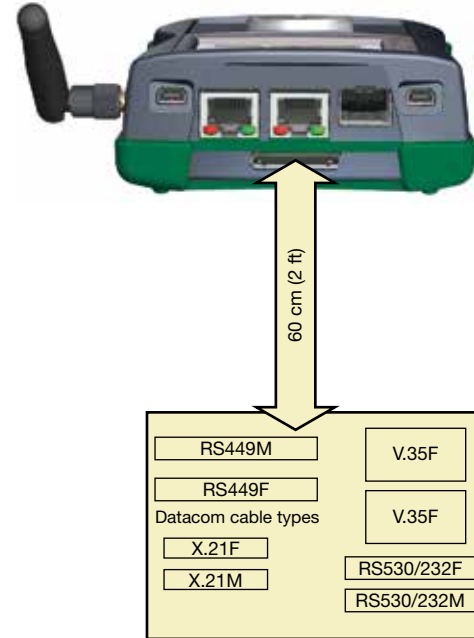
7. DATACOM Option – DS1G-SW-DCOM



The DS1G-SW-DCOM provides Bit Error testing for the following standard interfaces: RS-232, RS-530, RS-449, V.35, and X.21.

DTE and DCE modes are supported with proprietary cables provided.

RS-232 and RS-530 DTE&DCE share the same cable pair.



7.1 SETUP

The SETUP allows the following choices:

- Loading previously saved configuration file
- Selecting data interface
 - ▶ RS-232 Synchronous
 - ▶ RS-232 Asynchronous
 - ▶ RS-530
 - ▶ RS-449
 - ▶ V.35
 - ▶ X.21
- Selecting fixed bit rates or clock synthesizer (0-10 MHz, with 1 Hz accuracy)
- Tx clock source Internal or Recovered
- Rx clock source Internal or Recovered
- Loopback: Off, Local, or Remote
- ExMode: DTE or DCE
- Deleting or saving the currently displayed configuration



7.2 Bit Error Test (BERT)

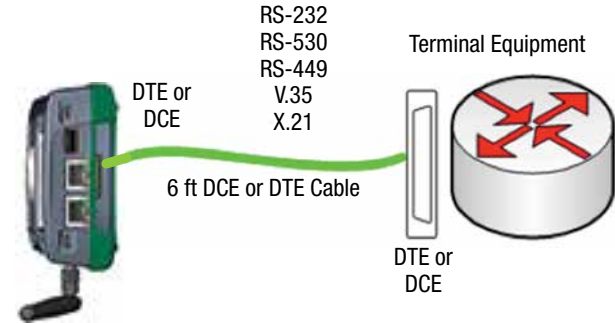
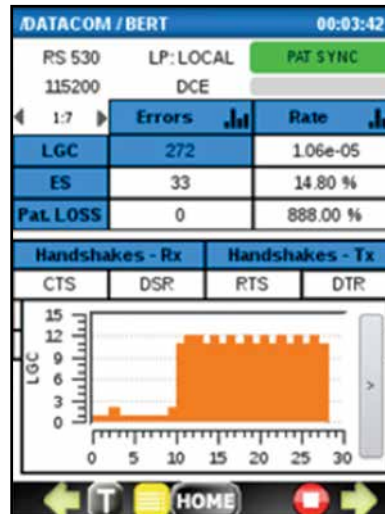
The DS1G-SW-DCOM option is primarily for End-to-End Bit Error testing.

To perform this test:

- Select the desired data interface.
- Set the desired DTE/DCE mode, clock rate, clock source for Tx and Rx.
 - ▶ If the tested device is DCE, use the DTE mode and the DTE cable.
 - ▶ If the tested device is DTE, use the DCE mode and the DCE cable.

Datacom Option Data Port RS-232/530/449 or V.35

Observe pattern status LED and error counters for presence of errors.




- Check and change if necessary **Handshakes Tx** (for DCE: CTS, DSR, DCD, RI, LL; for DTE: RTS, DTR, RL, LL) as required by the terminating equipment.

Connect the proper cable between the DataScout™ 1G test set data port and the object under test.

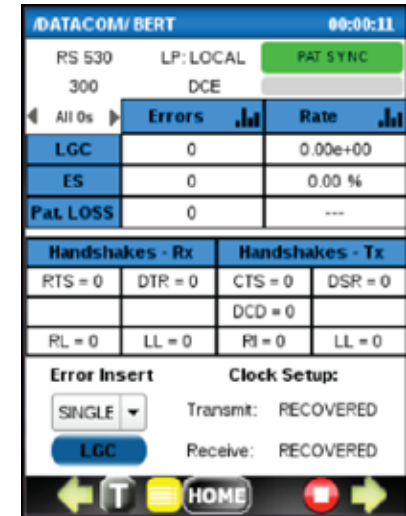
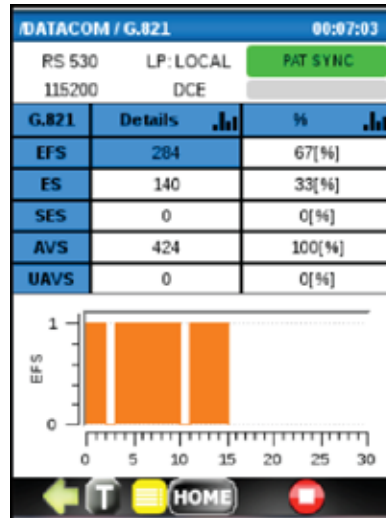
Select test Pattern and press **START** test.

The BERT screen shows:

- LOGIC (LGC) also called bit errors
- ERS errored seconds
- Number of Pattern Losses
- Check **Handshakes Rx** to verify if it is correct.



Press  to display the next screen with G.821 errors and %.

To see histogram of any error measurement, click on the corresponding error counter.



7.3 Test Results

Using and accessing the Test Result operation is identical for any DataScout™ 1G test set application. However, the data base of the test records is local for each application.

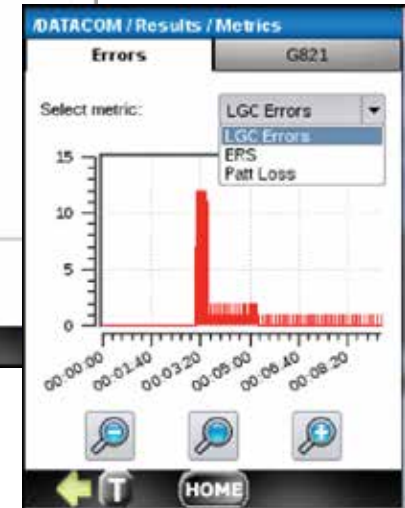
The first screen is a log of all tests that can be deleted or exported to a USB pen drive. To see details of the specific test record, highlight it and press  and observe the next screen that shows all recorded metrics. To see histograms of the key metrics, press  again and select the desired metric from the pull-down menu Errors or G.821.



Started	Stopped	Test
2013-04-16 01:06:18	2013-04-16 05:31:05	BERT RS-530
2013-04-15 10:59:58	2013-04-15 11:00:15	PDL RS-530
2013-04-15 10:50:17	2013-04-15 10:59:48	BERT RS-530
2013-04-15 18:29:15	2013-04-15 18:29:18	BERT RS-230
2013-04-15 18:29:02	2013-04-15 18:29:08	BERT RS-230
2013-04-15 18:00:01	2013-04-15 18:00:09	BERT RS-230
2013-04-15 17:59:39	2013-04-15 17:59:53	BERT RS-230

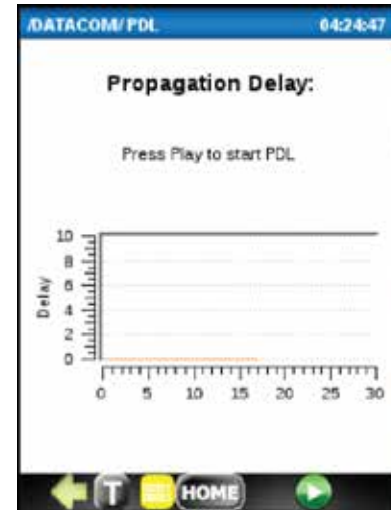


DATACOM / Results / Total	
Errorred Seconds	3
ES Rate	0.02
Pattern Loss	0
Pattern Loss Rate	888.00
G821 EFS	15884
G821 ES	3
G821 SES	0
G821 AVS	15887
G821 UAVS	0
G821 EFS Rate	99.98
G821 ES Rate	0.02
G821 SES Rate	0.00



7.4 Propagation Delay Test (PDL)

Press **Start** to begin a Propagation Delay test. The function will calibrate the connection and then display propagation results, including the numeric value and a histogram of the measurement.



8. IEEE C37.94 Option – DS1G-SW-C37

8.1 IEEE C37.94 Teleprotection

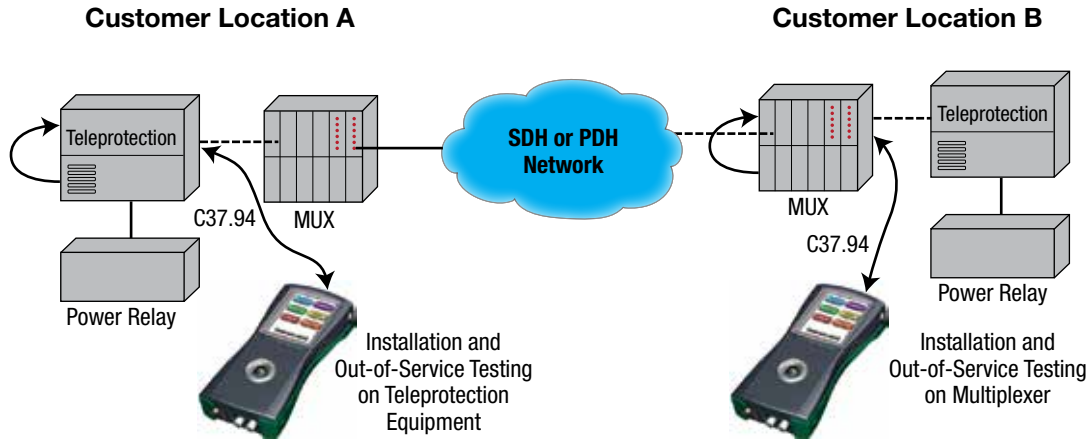
Power lines have redundancy. Relays switching the redundant lines are controlled by multiplexers and teleprotection circuits. Fiber optic lines are preferred over copper lines to connect this equipment due to their immunity to electrical noise.

In a typical teleprotection telecom network using IEEE C37.94 optical links, error free operation is of extreme importance to assure positive power relay closure/opening and reporting of this status.

A tester is needed to verify optical power and bit error free operation of the optical link between the data multiplexer and teleprotection equipment. In addition, data propagation delay should be measured.



The DataScout™ 1G test set C37.94 option provides all of these functions. The diagram below shows two typical loop tests originating from the tester.



8.2 C37.94 Option – Introduction

The C37.94 option installed in the DataScout™ 1G test set is intended for monitoring, testing, and troubleshooting of IEEE C37.94 optical link. The SFP optical module is 850 nm multimode transceiver. The SFP specification is shown in the “Technical Specifications” section of this manual.

The SFP receptacle is shared with other applications using the SFP optical modules such as the DS1G-SW-BAS and DS1G-SW-ADV.

8.3 Description

Upon Power Up the display starts with the main menu that is shared with all other applications installed. Press the **C97.34** button to initiate this application.

The Main Menu provides access to three test menus and setup menu described in detail in subsequent paragraphs:

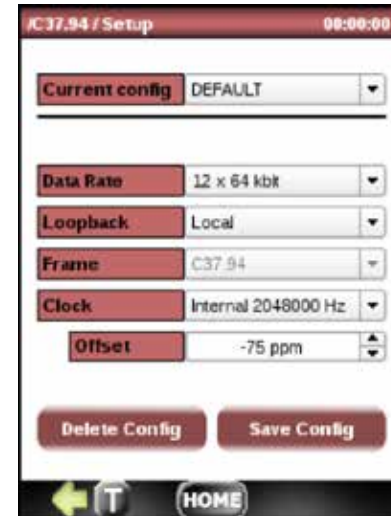
- BERT
- PDL
- OPTICAL POWER



8.4 SETUP

Test Setup consists of seven steps:

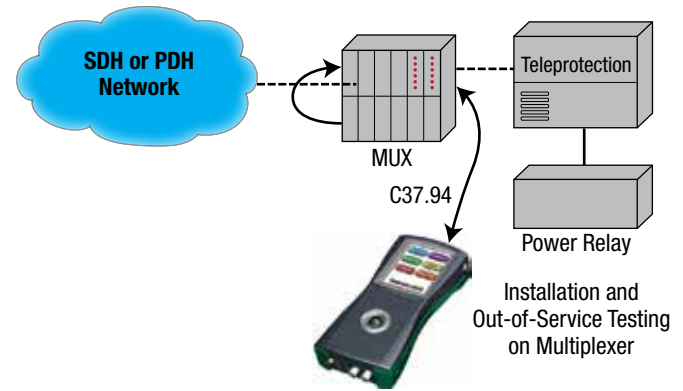
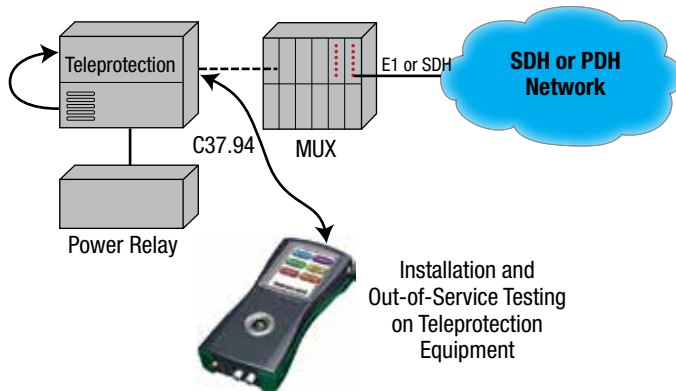
1. Choose setup configuration from the list of previously saved ones or leave the default.
2. Choose Data Rate as a multiple of $n \times 64$ kbps, where $n=1 \dots 12$
3. For normal operation leave Loopback Off or choose between Local Loop and Remote Loop.
4. Frame is always C37.94.
5. Choose Transmit clock source from Internal or Recovered (from received optical signal).
6. If Internal Clock is selected, there is an option to introduce offset in ± 1 ppm from -127 ppm to +127 ppm. This clock is useful for stressing clock recovery circuits in customer equipment, as the standard clock deviation is within ± 50 ppm.
7. Save this configuration if desired.



8.5 BERT Connection

There are two typical Bit Error Test connections:

1. DataScout™ 1G test set is terminating the teleprotection equipment which is looped, via the optical link, as shown on the network diagram below.
2. DataScout™ 1G test set is terminating the multiplexer equipment which is looped, via the optical link, as shown on the network diagram below.



8.6 BERT Test

Step 1.

Assuming that the SETUP Loopback is set to OFF, the BERT test pattern should be selected from the following by scrolling the list left or right: All 0's, All 1, 1:3, 1:7, 1:15, 1:31, 63, 511, 2047, 2-15-1, 2-20-1, 2-21-1.

Note: The selected pattern will be transmitted continuously even if the test is stopped, and other measurements are running, like Optical Power menu.

Step 2.

Select the measurement you want to see on a histogram by tapping the corresponding field.

Step 3.

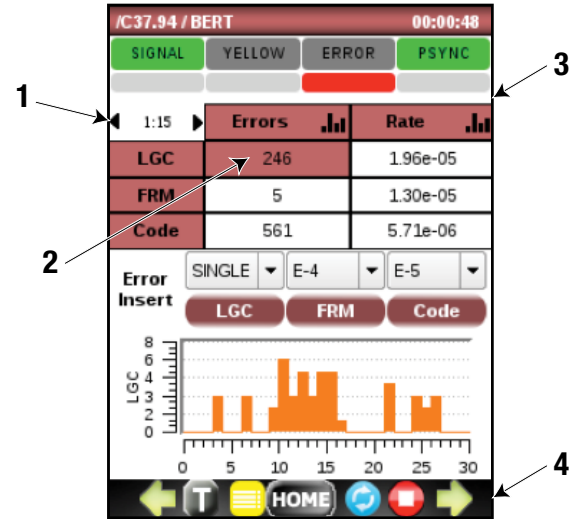
Clear History LEDs if needed.

Step 4.

Press  to begin BERT test.

Step 5.

At this point all error counters should reset to 0's and the test timer should start counting test seconds.




Step 6.


To verify the proper BERT test connection, press the LGC error injection button once under the LGC section of the ERROR injection menu to force one bit error. If the LGC error shows up, the connection is verified.


Optionally, a constant bit error rate can be injected. To do that, open the pull-down menu for the LGC Error Insert and select from 10-2 10-9 rate, and then press the LGC button.

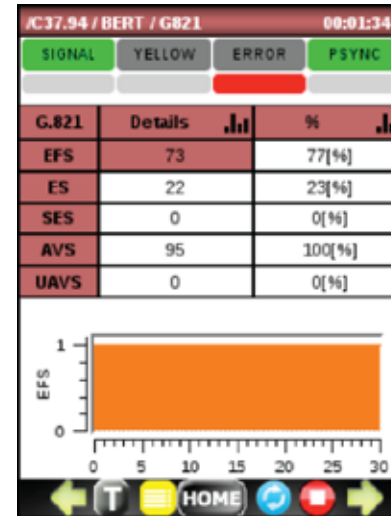
Step 7. After confirmation that the injected SINGLE errors or RATE were counted, press **Stop** and **Start** again to clear all counters.

Step 8. Observe the BERT counters for errors on the G.821 screen by pressing .


Step 9. Select the desired histogram by tapping the desired error field.

Step 10. The test results are constantly recorded in the memory and can be viewed after stopping the test and pressing the  button.

To view alarm status or simulate alarms, press .



8.7 ALARM Monitoring and Simulation

To see the Alarms screen, press  on the G.821 screen above.

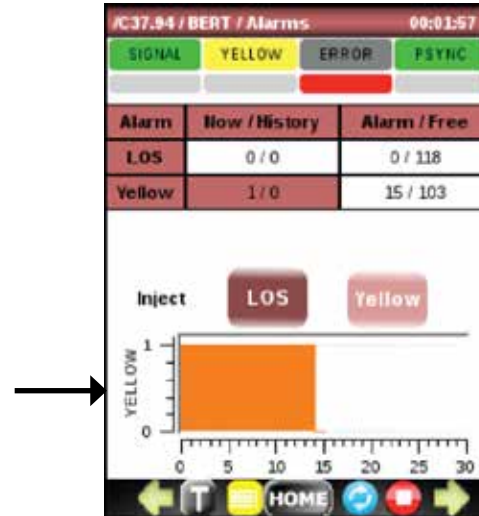
There are two alarms reported on the LED bar:

- LOS (Loss of Signal) – green LED + green history LED
- Yellow (Remote Alarm) – yellow LED + yellow history LED

These alarms can also be simulated by pressing the corresponding buttons **LOS** and **Yellow**.

To view a histogram of the alarm, tap the corresponding field in the results table; an example here shows a histogram for Yellow alarm.

To view Traffic Monitoring screen, press  .



8.8 Live Traffic Monitoring

To view Traffic Monitoring screen, press  .

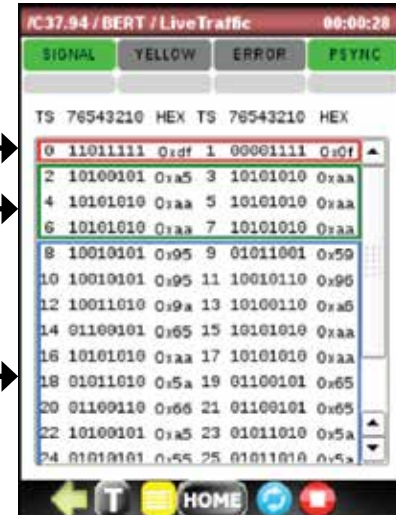
Each C37.94 frame has 32 bytes (timeslots), numbered on the Live Traffic screen from 0 to 31.

- Bytes 0-1 is Header
- Bytes 2-7 is Overhead
- Bytes 8-31 is Channel Data
 - ▶ Channel Data can be 1-12 bytes long; e.g., 1 byte corresponds to 64 kbps and 12 bytes to 720 kbps
 - ▶ Each data bit is followed by complement bit; therefore, at 12 bytes the total number of used bytes in the frame is 24 (8-31 timeslots)

Framing
2 bytes

Overhead
6 bytes

User data
from 2-24
bytes



8.9 Optical Power and SFP ID

Optical Power function provides two types of information:

1. SFP details:

- ▶ vendor name
- ▶ part #
- ▶ serial #
- ▶ wavelength
- ▶ LOS
- ▶ SFP presence
- ▶ SFP Tx Fault
- ▶ CDR Sync

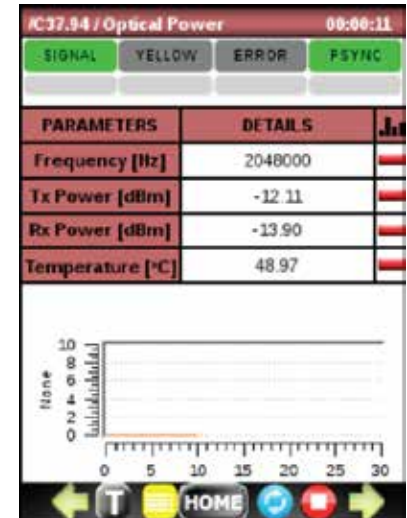
PARAMETERS	DETAILS
Vendor	HONLUS
Part Number	HOLS-P1850-LD
Serial Number	E2DAN12500107
Wavelength	850 nm

ALARM	STATE
SFP LOS	<input type="checkbox"/>
SFP Exist	<input type="checkbox"/>
SFP Tx Fault	<input type="checkbox"/>
CDR Sync	<input type="checkbox"/>

Second Screen

2. Optical receiver:

- ▶ clock frequency
- ▶ optical power of Tx
- ▶ optical power of Rx
- ▶ histogram of one of the above as selected



First Screen


To get these results, press button.

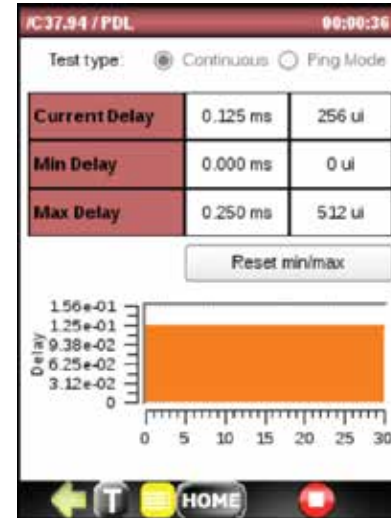
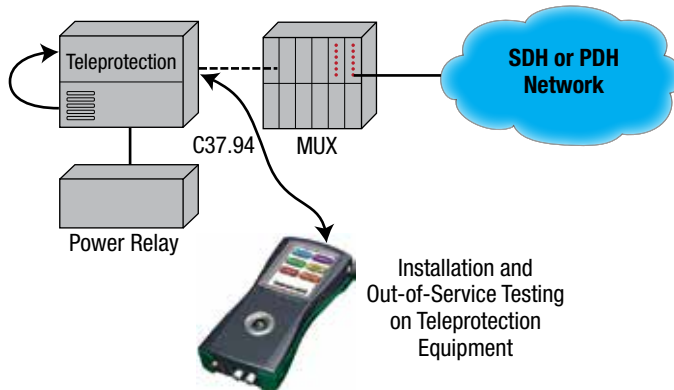
8.10 Propagation Delay Test

The propagation delay will measure the round trip delay of the signal sent from the DataScout™ 1G test set and returned to it via a loop. Example is shown below.


PDL has two operating modes which differ in precision and refreshing intervals.

- Continuous: Data is sent continuously, measurement precision is 125 us.
- Ping Mode: Data is sent and the round trip delay measured once per second.

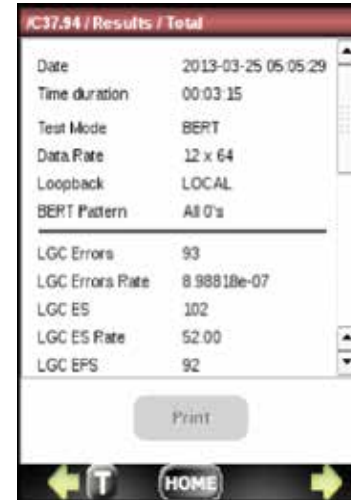
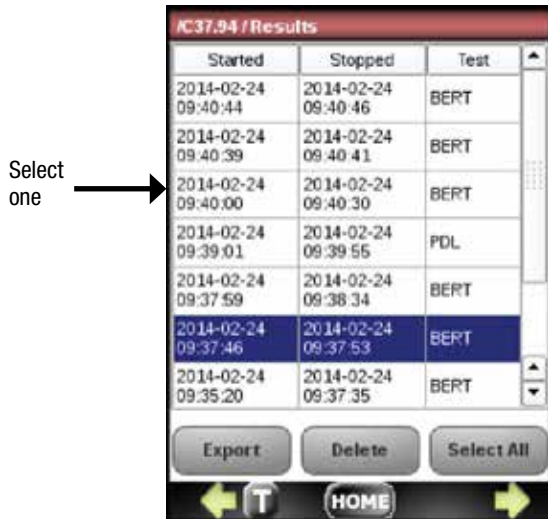
To start the test, connect the test set as shown, open PDL menu, and press  button.




8.11 C37.94 Test Results Storage, Viewing, and Transferring

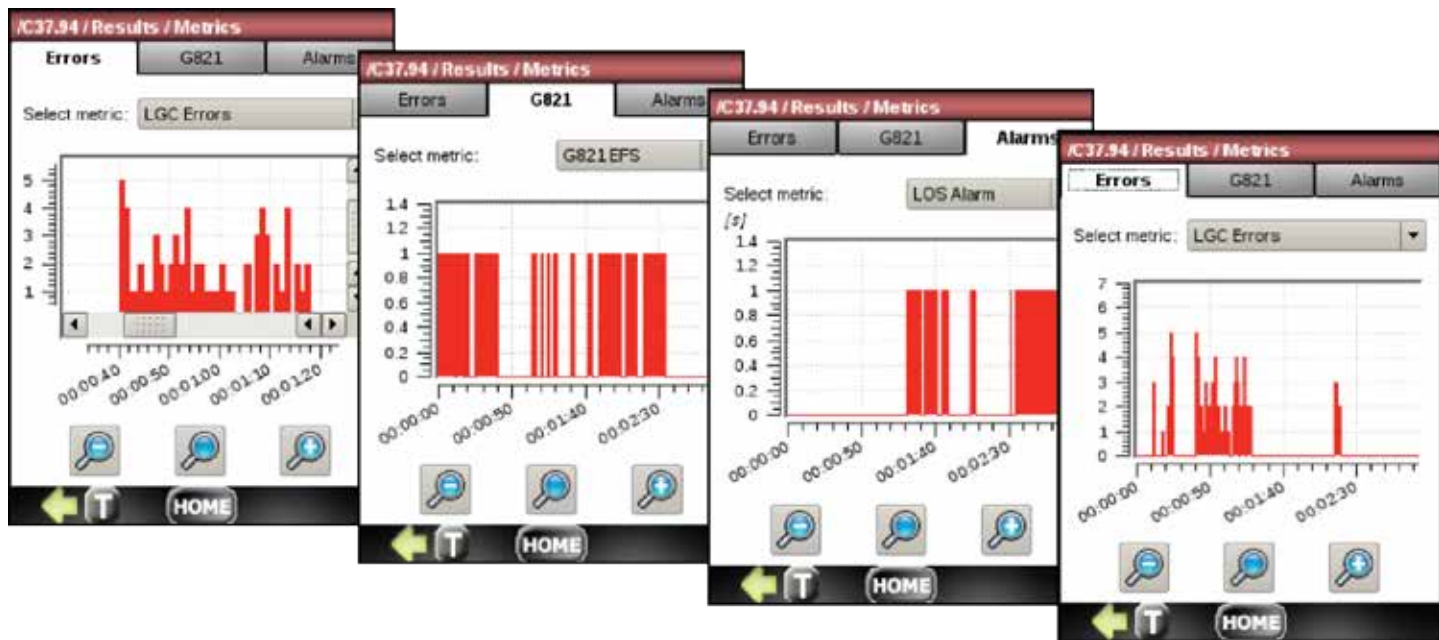
The Test Results  menu shows a log of all tests. To export it to the USB flash memory, press **EXPORT**, plug pen drive in the mini USB connector using the provided adapter cable, and follow the screen prompt to export the file.

To view details, highlight the desired test record and press  .



To see a histogram of specific measurements, select it and click  .

Here are some examples of histograms available:

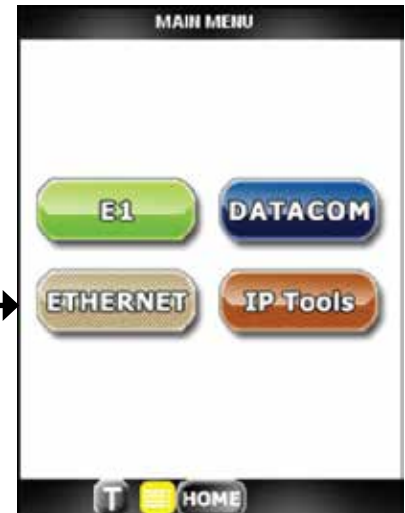


9. Gigabit Basic Option – DS1G-SW-BAS

9.1 Introduction

Selecting ETHERNET on the main menu displays the main screen of this option. The DS1G-SW-BAS provides the following test features:

- Wiremap
- Loopback
- BERT
- RFC-2544



Select

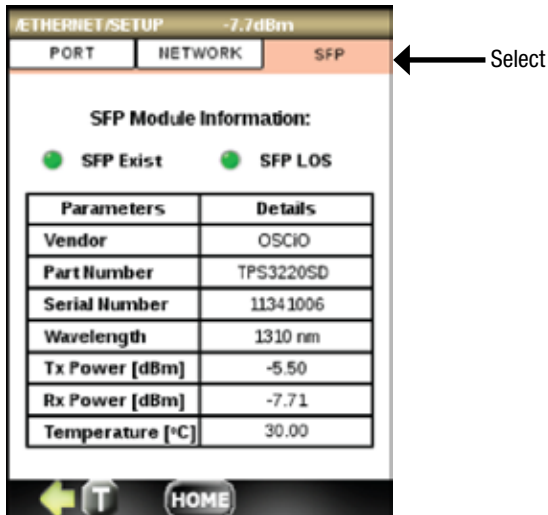


9.2 Global Setup

Press the SETUP button to enter this menu. The SETUP menu provides global settings for the above four test features.

9.2.1 SFP Identity

To identify the SFP device plugged into the tester SFP socket, press SFP tab and verify it.



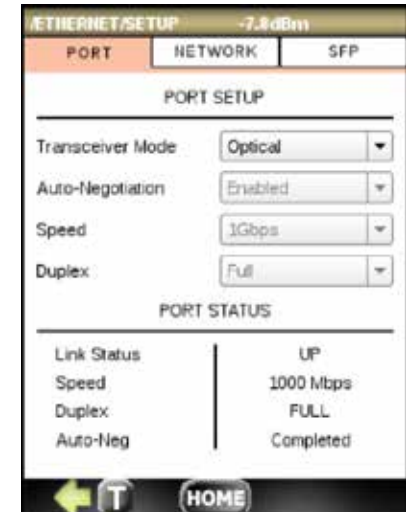
9.2.2 PORT SETUP and PORT STATUS

Select PORT to set up:

- Transceiver Mode: optical or electrical
- Auto-Negotiations: enabled or disabled
- Speed: 10 Mbps, 100 Mbps, 1 Gbps or Auto
- Duplex: Full, Half, Auto

PORT STATUS shows:

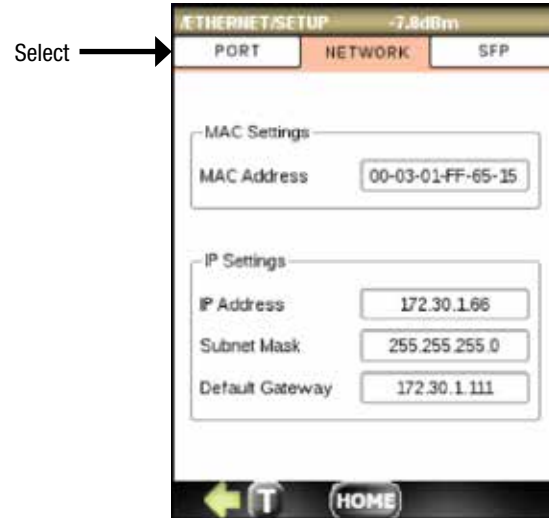
- Link Status UP or DOWN
- Speed set
- Duplex used
- Auto-negotiations in progress or completed



9.2.3 Network Parameters

NETWORK menu allows selection of:

- MAC Address
- IP Address
- Subnet Mask
- Default Getaway



9.3 Wiremap of Ethernet Cable

While not required by IEEE 802.3-2004, Ethernet cable diagnostics are commonly used. This feature is considered very important by a majority of the PHY vendors.

The feature provides extensive network and cable operating and status information:

- Cable length of properly terminated cable
- Cable termination mismatch, including short and open states
- Identification of which cable pair (A, B, C, D) is improperly terminated
- Coupling between cable pairs

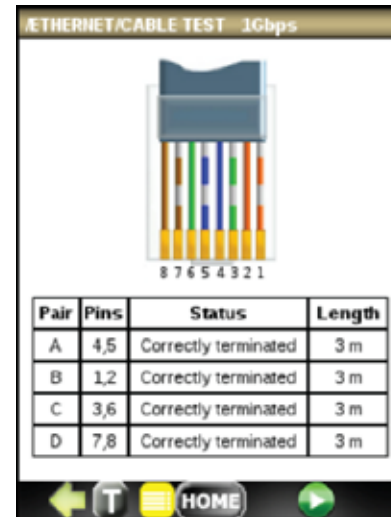
If a link is established in 10BASE-T or 100BASE-T mode, unused cable pairs 4-5 and 7-8 are not tested.

Note: Due to the legacy 10BASE-T hardware constraints, the cable length cannot be reliably determined when the cable is connected to a remote PHY in 10BASE-T Half-Duplex mode.

9.3.1 Fundamentals

This feature uses the Vitesse internal DSP of the PHY that can investigate the input signal characteristics in order to detect the link quality.

The WIREMAP software suite compares the signal received at the PHY device to the link partner transmit signal (defined by the standard) to determine the characteristics of the specific CAT-5 cable.



9.3.2 Information Provided

When properly terminated, the WIREMAP reports the approximate cable length (in meters) for each of the four cable pairs A, B, C, and D, the operation range being between 7 and 140 meters with 5-meter accuracy.

Cable Termination

Proper termination of the CAT-5 cable requires 100 ohm differential impedance between the positive and negative cable terminals. The IEEE 802.3 standard allows for a termination of as high as 115 ohm or as low as 85 ohm. If the termination falls outside of an accepted termination range, it will be reported as anomalous by the WIREMAP cable diagnostics.

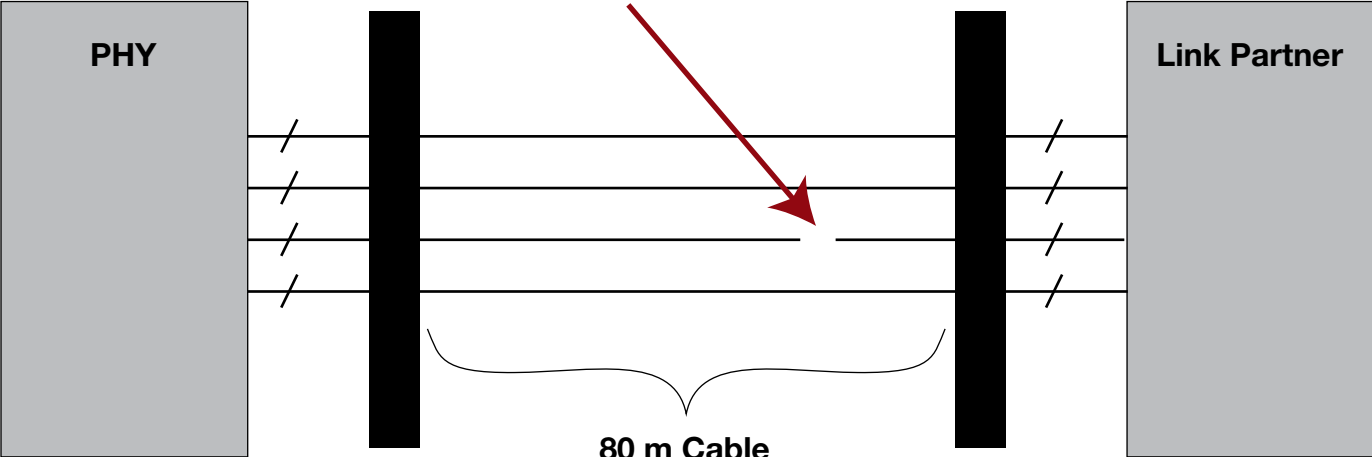
Open or shorted states on each of the cable pairs (A, B, C, D) are also recognized and their location determined with 8-meter accuracy.

Coupling between Cable Pairs

Shorted wires, improper termination, or high crosstalk resulting from an incorrect wire map can cause anomalous coupling between cable pairs. All these conditions can prevent the PHY from establishing a link at any speed.

The WIREMAP feature can correctly identify a cross-pair short location up to 100 meters with 10-meter accuracy.

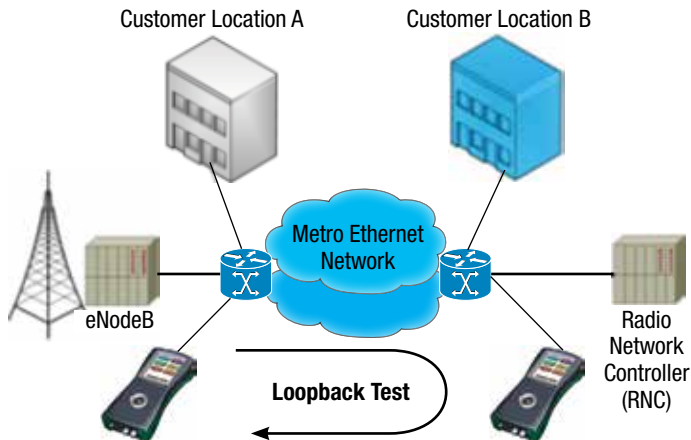
Fault found at 60 m on Pair C.



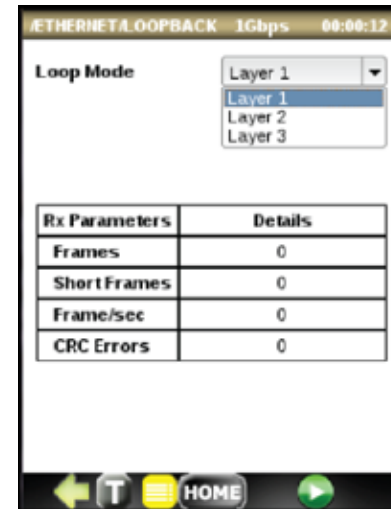
9.4 Loopback

The Loopback Regenerator is a feature of the DS1G-SW-BAS option that allows looping back to the sender Ethernet traffic on Layer 1, Layer 2, and Layer 3.

- Looping on Layer 1 is an equivalent of hardware cable loop. 100% of the Ethernet signal is looped. This feature can be used in place of the cable loop.
- Looping Layer 2 swaps src. MAC and dst. MAC.
- Loop Layer 3 swap src. MAC and dst. MAC, also swap src. IP and dst. IP.



To start Looping Regenerator, select the Layer and press the **START** button.



To stop the loop, press the **STOP** button.

9.5 BERT

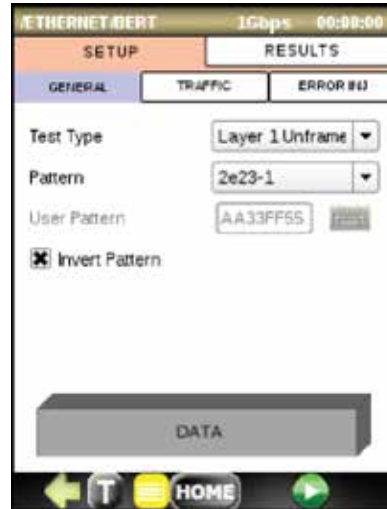
9.5.1 Overview

Ethernet Bit Error Rate Testing (BERT) is an important test when provisioning or troubleshooting Ethernet services. The DS1G-SW-BAS option provides the ability to generate a single stream of Ethernet traffic up to layer two (MAC) to test basic Ethernet services. Testing can be performed with fixed, pseudo random, or user-defined patterns.

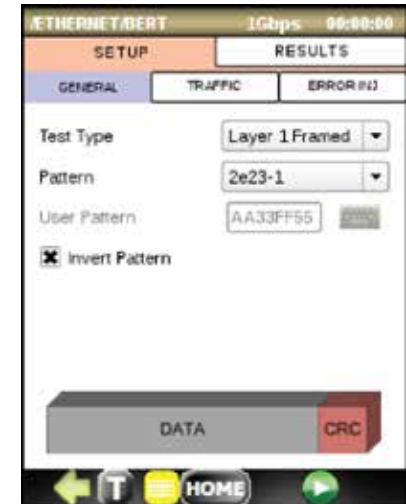
Multiple stream generation (8) and Layer 3 is available separately by activating the DS1G-SW-ADV test option.

The following framing options are available:

- Layer 1 Unframed – The entire bit stream is filled with selected test pattern).
- Layer 1 Framed – The selected test pattern is encapsulated within SOF, Preamble and CRC header/footer).



Layer 1: Unframed



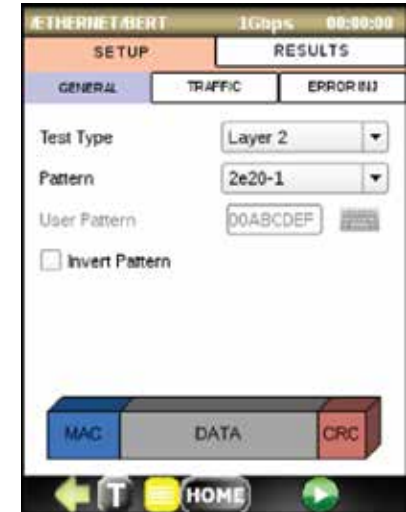
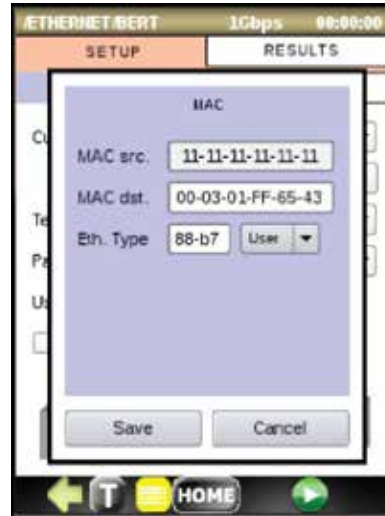
Layer 1: Framed

- Layer 2 Framed – Standard 802.3 Ethernet framing protocol is used. Selected BERT pattern is encapsulated with MAC (Media Access Control) address, in addition to SOF, Preamble, and CRC. The default MAC value is configured via the SETUP menu (global setup).

9.5.2 BERT Setup

GENERAL Menu

- Select Layer from pull-down window.
- Select test pattern from the pull-down window. If User Pattern is chosen, click on the keyboard icon and edit the pattern.
- For Layer 2, select Source and Destination MAC by tapping on the color frame box and enter both MACs.
- Enter Ethernet Type as either IP or User Defined and **Save** this screen.



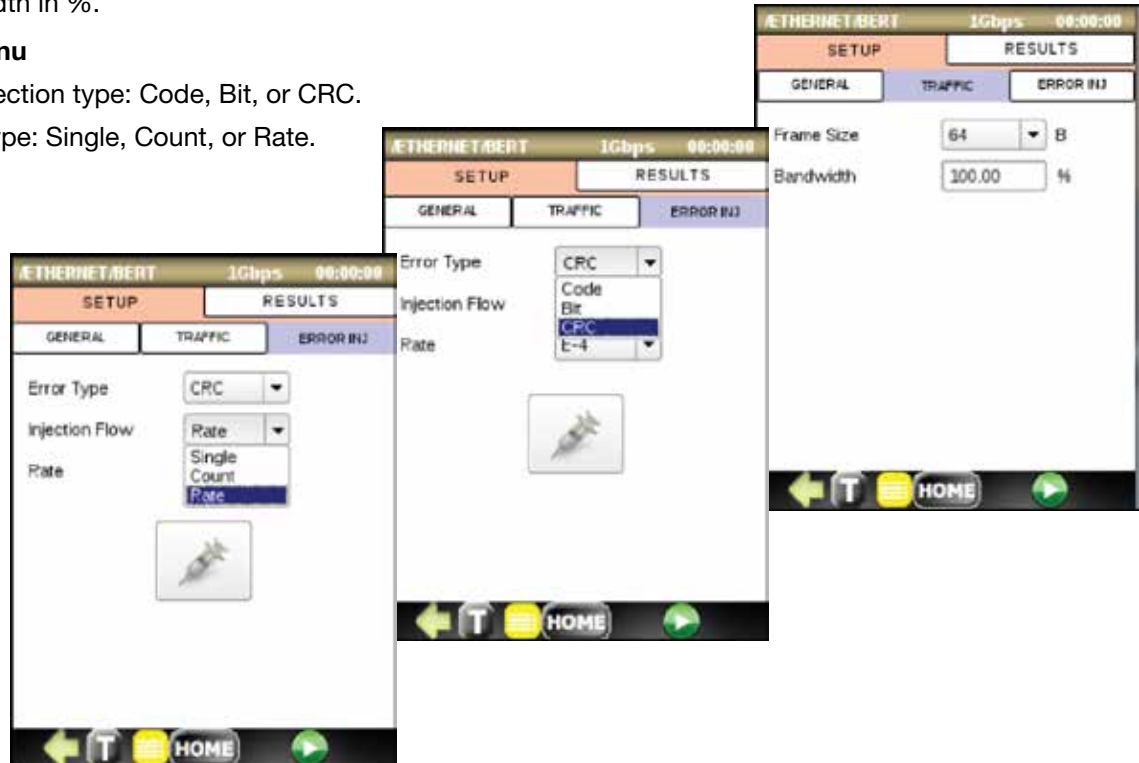
Layer 2


TRAFFIC Menu

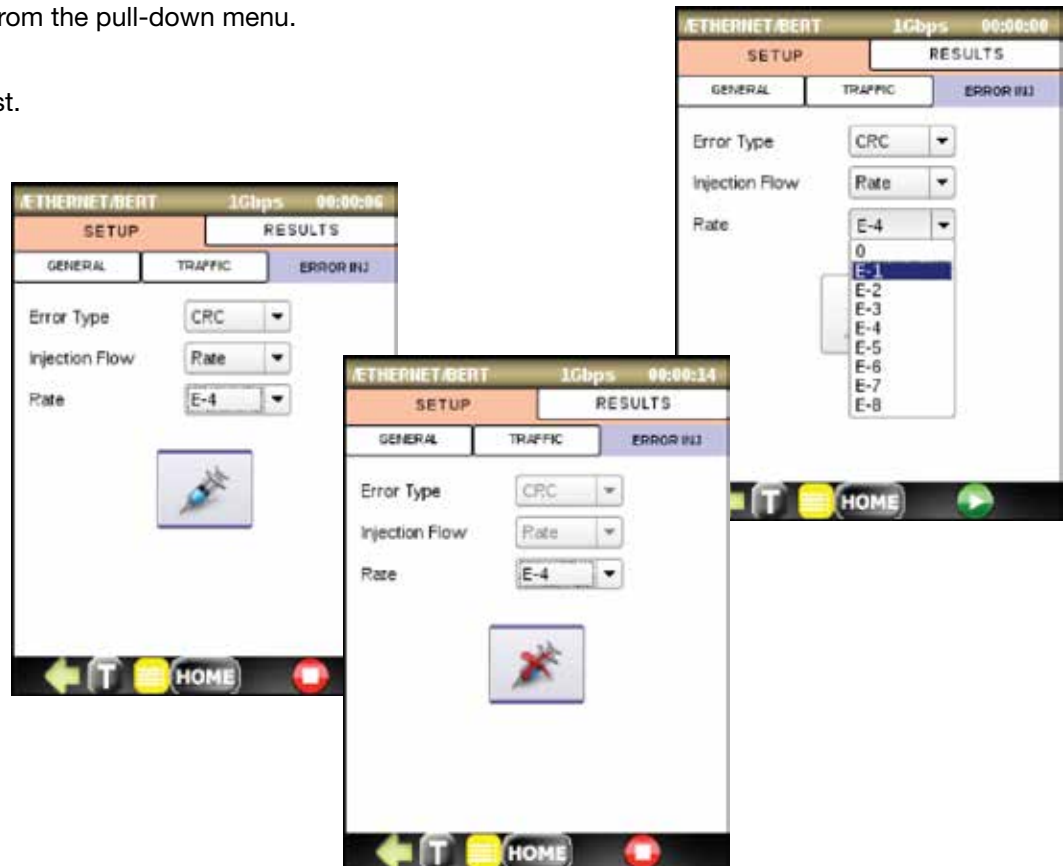
- Select Frame Size: 64, 128, 256, 512, 1024 or 1536.
- Select desired Bandwidth in %.

ERROR INJECTION Menu

- Select desired error injection type: Code, Bit, or CRC.
- Select Injection Flow type: Single, Count, or Rate.



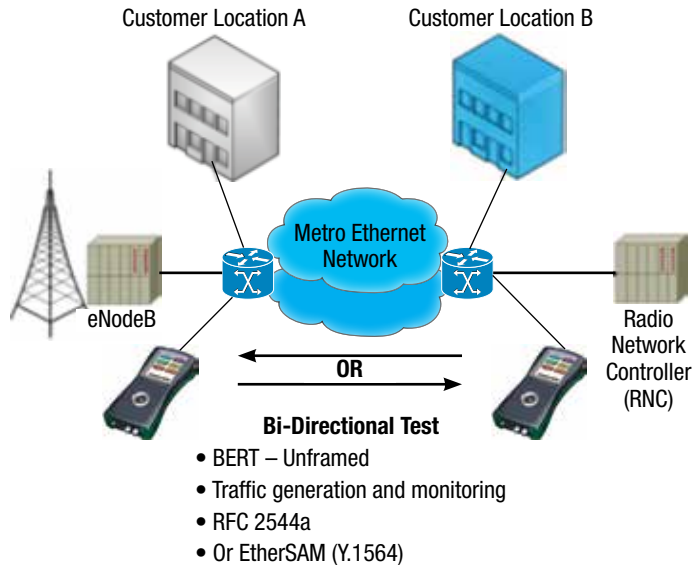
- If Rate is chosen, select one from the pull-down menu.
- Press  to start the BERT test.
- Tap on the syringe icon to start Error injection. For single error injection, tap for each error. The syringe changes color from blue to red.



9.5.3 Running BERT Test

End-to-End BERT Test

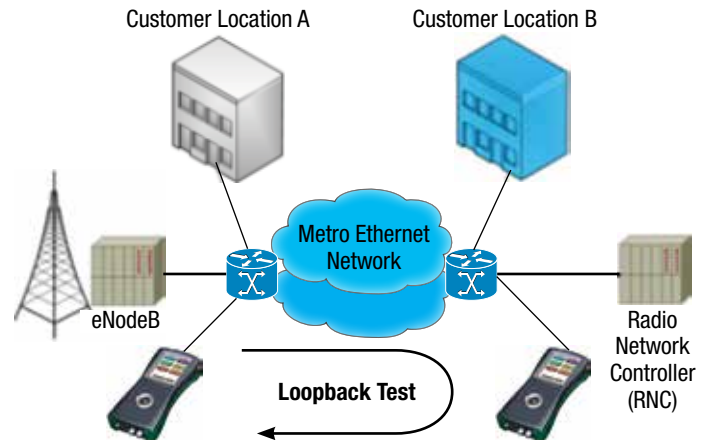
The end-to-end BERT test is to be performed between identical DataScout™ 1G testers. The setup should have the same BERT pattern.




Loopback BERT Test

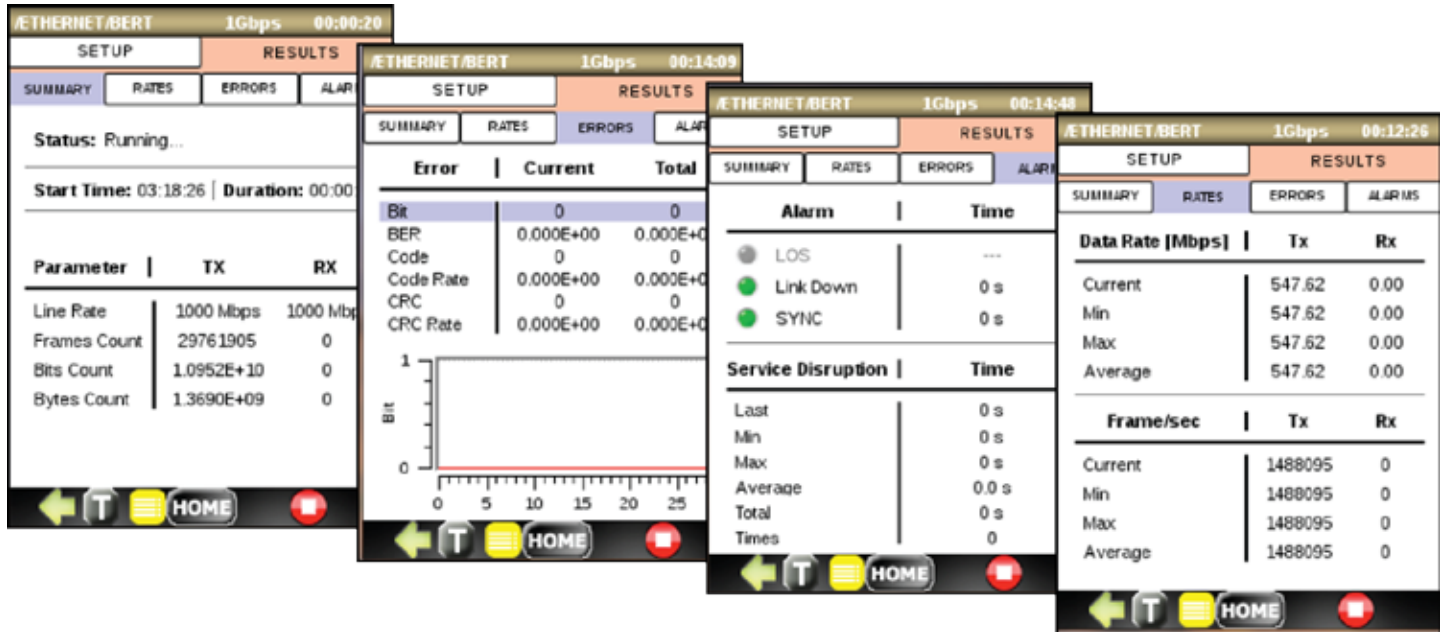
The Loopback test requires the second tester (DataScout™ 1G test set or another) to be configured as the loopback device at the far end.

- For Layer 1 Unframed BERT, select Layer 1 on the Looping Regenerator of the second DataScout™ 1G test set.
- For Layer 2 BERT, select Layer 2 on the Looping Regenerator.



Running BERT Test

Press  and observe RESULTS on the four tabs: SUMMARY, RATES, ERRORS, ALARMS.



The image displays four sequential screenshots of the BERT test interface, each showing a different tab of the test results.

Screenshot 1: SUMMARY
Title: /ETHERNET/BERT 1Gbps 00:00:20
Status: Running...
Start Time: 03:18:26 | Duration: 00:00
Table:

Parameter	TX	RX
Line Rate	1000 Mbps	1000 Mbps
Frames Count	29761905	0
Bits Count	1.0952E+10	0
Bytes Count	1.3690E+09	0

Screenshot 2: ERRORS
Title: /ETHERNET/BERT 1Gbps 00:14:09
Table:

Error	Current	Total
Bit	0	0
BER	0.000E+00	0.000E+00
Code	0	0
Code Rate	0.000E+00	0.000E+00
CRC	0	0
CRC Rate	0.000E+00	0.000E+00

Graph: Bit vs Time (0-25). The y-axis is labeled 'Bit' and ranges from 0 to 1. The x-axis is labeled 'Time' and ranges from 0 to 25. The graph shows a flat line at 0.

Screenshot 3: ALARMS
Title: /ETHERNET/BERT 1Gbps 00:14:48
Table:

Alarm	Time
LOS	---
Link Down	0 s
SYNC	0 s

Table:

Service Disruption	Time
Last	0 s
Min	0 s
Max	0 s
Average	0.0 s
Total	0 s
Times	0

Screenshot 4: RATES
Title: /ETHERNET/BERT 1Gbps 00:12:26
Table:

Data Rate [Mbps]	Tx	Rx
Current	547.62	0.00
Min	547.62	0.00
Max	547.62	0.00
Average	547.62	0.00

Table:

Frame/sec	Tx	Rx
Current	1488095	0
Min	1488095	0
Max	1488095	0
Average	1488095	0

9.6 RFC 2544 Conformance Testing

9.6.1 Fundamentals

The RFC 2544 conformance testing was introduced as a method to benchmark interconnected network devices. Because of its ability to measure throughput, burstability, frame loss, and latency, this methodology is also used to test Ethernet-based networks and is now the de facto standard when benchmarking an Ethernet network. The test methodology defines the different frame sizes to be tested (64, 128, 256, 512, 1024, 1280, and 1518 bytes), the test time for each test iteration [should be set to at least 60 or 120 seconds (latency)], the frame format (IP/UDP), etc.

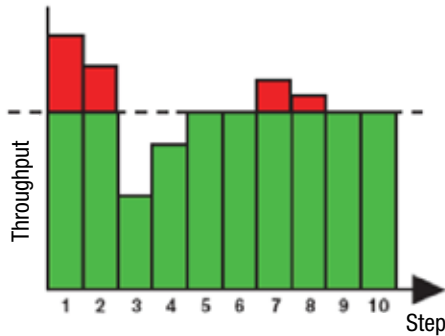
The throughput test allows the technician to obtain the maximum rate at which none of the offered frames are dropped by the device/system under test (DUT/SUT). This measurement translates the obtained rate into the available bandwidth of the Ethernet virtual connection.

The latency test (for store-and-forward devices) refers to the time interval that begins when the last bit of the input frame reaches the input port and ends when the first bit of the output frame is seen on the output port. It is the time taken by a bit to go through the network and back. Latency variability can be a problem. With protocols like VoIP, a variable or long latency can cause degradation in voice quality.

The frame loss test calculates the percentage of frames that should have been forwarded by a network device under steady state (constant) loads that were not forwarded due to lack of resources. This measurement can be used for reporting the performance of a network device in an overloaded state, as it can be a useful indication of how a device would perform under pathological network conditions such as broadcast storms.

The burstability or back-to-back test refers to the fixed length of frames that are presented at a rate such that there is the minimum legal separation for a given medium between frames (maximum rate) over a short to medium period of time, starting from an idle state. The test result provides the number of frames in the longest burst that the device or network under test will handle without the loss of any frames.

The RFC 2544 methodology was created to assess different parameters found in service-level agreements. By providing performance availability, transmission delay, link burstability and service integrity measurements, a carrier can certify that the working parameters of the delivered Ethernet circuit comply with the contract.

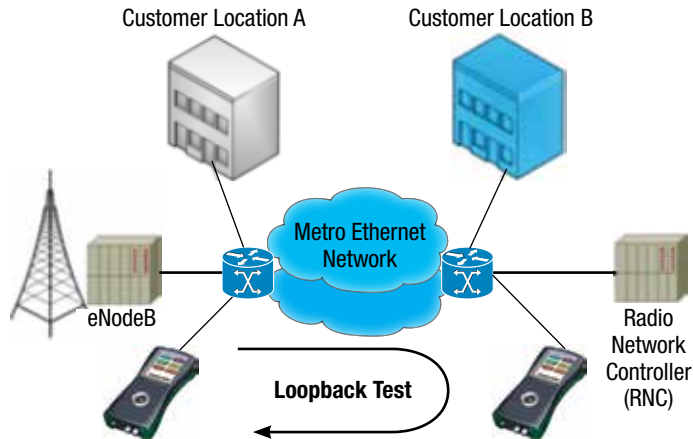


Trial	Tx Rate	Pass/Fail
1	100%	Fail
2	80%	Fail
3	40%	Pass
4	60%	Pass
5	70%	Pass
6	75%	Pass
7	77.5%	Fail
8	76%	Fail
9	75%	Pass
Validation	75%	Pass

Example of Throughput Test

9.6.2 Single DataScout™ 1G or Dual DataScout™ 1G Test Scenario

The simplest RFC 2544 scenario is the loopback test where the loopback device can be another DataScout™ 1G test set in loopback mode on layer 2 or 3. In this mode the DataScout™ 1G test set running the RFC 2544 test is configured for SINGLE test set mode.

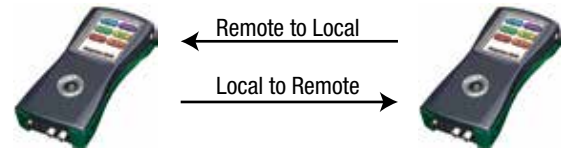


The dual test set approach is a more accurate test scenario. In this case, two units perform an asymmetrical SLA measurement, providing RFC 2544 results per direction. This scenario's main strength is that it quickly pinpoints which direction has not been configured properly or is at fault while providing performance metrics per direction.

Results from both directions are sent and displayed on the local unit. This ensures that the entire test routine can be completed by a single person in control of a single unit, providing shorter test time and reduced manpower. This flexibility also guarantees that different units can be set as a remote unit. The most interesting scenario is a

Customer Location A
DataScout™ 1G test set running
Local to Remote or Remote to Local
RFC 2544 test with all results here.

Customer Location B
DataScout™ 1G test set
responding as Remote to the
test set at Customer A.



centralized unit that is always configured as a remote unit with fixed addresses. The carrier can simply dispatch a single test person at a test site and the tester can quickly discover and execute service turn-up and burn-in efficiently and quickly without requiring an extra worker in the central office.

The dual test set approach also provides the capability to segment the network and quickly pinpoint in which direction issues occur. This is especially important where bandwidth is different between the upstream and downstream direction. In such a case, using a loopback tool will always yield the same results since the measurement

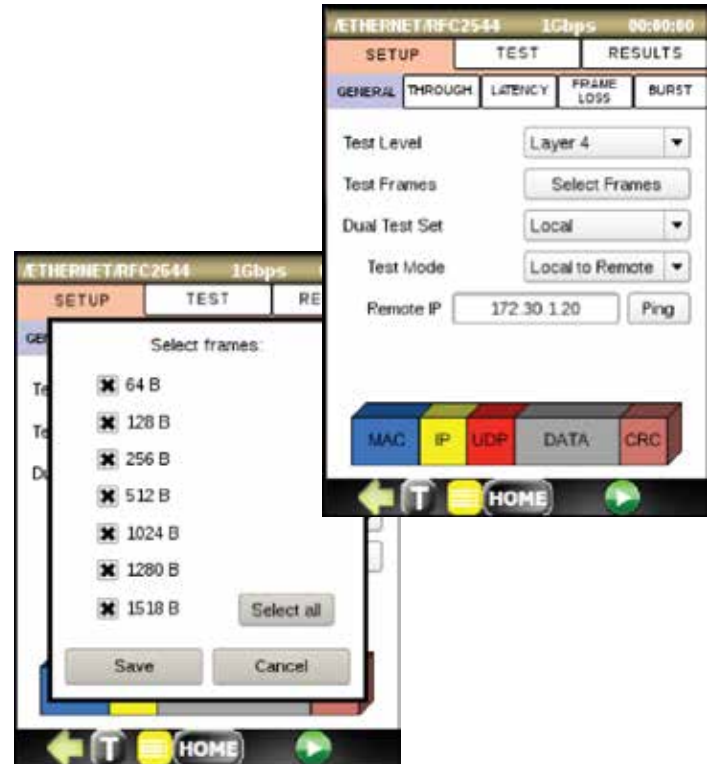
will be affected by the lowest throughput, and test results will not show that one direction has higher performance than the other. The same scenario will occur if a network misconfiguration is present in only one direction of the service. Depending on the error, the problem will not be identified with round-trip measurements. This often results in customer complaints and additional truck rolls. With the dual test set approach, both directions are independently analyzed at the same time and pass/fail results are provided per direction, yielding the highest level of confidence in service testing.

9.6.3 RFC 2544 Setup

The following settings have to be selected for RFC 2544 test:

GENERAL Tab

- Test Level (Layer 2, 3, or 4)
- Test Frames (64, 128, 256, 512, 1024, 1280, 1518)
- Dual Test Set mode (local*, remote*, disabled)
- Test Mode (local>remote*, remote>local*, bidirectional*)
- Remote IP address + PING button for verification
- Tap on MAC-IP-UDP boxes to set MAC and IP addresses, TTL, TOS, Protocol, Source, and Destination Ports



THROUGHput Tab

- Maximum Rate in %
- Accuracy in %
- Test duration in seconds
- Thresholds in %

The screenshot shows the THROUGHput configuration screen. At the top, it displays 'ETHERNET/RFC2544 1Gbps 00:00:00'. Below this are three tabs: 'SETUP', 'TEST', and 'RESULTS'. Underneath are five sub-tabs: 'GENERAL', 'THROUGH', 'LATENCY', 'FRAME LOSS', and 'BURST'. The 'THROUGH' sub-tab is selected. The main area contains a checked checkbox for 'Enable throughput test'. Below this are four input fields: 'Max rate' set to 100.00 %, 'Accuracy' set to 10.0 %, 'Test duration' set to 2 sec, and 'Threshold' set to 60.00 %. At the bottom is an Android-style navigation bar with a back arrow, a 'T' icon, a 'HOME' button, and a play button.

LATENCY Tab

- Maximum Rate in %
- Repetitions
- Test duration in seconds
- Thresholds in microseconds

The screenshot shows the LATENCY configuration screen. At the top, it displays 'ETHERNET/RFC2544 1Gbps 00:00:00'. Below this are three tabs: 'SETUP', 'TEST', and 'RESULTS'. Underneath are five sub-tabs: 'GENERAL', 'THROUGH', 'LATENCY', 'FRAME LOSS', and 'BURST'. The 'LATENCY' sub-tab is selected. The main area contains a checked checkbox for 'Enable latency test'. Below this are five input fields: 'Max rate' set to 100.00 %, a checkbox for 'Copy from throughput' which is unchecked, 'Repetitions' set to 1, 'Test duration' set to 1 sec, and 'Threshold' set to 12 us. At the bottom is an Android-style navigation bar with a back arrow, a 'T' icon, a 'HOME' button, and a play button.

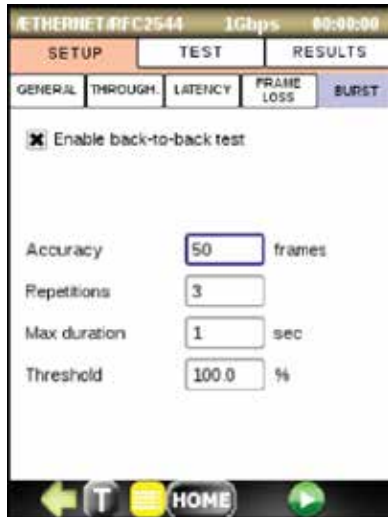
FRAME LOSS Tab

- Maximum Rate in %
- Step Size in %
- Test duration in seconds
- Thresholds in microseconds


The screenshot shows the FRAME LOSS configuration screen. At the top, it displays 'ETHERNET/RFC2544 1Gbps 00:00:00'. Below this are three tabs: 'SETUP', 'TEST', and 'RESULTS'. Underneath are five sub-tabs: 'GENERAL', 'THROUGH', 'LATENCY', 'FRAME LOSS', and 'BURST'. The 'FRAME LOSS' sub-tab is selected. The main area contains a checked checkbox for 'Enable frame loss test'. Below this are four input fields: 'Max rate' set to 100.00 %, 'Step size' set to 10 %, 'Test duration' set to 1 sec, and 'Threshold' set to 30.00 %. At the bottom is an Android-style navigation bar with a back arrow, a 'T' icon, a 'HOME' button, and a play button.

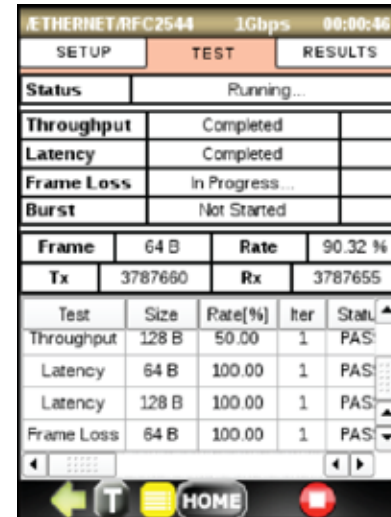
BURST (back-to-back) Tab

- Accuracy in frames
- Repetitions
- Maximum duration in seconds
- Threshold in %



9.6.4 Running RFC 2544 Test

- Press  to run the RFC 2544 test.
- Observe Subtest Status that should be “In Progress...”.
- Observe status of the RFC 2544 test propagation through Throughput, Latency, Frame Loss, and Burst.



9.6.5 RFC 2544 Test Results Viewing

The following eight screenshots present test results from the four RFC 2544 tests: Throughput, Latency, Frame Loss, and Burst (back-to-back).

The results are presented in numeric form in the corresponding tables or in the histogram form as shown in the last four screenshots.


The screenshots show the following test results for 1Gbps Ethernet:

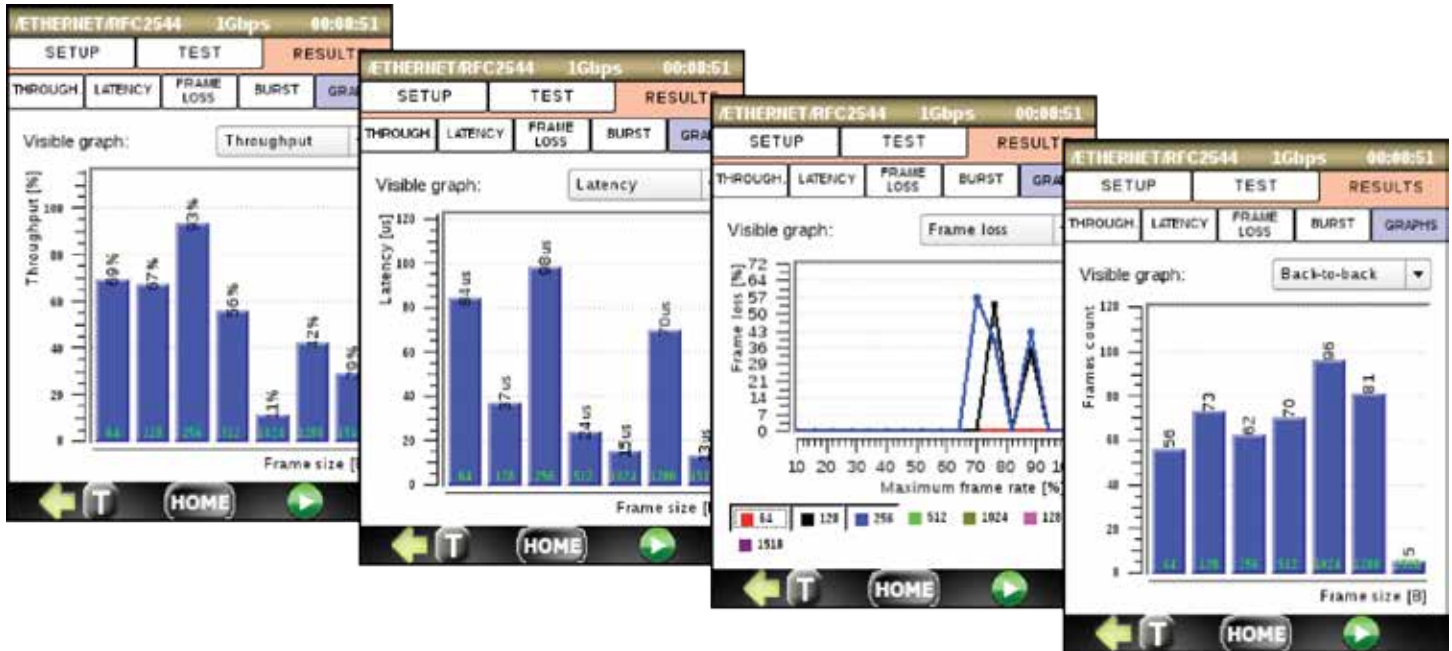
Frame Size	FrLoss [%]	Status
64	<0.01	PASS
128	<0.01	PASS
256	<0.01	PASS
512	23.31	FAIL
1024	<0.01	PASS
1280	16.18	PASS
1518	0.00	PASS

Frame Size	Latency [ms]	Status
64	12.391	PASS
128	65.992	FAIL
256	41.066	FAIL
512	72.507	FAIL
1024	35.189	FAIL
1280	52.308	FAIL
1518	55.191	FAIL

Frame Size	Through. [%]	Status
64	89.07	PASS
128	15.08	FAIL
256	61.91	PASS
512	53.77	FAIL
1024	55.99	FAIL
1280	52.38	FAIL
1518	94.63	PASS

Frame Size	Frame Count	Status
64	2976191	PASS
128	1689190	PASS
256	905798	PASS
512	469925	PASS
1024	239464	PASS
1280	192308	PASS
1518	162549	PASS

The same test results are recorded in the RESULTS  memory for viewing anytime or saving to the USB pen drive.



10. Advanced Gigabit Ethernet Test Option – DS1G-SW-ADV

10.1 Introduction

The DS1G-SW-ADV option enables the following test options:

- DS1G-SW-BAS functionality (refer to section 9)
- Traffic generation functionality
- Y.1564



10.2 Traffic Generator

10.2.1 Overview

The Traffic Generator test generates up to eight streams. The stream properties are configured independently for each stream. This test can be performed with Layer 2, Layer 3, or Layer 4 configurations with up to 2 VLAN tags.

The Traffic Generator measures simultaneously the following parameters:

- Received Frames count
- Transmitted Frames count
- Out-Of-Sequence
- Round Trip Latency

10.2.2 Traffic Generator Setup

PROFILE Tab

The Profile tab allows you to save and load user-defined test configuration.

To save current configuration data, tap the **Save** button and specify new or leave current profile name.

To load a specific profile that was saved previously, select its name from a combo box. After profile selection, configuration data will be automatically loaded.

To delete specific profile, select it from Current Profile combo box and tap **Delete** button. Note that you cannot delete DEFAULT profile, but only restore it to factory default when tapping the **Delete** button.

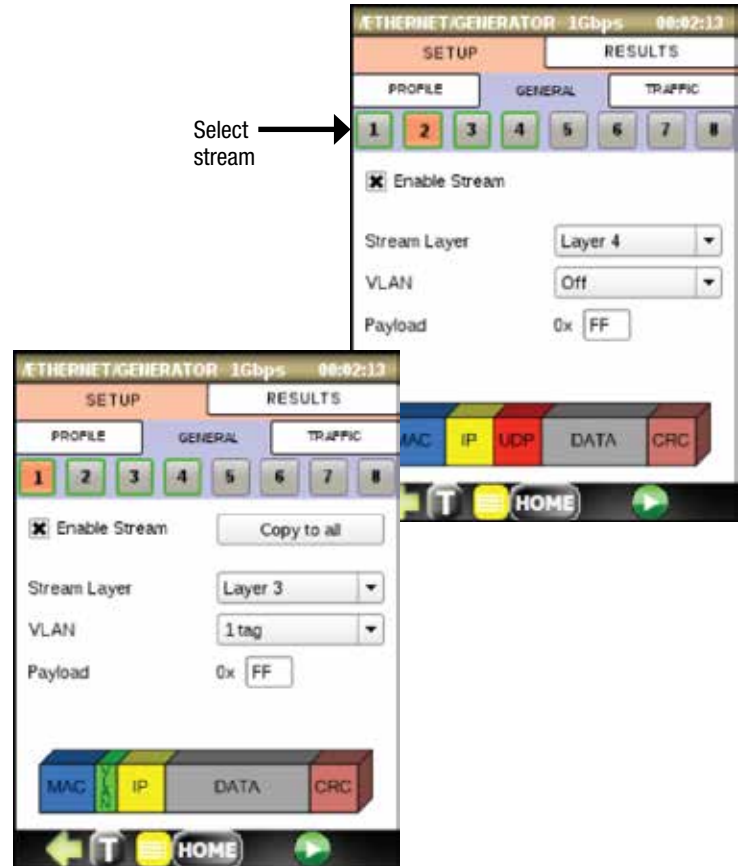


GENERAL Tab

Per stream setup:

- **Enable Stream:** Enable or disable current stream.
- **Stream Layer:** Select the frame structure of current stream. The choices are: Layer 2 (MAC), Layer 3 (MAC/IP), Layer 4 (MAC/IP/UDP).
- **VLAN:** Define number of VLAN tags in frame header. The choices are: Off, 1 tag, 2 tags.
- **Payload:** Define payload of frame in hexadecimal format.
- **Header setup:** Tap on frame box to set header parameters of each layer.





Press **Copy to all** button to copy first stream setup to other streams (2-8).



TRAFFIC Tab


Per stream setup:

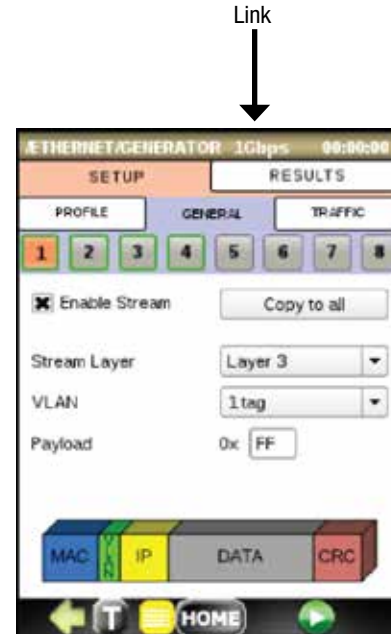
- **Frame Size:** 64, 128, 256, 512, 1024, 1280, or 1518 B.
- **Tx Rate:** % of interface Utilized Line Rate (URL).
- **Total Tx Rate:** Indicate sum of all enabled stream's Tx Rates (cannot exceed 100%).

Button	Meaning
	Stream disabled
	Stream disabled and selected
	Stream enabled
	Stream enabled and selected



10.2.3 Running Traffic Generator Test

- Do test setup or load proper test profile on PROFILE tab.
- Make sure that at least one stream is enabled.
- Ensure that link is up in the top status bar.
- Press  to run the Traffic Generator test. RESULTS tab will be automatically displayed.
- Observe results on SUMMARY, SEQUENCE, LATENCY, ALARMS tabs.

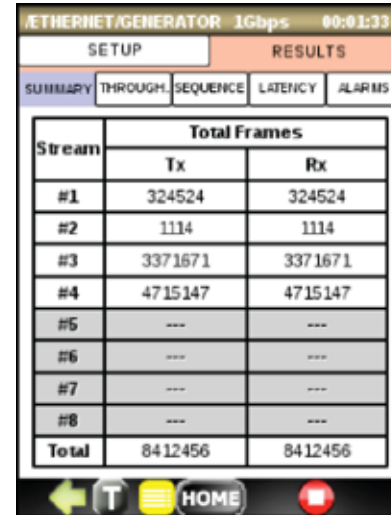


10.2.4 Traffic Generator Results

SUMMARY Tab

Frame count statistics are displayed for all enabled streams. Total transmitted and received frames are reported.

- **Tx:** Display the number of transmitted frames by each stream.
- **Rx:** Display the number of received frames by each stream



ETHERNET GENERATOR 1Gbps 00:01:33

SETUP RESULTS

SUMMARY THROUGH SEQUENCE LATENCY ALARMS

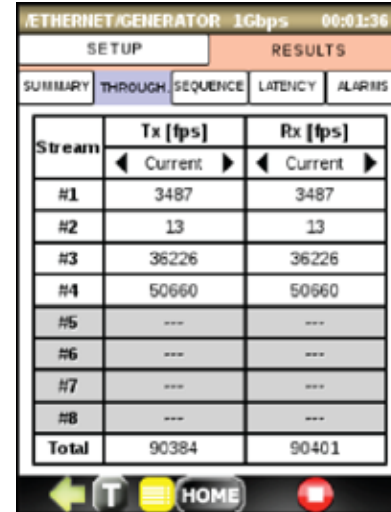
Stream	Total Frames	
	Tx	Rx
#1	324524	324524
#2	1114	1114
#3	3371671	3371671
#4	4715147	4715147
#5	---	---
#6	---	---
#7	---	---
#8	---	---
Total	8412456	8412456

← T ☰ HOME →

THROUGHPUT Tab

Transmit and receive rate is displayed in terms of frame per second (fps). Throughput is displayed individually for each stream. The current, average, minimum, and maximum values are reported.

- **Current:** Display average throughput value of last second.
- **Average:** Display average throughput value since the beginning of the test.
- **Minimum:** Display minimum throughput value since the beginning of the test.
- **Maximum:** Display maximum throughput value since beginning of the test.



ETHERNET/GENERATOR 1Gbps 00:01:36

SETUP RESULTS

SUMMARY THROUGH SEQUENCE LATENCY ALARMS

Stream	Tx [fps]	Rx [fps]
	◀ Current ▶	◀ Current ▶
#1	3487	3487
#2	13	13
#3	36226	36226
#4	50660	50660
#5	---	---
#6	---	---
#7	---	---
#8	---	---
Total	90384	90401

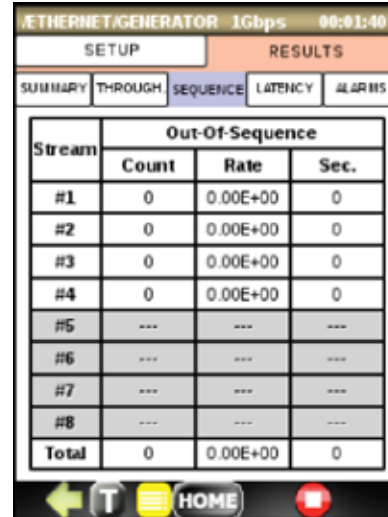
← T ≡ HOME →

SEQUENCE Tab

Out-Of-Sequence is declared when frame has its sequence number smaller than previously received frame.

Per stream Out-Of-Sequence statistics:

- **Count:** Display total number of frames declared as Out-Of-Sequence.
- **Rate:** Display total received frames to Out-Of-Sequence frames ratio.
- **Sec.:** Display amount of time in seconds that Out-Of-Sequence occurred.



The screenshot shows a mobile application interface for monitoring an Ethernet generator. The title bar at the top reads "/ETHERNET/GENERATOR 1Gbps 00:01:40". Below the title bar are two tabs: "SETUP" and "RESULTS". Under the "RESULTS" tab, there are four sub-tabs: "SUMMARY", "THROUGH", "SEQUENCE", "LATENCY", and "ALARMS". The "SEQUENCE" tab is currently selected. The main content area displays a table titled "Out-Of-Sequence" with the following data:

Stream	Out-Of-Sequence		
	Count	Rate	Sec.
#1	0	0.00E+00	0
#2	0	0.00E+00	0
#3	0	0.00E+00	0
#4	0	0.00E+00	0
#5	---	---	---
#6	---	---	---
#7	---	---	---
#8	---	---	---
Total	0	0.00E+00	0

At the bottom of the screen, there is a navigation bar with four icons: a back arrow, a 'T' icon, a list icon, and a 'HOME' button. To the right of the 'HOME' button is a red square icon.

LATENCY Tab

The Round Trip Latency parameter statistics are displayed for all enabled streams. The current, average, minimum, and maximum values are reported.

- **Current:** Display average latency value of last second.
- **Average:** Display average latency value since the beginning of the test.
- **Minimum:** Display minimum latency value since the beginning of the test.
- **Maximum:** Display maximum latency value since the beginning of the test.

Use ◀ and ▶ buttons to switch between Current/Average and Minimum/Maximum latency values.

The top screenshot shows the 'LATENCY' tab with the following table:

Stream	Latency [us]	
	◀ Current ▶	◀ Minimum ▶
#1	1	1
#2	1	1
	1	1
	1	1
	---	---
	---	---
	---	---
	---	---



The bottom screenshot shows the 'LATENCY' tab with the following table:

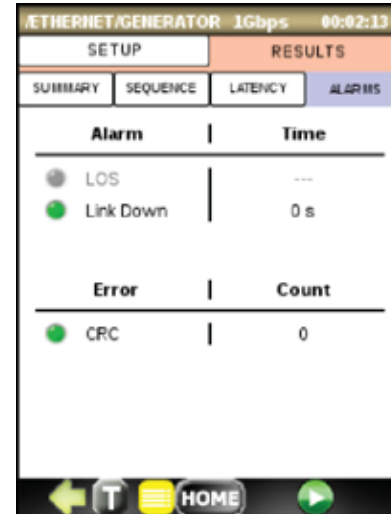
Stream	Latency [us]	
	◀ Average ▶	◀ Maximum ▶
#1	1	2
#2	1	2
#3	1	2
#4	1	2
#5	---	---
#6	---	---
#7	---	---
#8	---	---

ALARMS Tab

The alarms are displayed with green, red background when applicable; otherwise will be displayed in gray. The error count and the amount of time in seconds that alarm remained raised during test execution are also displayed.

- **LOS (Loss Of Signal):** Indicates a loss of signal on the optical port.
- **Link Down:** Indicates that Ethernet connection is down.
- **CRC:** Display total number of received frames with invalid CRC.

LED Color	Meaning
	No error pending
	At least one error present in last second



10.3 Y.1564

10.3.1 Overview

DataScout™ 1G test set Y.1564 test suite is fully compliant with ITU-T Y.1564 and offers an efficient method of qualifying and troubleshooting Ethernet services. The test set can perform two-way tests (round-trip) with far-end loop device. Key features of DataScout™ 1G test set Y.1564 are:

- Configurable services of up to eight simultaneous flows including CIR, EIR, Traffic Policing, frame size.
- Flexible Layer 2, Layer 3, and Layer 4 settings, including MAC and IP addresses, VLAN settings, TTL, TOS, UDP port number.
- Traffic coloring support (traffic classifying).
- Step load CIR test support (up to seven steps).
- Independent setting of Service Acceptance Criteria limits for each service.
- Test verdict reporting with pass/fail indication based on Service Acceptance Criteria.

10.3.2 Y.1564 Setup

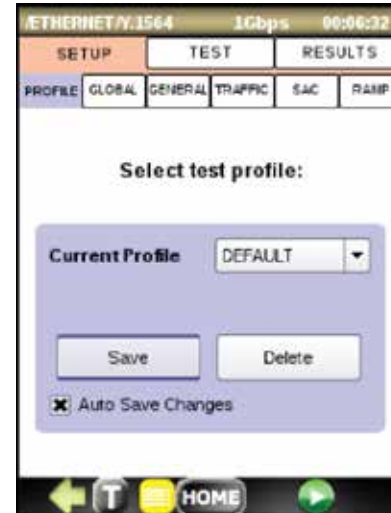
PROFILE Tab

Profile tab allows you to save and load user-defined test configuration.

To save current configuration data, tap the **Save** button and specify new or leave current profile name.

To load a specific profile that was saved previously, select its name from a combo box. After profile selection, configuration data will be automatically loaded.

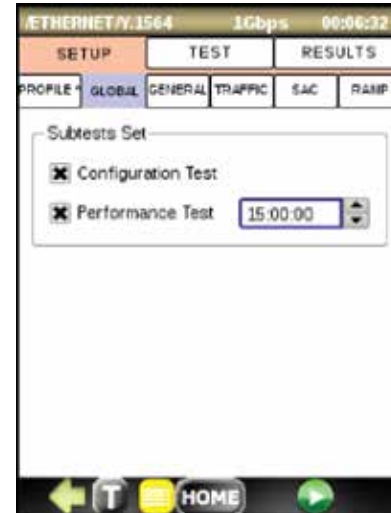
To delete specific profile, select it from Current Profile combo box and tap **Delete** button. Note that you cannot delete DEFAULT profile, but only restore it to factory default when tapping **Delete** button.



GLOBAL Tab

Global setup for Y.1564 includes:

- **Configuration Test:** Enable configuration test.
- **Performance Test:** Enable performance test. If enabled, set time in HH:MM:SS format for the Service Performance test duration. Default setting is 15 minutes.





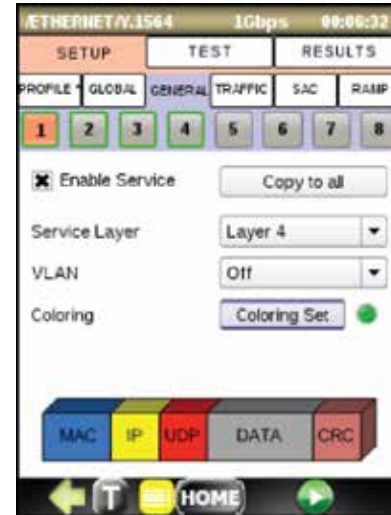
GENERAL Tab

Tab includes per service setup:

- **Enable Stream:** Enable or disable current stream.
- **Stream Layer:** Select the frame structure of current stream. The choices are: Layer 2 (MAC), Layer 3 (MAC/IP), Layer 4 (MAC/IP/UDP).
- **VLAN:** Define number of VLAN tags in frame header. The choices are: Off, 1 tag, 2 tags.
- **Coloring:** Configure traffic coloring.
- **Header setup:** Tap on frame box to set header parameters of each layer.

Press **Copy to all** button to copy 1st service setup to others services (2-8).

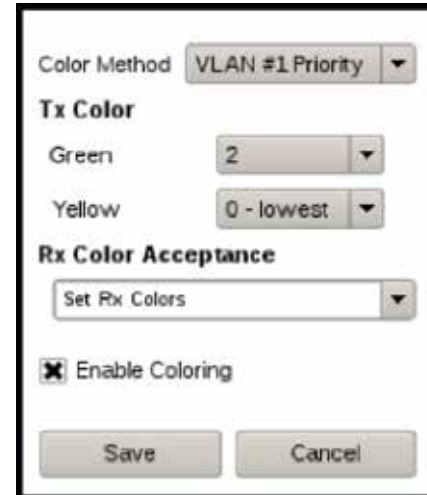
LED Color	Meaning
	Traffic coloring is on
	Traffic coloring is off



Traffic coloring enables user to tell the network which of the frames should be marked as green frames (high priority level) and which frames should be marked as yellow frames (low priority level). Color mode can be on or off independently for each service. Press **Coloring Set** button to open traffic coloring configuration menu for current service.

Traffic coloring menu includes:

- **Color Method:** Configure which field in the test traffic implements the color mechanism. The choices are: IP DSCP, IP ECN, VLAN Priority, VLAN DEI. The color markers must have different value for green and yellow traffic corresponding to the same service.
- **Tx Color:** Define color marker value for green and yellow traffic.
- **Rx Color Acceptance:** Configure Rx traffic color filter. Define which of received frames should be classified as green and which as yellow.
- **Enable Coloring:** Enable or disable traffic coloring for current service.

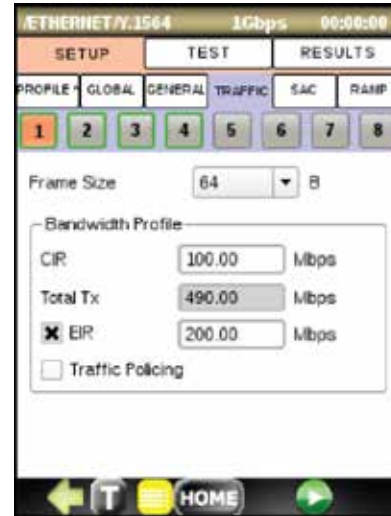


The screenshot shows a configuration window for traffic coloring. It features a 'Color Method' dropdown menu set to 'VLAN #1 Priority'. Under the 'Tx Color' section, there are two dropdown menus: 'Green' set to '2' and 'Yellow' set to '0 - lowest'. The 'Rx Color Acceptance' section has a dropdown menu labeled 'Set Rx Colors'. Below this is a checkbox labeled 'Enable Coloring' which is checked. At the bottom, there are 'Save' and 'Cancel' buttons.

TRAFFIC Tab

Display setup panel that enables user to define frame size and bandwidth profile for each service to be tested.

- **Frame Size:** 64, 128, 256, 512, 1024, 1280, or 1518 B.
- **CIR (Committed Information Rate):** Define CIR value.
- **Total Tx:** Indicates sum transmit rate (CIR) of all enabled services (cannot exceed 100% of interface Utilized Line Rate).
- **EIR (Excess Information Rate):** Enable execution EIR test as a part of configuration test suite. If enabled, define EIR value.
- **Traffic Policing:** Enable execution of the policing test as a part of configuration test suite. If network under test is not using any traffic administration algorithm, you may want to disable policing test.



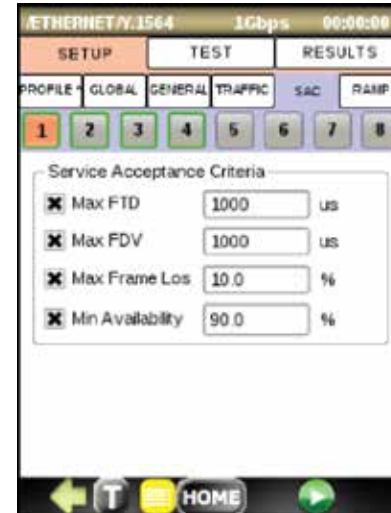
SAC Tab

The Service Acceptance Criteria (SAC) parameters allow defining the pass/fail verdict thresholds for service. The set of values defines minimum requirements to ensure that the service meets with Service Level Agreement. SAC parameters are only guaranteed for traffic conforming to the CIR.

The following values comprise the Service Acceptance Criteria:

- **Max FTD (Frame Transfer Delay):** Determine the maximum that the frames can take to travel from source to destination (round trip delay for looped back frames) to still be compliant with the SLA.
- **Max FD (Frame Delay Variation):** Determine the maximum frame jitter allowed to still be compliant with the SLA.
- **Max Frame Loss:** Define maximum ratio of lost frames to total transmitted frames allowed to still be compliant with the SLA.
- **Min Availability:** Define minimum percentage of service availability allowed to still be compliant with SLA.

Enabling or disabling checkbox determines if corresponding parameter will be verified during test.



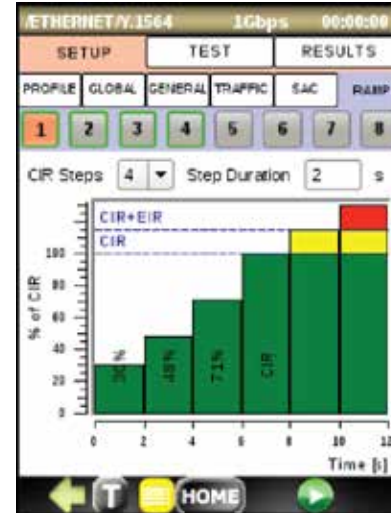
RAMP Tab

For each service, a step load test may be used to gradually reach the CIR. The RAMP tab allows the user to create multiple CIR test steps.


RAMP configuration includes:




- **CIR Steps:** Define number of steps to be tested in configuration CIR test.
- **Step Duration:** Determine test duration for each ramp step.
- Using the touch screen, modify step level in terms of % of CIR.

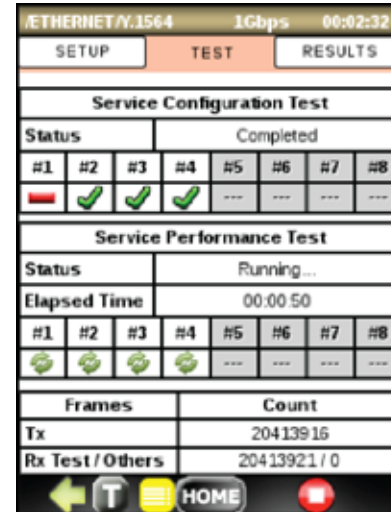
EIR step and Traffic policing step are part of ramp graph as soon as they are enabled on TRAFFIC tab for corresponding service.



10.3.3 Y.1564 Running Test

- Do test setup or load proper test profile on PROFILE tab.
- Make sure that at least one service is enabled.
- Ensure that link is up in the top status bar.
- Press  to run the Y.1564 test. TEST tab containing current test and services status will be automatically displayed.
- Phase 1 – Service Configuration test: The services will be tested one by one.
- Phase 2 – Service Performance test: The services will be tested simultaneously over defined period of time.

Icon	Meaning
	Fail status
	Pass status
	Running



10.3.4 Y.1564 Results

Overview of measurements

- ULR: Utilized Line Rate is a average rate of frames including the minimum size interframe gap, the preamble, the start of frame delimiter and the service frame bits starting with the MAC address and ending with the FSC.
- FTD: The time a frame takes to transfer between two measurement points of a network.
- FDV: The variation of the arrival of frames at the measurement point.
- FLR: The ratio of total lost frames to the total frames transmitted.
- AVAIL: A test flow is considered to be in one of two stated either Available or Unavailable, switch to the Unavailable happens from the commencement of a block of 10 consecutive SESETH (Severe Errored Seconds Ethernet). A SESETH is considered when FLR for that second excess a rate of 0.5 (50%). Once the SESETH rate is exceeded the test flow will remain in the Unavailable state until the commencement of a block of 10 consecutive non-SESETH.

Configuration Test Results

Service Configuration test results include:

- Step Verdict
- Tx ULR
- Rx ULR
- Tx Frame Count
- Rx Frame Count
- Frame Loss Count
- Frame Loss Rate
- FTD (Frame Transfer Delay)
- FDV (Frame Delay Variation)

Step	PASS/FAIL	Tx ULR [Mbps]	Rx ULR [Mbps]
33% CIR	✓	42.90	42.90
50% CIR	✓	65.00	65.00
100% CIR	✓	130.00	130.00
EIR Total	✓	429.91	429.91

D [us]		FDV [us]		
Mean	Max	Min	Mean	Max
1	2	-1	0	1
1	2	-1	0	1
1	2	-1	0	1
1	2	-1	0	1

Parameters that are verified against Service Acceptance Criteria (defined on SAC tab) are displayed with yellow backlight. The Service Configuration test is pass if all verified parameters for each step are found to be within acceptable limits. Test is reported as fail if any test step is marked as fail.

The service configuration test is broken down into three steps. The steps are tested individually for all services and evaluated as follows:

- CIR Test: The CIR test step is considered to pass if the computed performance metrics (FTD, FDV, FLR) are within acceptable limits.
- EIR Test
 - ▶ Non-color-aware services: The test is considered to pass if $CIR * (1 - FLR) < Rx\ ULR \leq CIR + EIR$.
 - ▶ Color-aware services: The test is passed if FTD, FDV and FLR for green traffic are within acceptable limits.

- Traffic Policing Test

- ▶ Non-color-aware services: The test is considered to pass if $CIR * (1 - FLR) < Rx\ ULR \leq CIR + EIR + 1\%$.
- ▶ Color-aware services: The test is passed if FTD, FDV, and FLR for green traffic are within acceptable limits and if the aggregated Rx ULR (green + yellow) meets following condition: $CIR * (1 - FLR) < Rx\ ULR \leq CIR + EIR + 1\%$.

Performance Test Results

Service Performance test results include:

- Rx ULR
- FTD (Frame Transfer Delay)
- FDV (Frame Delay Variation)
- Tx ULR
- FLR (Frame Loss Rate)
- Availability
- Unavailability seconds

ETHERNET/Y.1564		1Gbps		00:03:02	
SETUP	TEST	RESULTS			
CONF. TEST	PERF. TEST	ALARMS			
1	2	3	4	5	6
7	8	Verdict: PASS ■ - SAC Verified			
	Curr	Min	Mean	Max	
ULR [Mbps]	100.00	0.00	94.52	100.00	
FTD [us]	1	1	1	2	
FDV [us]	0	-1	0	1	
Tx ULR [Mbps]					100.00
FLR [%]					5.477
FL Count					1475309
AVAILABILITI [%]					94.48
Unavailability [sec]					10



ETHERNET/Y.1564		1Gbps		00:03:07	
SETUP	TEST	RESULTS			
CONF. TEST	PERF. TEST	ALARMS			
1	2	3	4	5	6
7	8	Verdict: FAIL ■ - SAC Verified			
	Curr	Min	Mean	Max	
ULR [Mbps]	120.00	0.00	113.57	120.01	
FTD [us]	1	1	1	2	
FDV [us]	0	-1	0	1	
Tx ULR [Mbps]					120.00
FLR [%]					5.359
FL Count					114398
AVAILABILITI [%]					94.59
Unavailability [sec]					10

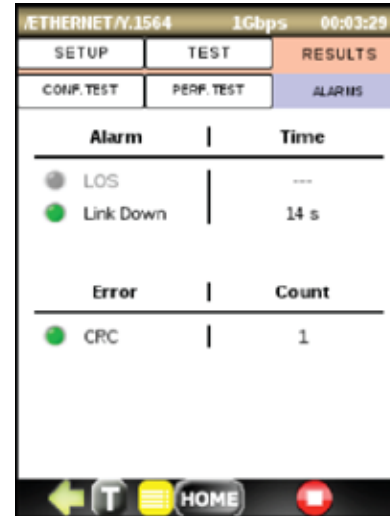
Parameters that are verified against Service Acceptance Criteria (defined on SAC tab) are displayed with yellow backlight. The Service Performance test is pass if all verified parameters are found to be within acceptable limits. If any parameter exceeds limit, it becomes highlighted in red and test verdict is reported as fail.

ALARMS Tab

The alarms are displayed with green, red background when applicable; otherwise will be displayed in gray. The error count and the amount of time in seconds that alarm remained raised during test execution are also displayed.

- **LOS (Loss Of Signal):** Indicates a loss of signal on the optical port.
- **Link Down:** Indicates that Ethernet connection is down.
- **CRC:** Display total number of received frames with invalid CRC.

LED Color	Meaning
	No error pending
	At least one error present in last second



ETHERNET/1564 1Gbps 00:03:29		
SETUP	TEST	RESULTS
CONF. TEST	PERF. TEST	ALARMS
Alarm	Time	
LOS	---	
Link Down	14 s	
Error	Count	
CRC	1	

11. IPTV Test Option – DS1G-SW-IPTV

IPTV application allows user to monitor multiple IPTV multicast streams at the same time (up to 30 Mbit/s bandwidth, typically 5-6 SD streams or 1-2 HD streams).

The application supports UDP/ MPEG-2 TS & UDP/RTP/ MPEG-2 TS.

The DataScout™ 1G test set IPTV can connect as the end-device to emulate Set-Top Box (sending an IGMP join) or connect passively. Passive streams are described as “Passive” next to the bandwidth value.

The example screen on the right shows a list of connected streams. Click on + to expand the tree with information about PID numbers inside the stream such as:

- PID type (table like PAT/PMT/... and audio/video data)
- PID number
- bandwidth for each PID respectively



The BASIC information about the PID within the STREAM includes:

- multicast address
- data type (stream/PID)
- PID number only for PID
- bitrate
- IP source & destination address
- UDP source & destination address

APTV/STATISTICS

Basic	Packets	TR101290
Multicast	225.1.1.1	
Data type*	STREAM	
PID Number	N/A	
Bitrate	4994 kb/s	
IP Src Address:	172.30.1.3	
IP Dst Address:	225.1.1.1	
UDP Src Port:	52891	
UDP Dst Port:	5500	
Encapsulation:	UDP/MPPEG-2TS	

*Stream or PID information

← T HOME

Next screen shows Packet statistics, such as:

- packet loss
- packet out of sequence
- packet discarded
- packet received and ratio of each one

APTV/STATISTICS

Basic	Packets	TR101290
Packet Loss	0	
Packet Out of Sequence	0	
Packet Discarded	0	
Packet Received	1143324	
Packet Loss [%]	0.00	
Packet Out of Sequence [%]	0.00	
Packet Discarded [%]	0.00	
Packet Received [%]	100.00	

← T HOME

The last two screens show values of TR101290

Priority 1 and 2 alarms:

- Priority 1: TS Sync Loss, Sync Byte Error, PAT Error, PAT 2 Error, Continuity Error, PMT Error, PMT 2 Error, PID Error.
- Priority 2: Transport Error, CRC Error, PCR Error, PCR Repetition Error, PCR Discontinuity Error, PCR Accuracy Error, PTS Error, CAT Error.

APTV/STATISTICS		
Basic	Packets	TR101290
Priority 1		Priority 2
No.	Indicator	Value
1.1	TS SyncLoss	0
1.2	Sync Byte Error	0
1.3	PAT Error	0
1.3.1	PAT 2 Error	0
1.4	Continuity Error	0
1.5	PMT Error	0
1.5.1	PMT 2 Error	0
1.6	PID Error	0

12. VoIP Test Option – DS1G-SW-VOIP

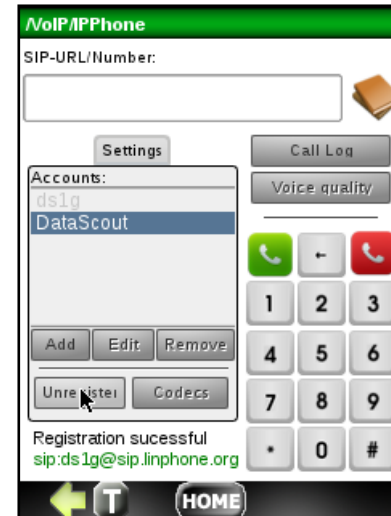
The VoIP application consists of:

- SIP softphone
- Call Log
- SIP Protocol Flow analyzer

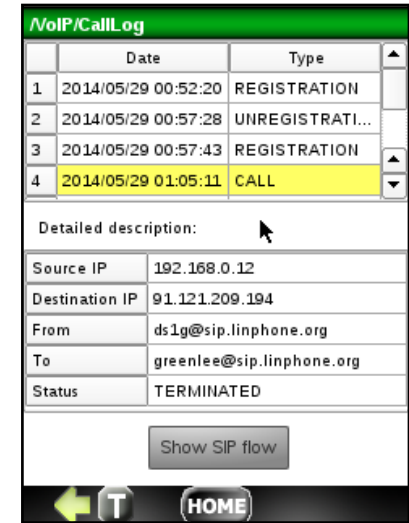


The Softphone, shown below, requires a registration with the chosen SIP proxy server, prior to originating or receiving a call. To do that:



- Press the **Register** button and wait for “Registration Successful” and the login address (sip:DataScout@GreenleeSIP.com in this example).





- To add a new SIP account, press **Add** button and fill out the form with Account ID, User ID, Password and Proxy name. This information is normally provided by the Sip Proxy Server subscription.



Call Answer:

- Once registered, a call can be received by pressing the answer  button.
- Plug in the provided headset to converse with the calling party.
- To terminate the call, press the hang up  button.

Call Origination:

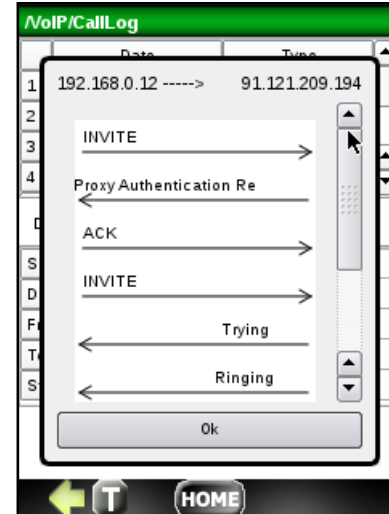
- To originate the call, make sure the SIP registration is successful.
- Enter the desired SIP or URL telephone number.
- Press , wait for the connection, and start conversation via the provided handset.
- To terminate the call, press the hang up  button.

Call Log:

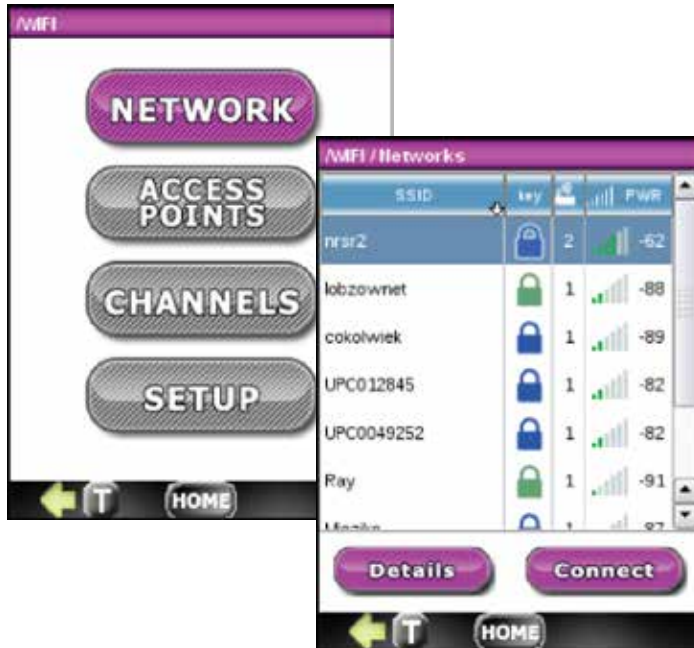
To view the call log, press the **Call Log** button on the Softphone face. Optionally, the Call Log can be entered from the main VoIP menu **Call Log** button.

SIP Flow:

To view or analyze the SIP protocol flow for the specific call, click on the call item in the call log and then press the **Show SIP flow** button.



13. Wi-Fi Analysis Test Option – DS1G-SW-WIFI



The DataScout Wi-Fi test option provides a comprehensive tool to discover presence of Wi-Fi networks based on 802.11 b/g/n standard. Discovered networks are listed, as shown below, with their SSID, encryption key color codes:



No encryption

WEP key

WPA2-PSK

WPA-PSK

Number of access points, signal power in bars, and dB. To proceed with test, select a network by highlighting it. If the selected network has multiple access points, press **Details** button to see the list. Otherwise, press **Connect** to connect to it.

The network with two access points is shown on the left. To proceed, select the desired access point and **Connect**. The Channel and View functions have not been activated yet in this software version.

The two screens to the right show the automatic test sequence.



14. IP TOOLS

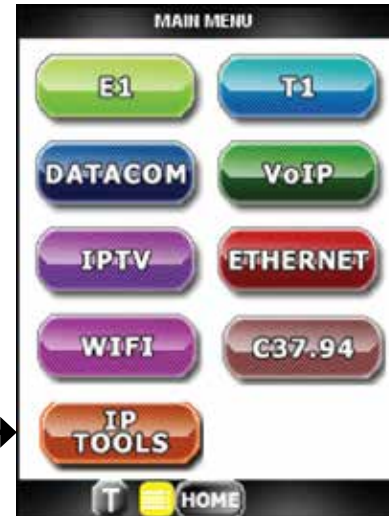
IP TOOLS is a set of IP testing functions supplied as a standard feature of the DataScout™ 1G test set.

The functions are:

- PING
- Trace Route
- Discover
- FTP
- HTTP

The IP TOOLS are available on the “LAN” T- Base 10/100 Ethernet interface, a standard feature of the DataScout™ 1G test set.

Select →



14.1 PING

Ping function setup includes:

- URL or IP address
- Data Size
- Time To Live
- Delay
- Timeout
- Attempts number

Press Ping button to start the test and observe the results on the automatically opened RESULTS screen.

The test can be stopped anytime by pressing the STOP button.

The image displays two screenshots of the 'AP TOOLS' interface. The top screenshot shows the 'Ping' function setup screen. The bottom screenshot shows the 'RESULTS' screen after the test is completed.

AP TOOLS - Ping Setup

AP TOOLS				
Ping	Trace Route	Discover	FTP	HTTP
SETUP		RESULTS		
Seq	Address	Time(ms)	TTL	▲
23	173.194.70.106	34.80	45	
24	173.194.70.106	51.40	45	
25	173.194.70.106	32.80	45	▲
26	173.194.70.106	33.40	45	▼

AP TOOLS - Ping Results

AP TOOLS				
Ping	Trace Route	Discover	FTP	HTTP
SETUP		RESULTS		
Seq	Address	Time(ms)	TTL	▲
23	173.194.70.106	34.80	45	
24	173.194.70.106	51.40	45	
25	173.194.70.106	32.80	45	▲
26	173.194.70.106	33.40	45	▼

Summary Statistics

Sent	26	Received	26
Lost [%]	0.00		
Round Trip Time [ms]			
Current	33.40	Avg	38.40
Min	31.86	Max	53.62

Buttons: Ping, Stop

Navigation: Home, T, Back

14.2 Trace Route

The Trace Route setup includes:

- Destination URL or IP address
- Max number of Hops
- Timeout

Press **Trace** button to start the test and **STOP** button to stop the test.

A table with trace results fills out automatically during the test.



The screenshot shows the 'AP TOOLS' interface with the 'Trace Route' tab selected. The destination is set to 'www.google.com', Max Hop is 30, and Timeout is 5 seconds. The results table shows the following data:

Hop	Time[ms]	Address
7	45.197	84.116.133.97
8	37.109	72.14.219.9
9	35.034	209.85.240.64
10	68.054	72.14.234.231
11	33.295	209.85.254.112
12	*	*
13	37.079	173.194.70.147

Buttons for 'Trace' and 'Stop' are visible at the bottom of the interface.

14.3 Discover

The Discover function scans the network by IP address range specified in CIDR notation. IP range notation is constructed from:

- IP address
- Prefix – number of leading '1' in the routing prefix mask

The function starts when **Discover** button is pressed and when it is completed a green check appears.

To get details for each device, highlight its corresponding line in the table and press **Details** button.

The top screenshot shows the 'AP TOOLS' application with the 'Discover' tab selected. The IP Range is set to 172.30.1.0 / 24. The status is 'Completed' with a green checkmark and 'Scanned / Find: 256 / 17'. A table lists discovered devices:

No.	IP Address	MAC Address
1	172.30.1.2	FC:F5:28:FD:FD:50
2	172.30.1.3	00:26:18:A2:7C:2D
3	172.30.1.4	00:0B:FD:AEE
4	172.30.1.10	08:00:27:AA:8
5	172.30.1.17	6C:62:6D:5B:3
6	172.30.1.26	38:60:77:5E:1
7	172.30.1.63	02:52:0B:02:1

The bottom screenshot shows the 'Details' screen for the selected device (No. 1). The IP Range is still 172.30.1.0 / 24. The status is 'Completed' with a green checkmark and 'Scanned / Find: 256 / 17'. A table shows the details for the selected device:

Parameters	Details
No.	11
IP Address	172.30.1.92
Machine Name	nrc-desktop
MAC Address	38:60:77:82:CE:8B
Vendor	Pegatron

14.4 FTP

The FTP function allows checking:

- Throughput Current and Average
- Data transfer rate
- Transfer Time

To start the test fill out the FTP address field, select “anonymous” or Filed the User name and the password Pwd, and then press **Start** button and wait for Completed green check to appear.



14.5 HTTP

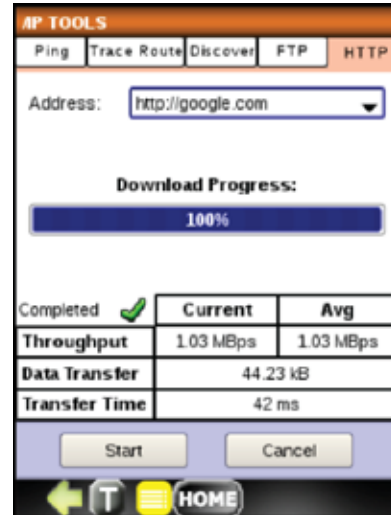
The HTTP function tests www connection.

To test HTTP, fill out the URL address or IP address, and press **Start** button.

To start the test press **Start** button.

When the website's home page is loaded, Completed green check will appear along with:


- Throughput Current and Average
- Data Transfer rate
- Transfer Time



15. Remote Control

The DataScout™ 1G test set has a VNC server built in and can be controlled from the VNC Client application. This option uses the Ethernet 10/100Base-T LAN or Wi-Fi interface. To start the VNC remote control:

On the test set toolbar press:

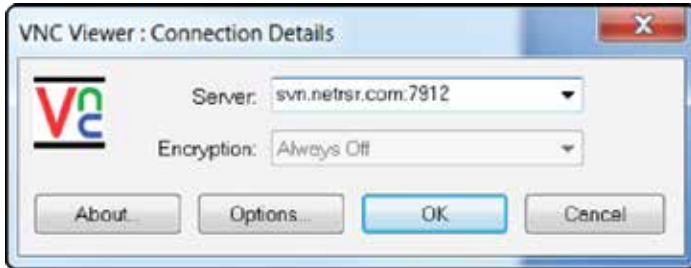
1.  and select either “eth0 ON” or “wlan0 ON”.
2. Get IP address and **OK** it. Note this IP address and the port number as it will be needed for the Client.
3. Select “VNC local” for remote control with the same LAN or “VNC global” for outside network.
4. The default ID (password for the Client) is 1234. To change it, click on it and select another number from the available list.

On the Client:

1. Install free, open source VNC from this location: <http://www.realvnc.com/download/viewer/>
2. Run the VNC client. The Client logon window is shown below.



3. Enter the Server name or IP address; enter OK.




4. Enter password in the authentication window.
The VNC should connect to the server as shown to the right.



16. Software Update Procedure

To update the DataScout™ 1G test set software, follow this procedure:

1. Download the update file (about 120 Mb) from the link provided in the email.
2. Copy the file to an empty USB pen drive. If the update is from software older than 5.00.0m the pen drive requires at least 500 Mb of spare space for unpacking.
3. Insert the USB pen drive through the provided USB-to-USB mini adapter cable.
4. Press  button and press Update button. Press Yes to the warning message.



5. If no USB is detected, a message appears.

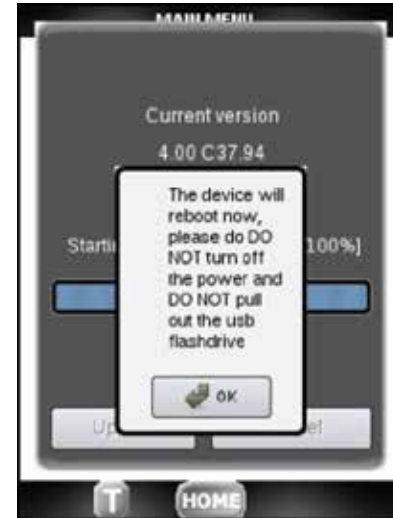
Otherwise folders on the USB will appear. Highlight the desired version of the Update and press Select.

The unpacking and installation process has been started and will continue for 3-4 minutes with progress messages displayed.



6. Next, OK the warning message and wait for the reboot to complete. Once the main menu appears, unplug the USB adapter cable.

The update process has been completed successfully. Contact Greenlee technical support with the serial number and brief description of any issue if the update was not completed successfully.



Greenlee Textron Inc. warrants to the original purchaser of these goods for use that these products will be free from defects in workmanship and material for one year. This warranty is subject to the same terms and conditions contained in Greenlee Textron Inc.'s standard one-year limited warranty.

For all Test Instrument repairs, contact Customer Service at 800-642-2155 or 760-598-8900 and request a Return Authorization.

For items not covered under warranty (such as items dropped, abused, etc.), a repair cost quote is available upon request.

Note: Prior to returning any test instrument, make sure the battery is at full charge.



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